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The 'University Studies' constitute a sub-series of the INDIANA UNIVERSITY BULLETIN *in which from time to time are published some of the contributions to knowledge made by instructors and advanced students of the University. At present not more than two or three such numbers are issued a year.*

In the present volume continuous pagination ceases with page 219; hence in the following table of contents no page reference is given for the last four contributions. They are listed, however, in the order of their publication, and of their appearance in this volume.

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Prefatory Note

The main purpose of the INDIANA UNIVERSITY BULLETIN is the publication of the official statements of the various subdivisions of the University, including their announcements of courses. From time to time this publication has further been used to present addresses given at the University, educational studies which are of value to teachers of the State, and other matters which may interest the University alumni and its patrons.

Hitherto no attempt has been made to include in the BULLETIN papers embodying researches made in the various laboratories and departments of the University. These have been left to find their way into print through other channels than the official University publication. With this issue of the BULLETIN a sub-series is established, to be known as the 'University Studies,' in which will be published from time to time some few of the contributions to knowledge made by instructors and advanced students of the University.

At present it is not intended to issue more than two or three such numbers a year, but it is hoped ultimately to be able to enlarge the scope of the series. The 'Studies' will be continuously numbered, and from time to time a title-page and table of contents will be issued, for binding them up in volumes. The size page of the BULLETIN is changed with this issue to suit better the character of the new publications.

For information concerning the 'University Studies,' address

The Editor of Publications,
Indiana University,
Bloomington, Indiana.

1. A Note on the Pharmacological Action of Uranium.

By Dennis Emerson Jackson, Assistant Professor of Physiology, in collaboration with Frank Charles Mann.

Introduction. The various compounds of uranium have never occupied a prominent place in the field of practical therapeutics. The element possesses marked toxic properties, and but few scientific suggestions have ever been made concerning the utilization of any of its pharmacological actions in the treatment of disease.

A brief survey of the literature is sufficient to convince one that the physiological actions of this substance have by no means been completely determined. Perhaps the most complete and satisfactory study of the physiological action of uranium which has yet appeared was published in 1890 by Woroschilsky[1]. Valuable work was also done by Chittenden[2] and his collaborators in 1885-6. Recently some attention has been given to uranium as a convenient agent for the production of certain forms of experimental edema[3].

This article will deal with only three general phases of the pharmacological action of this metal, viz., first, the action of the substance on the secretion of lymph; second, its action on the circulation and respiration; and third, its action on the blood.

If sodium uranate be added to a strong aqueous solution of tartaric acid a soluble compound of uranium will be formed which may be used for intravenous injections without precipitation of the blood. It is usually necessary to add a small amount of sodium hydrate in order to neutralize completely the tartaric acid after the desired amount of sodium uranate has been added. It is, however, probably slightly more convenient to proceed as did Woroschilsky in making the double salt. Nearly all of the following experiments have been performed with solutions made up after this method. It consists in heating uranium nitrate in a crucible until all the acid is driven off and the reddish-brown oxide (UO_3) has been formed. The oxide is then carefully weighed and from this weight the percentage strength of the solution is calculated. The oxide is placed in a small amount of distilled water, heated, and small quantities of tartaric acid are added from time to time until the oxide is dissolved. The slight excess of tartaric acid which is usually found to be present is neutralized with sodium hydrate, using phenolphthalein as an indicator. The solution is then diluted

[1] Woroschilsky, *Arbeiten des Pharmakologischen Instituts zu Dorpat,* V, (1890), 1.

[2] Chittenden, *Studies from the Sheffield Scientific School,* I, II, III, 1885-6.

[3] Pearce, *The Archives of Internal Medicine,* June, 1909.

with distilled water until the desired percentage is obtained. The neutralized solution is of a bright golden-yellow color. I have used in nearly all cases a two per cent solution of the red oxide (UO_3), the percentage being based on the relation of the weight of the oxide used to the amount of the solution when changed into the double salt (sodium-uranium-tartrate) and completely diluted. A solution made up in this manner gives no visible precipitate of egg albumen, blood, or serum when added to any of these proteid solutions in a test tube. It possesses moderate antiseptic power, but some fungi grow readily in two per cent solutions of it. If the solution be made slightly acid it gains greatly in antiseptic power, and will also precipitate proteids. Addition of a little sodium hydrate will again dissolve the proteid precipitate, which is also soluble in an excess of the albumen.

The administration of sufficient quantities of uranium to an animal is usually followed within a few days by albuminuria, glycosuria, parenchymatous degenerations, gastro-intestinal disturbances, paralyses; and, according to most observers, certain marked pathological changes are found in the blood vessels.

Action on Lymph Flow. The effect of uranium on lymph flow may best be described by the following protocol of one of my experiments:

Feb. 18, 1910. Dog, male, yellow, weight 18 kilos, in good condition. Twelve hours previously the animal had eaten some meat, no other solid food taken before the experiment. Etherized and placed upon the operating table. Arrangements made for artificial respiration when needed. Blood pressure taken from right carotid artery, injections made into the left femoral vein. Chest opened a little at the apex and a cannula placed in the thoracic duct. Normal lymph flow was 37 drops in 15 minutes, i.e., $12\frac{1}{3}$ drops in each five minutes. Normal time required for clotting of the lymph was $4\frac{1}{2}$ minutes. Lymph was thin and somewhat opalescent, i.e., fat was present but not abundant.

11:22. Injected 10 cc. of a two per cent (UO_3) solution of sodium uranium tartrate. In the next five minutes 12 drops of lymph were secreted.

11:28. Injected 10 cc. of drug. In the next five minutes 16 drops of lymph were secreted.

11:34. Injected 10 cc. of drug. Lymph flow 13 drops in five minutes.

Lymph clotted readily after 30 cc. of drug had been injected. Hence not more than traces of the uranium could be present in an active form in the secreted lymph, for the addition of a very small amount of the drug to the lymph outside the body prevents clotting.

11:42. Blood pressure fallen about one-half. Muscular tremors well marked but weaker than with eserine. Lymph remains clear and opalescent. No noticeable increase in the rate of flow.

11:56. Lymph still clear, no traces whatever of any blood streaks.

11:57. Injected 30 cc. of drug to kill the animal. Urinated, convulsions, tremors. Slight increase and then a decrease in rate of lymph flow.

12:00. Artificial respiration stopped and animal died of asphyxia. Was still in fair condition just before death.

In this case observations upon the lymph flow were continued for only about three-quarters of an hour, but the results are perfectly typical of those obtained in other cases in which observations were carried on for a much longer time. In some instances a very slight increase over the normal is obtained. I believe this to be due not to any specific action of the drug on the formation of lymph, but rather to the muscular movements of the visceral organs; and in case of convulsive contractions of the skeletal muscles in general these probably also help to force a few extra drops of lymph out of the thoracic duct or its immediate branches. The increased muscular movements are probably partly due to a slight stimulation of the motor endings in striated muscle. There seems also to be a clearly defined but transitory stimulation of certain parts of the central nervous system. This is later followed by marked depression and paralysis. In a few instances slight traces of blood were seen in the lymph as it flowed from the duct. In at least one case the quantity of blood thus observed seemed to increase progressively in amount as the intoxication progressed. At no time, however, did the lymph acquire more than a slightly reddish tinge and the rate of lymph flow was not noticeably increased. Pearce[4] produced edema in rabbits suffering from uranium nephritis when he gave them 100 cc. of water by stomach daily for two or three days. He assumed that the uranium had injured the capillary epithelium and concluded that the combination of these three factors, nephritis, injury to the capillary walls, and the administration of water was sufficient to produce a well-marked edema in rabbits. His experiments extended over a number of days, and it is quite probable that in that interval pathological conditions

[4] Pearce, *loc. cit.*

might develop which would be entirely absent in an animal which was killed by uranium in a relatively short period of time. In the present instance I have not attempted to do more than to study the immediate action of the drug. It may be said, however, that in animals which die within an hour or so after the first injection of uranium numerous small ecchymotic patches may be seen in the intestinal mucosa. It is probable that in some cases such an action as this might lead to the formation of lymph containing slight traces of blood. If the capillary epithelium is weakened sufficiently to allow the escape of a considerable amount of fluid from the blood then this fluid is not, at least within the first two or three hours, passed out of the thoracic duct. The significance which this may have in relation to the production of edema when water is administered to an animal after two or three days' treatment with uranium I do not care to discuss.

Action on the Circulation. Woroschilsky[5] observed a rise in blood-pressure which he attributed to stimulation of the vaso-constrictor center. I have corroborated his results and find that with moderate injections (6 to 10 cc. of two per cent solution) the rise is at first only of a transient character. With repeated administrations, however, there is gradually developed a tendency for the pressure to maintain an elevation slightly above the normal (Fig. 1). This seems to be at least partly due to a slight, continuous, but gradually increasing stimulation of the vaso-constrictor center in the medulla. This stimulation is probably due in part to a sort of compensatory (asphyxial) action by which the circulation tries to counterbalance the gradually progressing depression of the respiratory center. The increased volume of blood caused by the rapid introduction of eight or ten cubic centimeters of fluid into the circulation usually produces a slight rise of blood-pressure lasting about as long as the injection continues. I have observed that this elevation is often followed by a slight fall which is also transient and may amount to twenty or twenty-five millimeters (Hg manometers) (Fig. 1). I believe this fall is mainly due to a direct depressant action on the heart, for it also occurs after section of the vagi, and sometimes I have noted after large injections that the heart may weaken and miss one or two beats and then gradually regain its normal strength. This may also occur after section of the vagi. Seven or eight cubic centimeters of a two per cent solution (UO_3 changed to the double salt) generally produce a rise of about fifty millimeters of mercury in a

[5] Woroschilsky, *loc. cit.*, p. 28.

medium sized dog. Electrical stimulation of a vagus nerve stops the heart after repeated large injections of the substance. Incidentally it may be mentioned that the secretory endings of the chorda tympani in the submaxillary gland, the endings of the phrenics and the motor endings of the sciatic remain active throughout the intoxication. Injection of a two per cent solution of uranium nitrate causes a marked transient fall in blood-pressure which can scarcely be distinguished from the action of amyl nitrite. Ura-

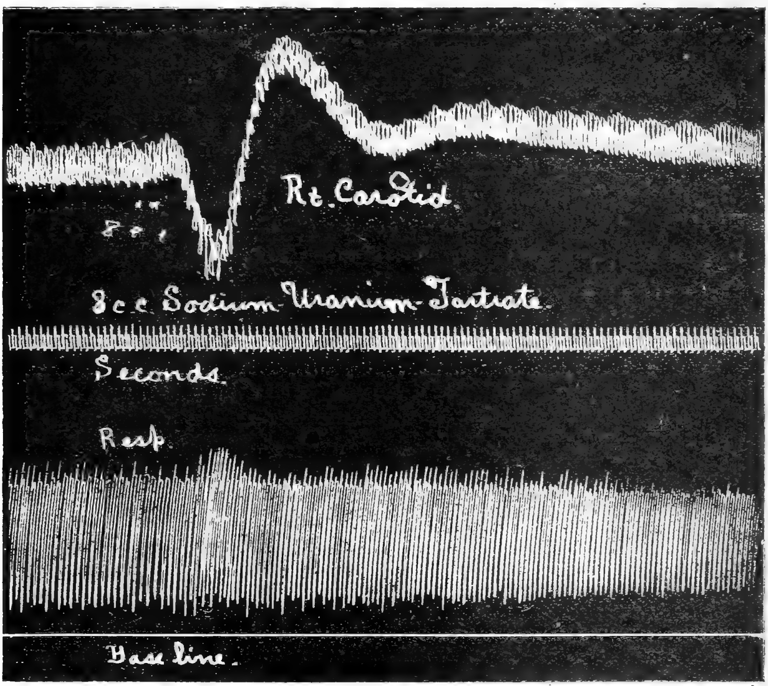

FIGURE 1. Blood pressure and respiratory tracings from a dog. Injection of 8 cc. of 2 per cent. (UO_3) sodium-uranium-tartrate solution. (See text for description.)

nium acetate also causes a lowering of pressure. Disodium tartrate causes no effect upon the circulation aside from the increased volume of fluid in the vessels.

Action on the Respiration. Injection of moderate amounts (7 to 10 cc.) of two per cent solution of the double salt caused a very slight increase in both rate and depth of respiration (Fig. 1). The immediate cause of death was respiratory paralysis. Uranium has long been supposed to possess an action somewhat resembling that of hydrocyanic acid[6]. I find its stimulating effect upon the respiration to be much smaller than that of the cyanides. Early in its action the depression of the respiratory center becomes evident. After a time the respiration ceases, but the circulation remains in good condition and if artificial respiration be given the animal may be kept alive for a long time. Normal respiration does not return until after ten to thirty minutes, if it is reinstated at all. The cessation of the breathing is usually rather rapid and there is but little tendency toward Cheyne-Stokes respiration, as is often seen with the cyanides. I have repeatedly noticed when the respiration had become greatly depressed that the injection of another dose of the substance would tend to revive the animal, apparently very much in the same way as the cyanides. This is probably due mainly to a slight direct stimulation of the central nervous system, for the effect comes on immediately after injection of the drug. The remarkable specific depression which this substance exercises on the respiratory center reminds one of morphine. I have regularly observed that, after a certain amount of the drug had been administered, the animal would pass into a sort of comatose condition, in which but little ether would be required to maintain the anæsthesia[7]. This may be due to the gradually progressing central paralysis, but it may also be contributed to, in part at least, by some specific action on the blood. The view has been generally held of late years that uranium retards the reduction of the oxyhæmoglobin in the tissues. I shall refer to this point again.

Action on the Blood. Uranium and the cyanides both prevent coagulation when added in sufficient quantity to drawn blood. Is this action the same in each case? I have attempted to throw some light on this question by trying the action of the drugs on certain common ferments.

If an aqueous extract of potato peelings be treated with a small amount of tincture of guaiac, an oxidizing ferment from the potato will at once oxidize the guaiac over to a blue compound. If a uranium solution (either the acetate, nitrate, or double salt) be added to the aqueous extract before the tincture of guaiac is poured in, there will be no hindrance whatever to the normal change over to the blue compound. Apparently uranium exercises no inhibitory power at all upon this ferment. If a solution of potassium cyanide

[6] Kobert, *Ueber Cyanmethaemoglobin und den Nachweis der Blausäure*, Stuttgart, 1891. (*Lehrbuch der Intoxicationen*, 2d ed., pp. 94-99.)
Geppert, *Zeitschrift für klinische Medicin*, XV, 208, 307.

[7] Meltzer, *American Journal of Physiology*, XXIII, (1909), 141.

be added to the aqueous extract before the tincture of guaiac is added, then no blue color will appear at all. Evidently hydrocyanic acid acts differently from uranium upon this ferment.

When normal blood is treated with hydrogen peroxide a marked evolution of gas is at once produced. If a solution of uranium (either the acetate, nitrate, or double salt) be added to the blood before the hydrogen peroxide is added, the formation of gas is in no wise hindered. Apparently the reaction takes place exactly the same as in normal blood. When blood is treated with a cyanide and then hydrogen peroxide is added, it is generally stated that no gas at all is produced. As a matter of fact, a very little gas is usually formed, but the reaction is entirely different from that produced by the hydrogen peroxide on normal blood or in the presence of uranium. Evidently uranium and hydrocyanic acid manifest different properties so far as this reaction is concerned.

If normal blood be treated with a little tincture of guaiac, a yellowish mixture is obtained, but no blue compound is produced. Addition of a little hydrogen peroxide to the mixture at once causes a great evolution of gas and the development of a deep blue color. The presence of some of the earlier formed yellowish substance gives the whole mixture a deep greenish-blue appearance. If the experiment be repeated in the same manner, but with the addition of a little uranium solution to the blood before the hydrogen peroxide is added, a profuse evolution of gas and the formation of a deep greenish-blue color is at once observed. The reaction appears to take place exactly as it would if no uranium had been added. When a cyanide is substituted in place of the uranium in the above experiment no gas is formed but the deep greenish-blue color at once makes its appearance. Evidently in this case, so far as the development of the blue compound is concerned, neither uranium nor the cyanides exercises any noticeable inhibitory activity. The formation of the blue compound in this case seems to be separate and independent from the formation of the methæmoglobin. Incidentally these experiments show that the ferment in potato peelings which causes the guaiac to be oxidized to the blue compound is by no means so resistant as the corresponding ferment in blood, for cyanides stop the action of the former and not that of the latter.

The general results of these experiments may be summed up in a few words. Cyanides and uranium act differently on some ferments, but apparently act similarly (or possibly exert almost no action) on others. Unfortunately these conclusions cannot throw any light upon the question of the similarity or the difference in the methods by which cyanides and uranium prevent the coagulation of blood. It is to be noted, however, that uranium does not inhibit the action of these ferments[8].

It was shown by Collingwood[9] that if a two per cent solution of disodium-hydrogen-phosphate (Na_2HP_4) be added to blood (in any amount up to an equal volume) and the free calcium ions be thus precipitated out, the blood would still clot, but a somewhat longer time (one-half hour) was required for the completion of the process than was necessary in the case of normal blood. The usual test for uranium is the formation of a precipitate when a phosphate solution is added to a solution containing uranium. It seemed that this coincidence might furnish an opportunity to determine something concerning the action of uranium. Since sodium-uranium-tartrate does not precipitate dilute calcium chloride solutions, we should expect some sort of proteid combination to be formed by the uranium, or, the presence of the metal may in some way check the action of the ferments. At any rate, if it should be possible to add sufficient phosphate to precipitate all the free calcium in the blood (and still leave an excess of phosphate ions free (?) in the plasma), then the addition of an equal volume of a two per cent solution of disodium-hydrogen-phosphate to blood which has been prevented from clotting by the previous addition of the smallest effective quantity of uranium might cause clotting to take place, this, however, being dependent upon the nature of the uranium action. If it were merely inhibiting the ferments by its presence in solution, clotting ought to occur. If it were loosely bound to some proteid element, clotting would probably occur. If it should be firmly combined with some proteid absolutely essential to clot formation, clotting would probably not occur.

A series of experiments were carried out to test this point. Perfectly fresh blood was obtained from etherized dogs and was used immediately after withdrawal from the right femoral artery. It was found that if a small amount (one-tenth volume of two per cent solution) of sodium-uranium-tartrate be added to fresh blood and clot formation be thereby prevented, then the addition of a two per cent solution of disodium-phosphate (Na_2HPO_4) in any amount up to one-half of the total volume would not cause clot-

[8] Chittenden (*loc. cit.*) found in general that an extremely small amount of uranium increased, while more decreased the activity of the digestive ferments, the reactions varying somewhat with the different uranium salts used.

[9] Collingwood, *Journal of Physiology,* XXXVIII, (1909), *Proceedings of the Physiological Society,* lxxix.

ting. Nor would the addition of calcium chloride solution cause the blood to clot, either before or after the addition of disodium phosphate. This would indicate that either the ferments or some of the proteid elements of the blood had been affected by the uranium and that its action is different from that of the oxalates, for the careful addition of a slight excess of calcium chloride causes oxalated blood to clot. Again the action of uranium in preventing clot formation differs from that of the fluorides in at least two particulars. The addition of a small amount of thrombokinase derived by aqueous extraction from minced spleen and lymphatic glands causes blood treated with potassium fluoride to clot in almost the normal time. The addition of thrombokinase is entirely without effect upon blood treated with uranium. Also, if a small excess of calcium chloride be added cautiously to blood treated with a fluoride solution clotting will occur. As stated above, addition of calcium does not cause clotting in blood containing uranium. It was supposed by Rettger[10] that the fluorides act by combining with the calcium to form calcium fluoride which in turn is bound in some way to a portion of the protein. It may be that uranium acts in some such manner as this, but it is to be noted that blood treated with uranium behaves itself in an entirely different manner toward calcium and thrombokinase from blood treated with fluorides. It may be further mentioned that dialysis causes fluoride blood to clot. I was unable to detect the formation of any true clot in uranium blood after twenty-four hours of dialyzing in running (tap) water. Uranium acts differently from magnesium sulphate, inasmuch as the addition of thrombokinase causes clotting in blood treated with that salt. And further, magnesium sulphate blood may be made to clot by sufficient dilution with salt solution. No amount of dilution will cause clotting in blood treated with uranium.

It might be questioned whether or not disodium phosphate would precipitate out all the uranium when added to blood which had been treated with that metal. If to a Ringer's or similar salt solution to which a small amount (one-tenth volume of two per cent solution) of sodium uranium tartrate has been added there be further added a slightly larger quantity (one-quarter volume of two per cent solution) of disodium hydrogen phosphate, a marked precipitate will soon be produced. Mainly calcium phosphate comes down at first, but after a little time it appears that the uranium also is precipitated, for if blood be added to the clear filtrate, clot-

[10] Rettger, *American Journal of Physiology,* (1909) XXIV, 406.

ting will occur in approximately the normal time. And if the precipitated calcium and uranium phosphate be washed with a little distilled water, dried and then, after comminution with a little normal salt solution, be added to blood, clotting will occur in about the normal time. It would appear, then, that pure uranium phosphate is sufficiently insoluble in blood to be unable to prevent clot formation. (This also holds good for sodium uranate which is insoluble.) It should be stated that when a solution of disodium hydrogen phosphate is added to a solution of sodium uranium tartrate the uranium phosphate is not precipitated immediately, but some ten to twenty minutes are required for complete precipitation. Consequently, when disodium hydrogen phosphate is added to blood previously treated with uranium it is probable that complete precipitation would not occur for some twenty minutes or longer. But if after a period of twenty or thirty minutes either calcium chloride, thrombokinase, fibrin ferment (serum from blood clot) or any two (or all three of these) be added, no clot will be formed. The addition of fibrin ferment would seem to indicate that the fibrinogen had been affected, for if all of the free soluble uranium has been precipitated, then the addition of fibrin ferment should produce clotting unless the fibrinogen has been affected. It seems probable, however, that the uranium when first added to the blood rapidly forms combinations with practically all of the proteid elements at hand and that even if the excess of free uranium (provided any such quantity should be left over) is later precipitated out by disodium hydrogen phosphate, then the uranium-proteid compounds are not broken up but still maintain practically their original condition. These compounds are apparently also soluble in excess of proteid, for if a small amount (2 cc.) of the blood treated with phosphate, after uranium, be added to a larger quantity (6 cc.) of fresh blood and the mixture well shaken, clotting will be prevented.

It may be objected that in the presence of soluble proteids and dilute salt solutions, such as constitute blood, the disodium hydrogen phosphate would not precipitate out the uranium in the usual manner. But if uranium be added to dilute salt solutions approximating as nearly as possible the quantity and quality of those found in the blood, then the disodium hydrogen phosphate will precipitate the uranium so completely that the clear filtrate exercises no noticeable inhibitory action upon clot formation in fresh blood. If such precipitate is not formed when uranium, and then phosphate, are added to blood, it would appear to be because the uranium has already entered into some sort of combination with the proteids themselves. This is what I believe actually occurs. In this connection may be recalled the action of oxalates, which precipitate the free calcium of the blood, but apparently do not form proteid combinations, for addition of a slight excess of calcium chloride again establishes the conditions requisite for coagulation of the blood. It must, of course, not be forgotten that the addition of a two per cent solution of the disodium hydrogen phosphate (in any amount up to an equal volume) to normal blood does not prevent coagulation.

It is generally assumed that the cyanides prevent coagulation by inhibiting the action of the ferments concerned in clot formation. If this be the whole truth (which I am inclined to doubt), then the above results would seem to indicate that the action of uranium is much more extensive than that of the cyanides so far as the inhibition of clot formation is concerned. And uranium certainly acts differently from several of the other inorganic compounds which are ordinarily used to prevent clot formation.

When a cyanide is added to drawn blood outside the body, a bright red color is at once produced. This is usually described as being the same color as that possesssed by pure arterial blood. In a similar manner if a small quantity (one-twentieth volume of two per cent) of sodium uranium tartrate solution be added in the presence of oxygen or air to freshly drawn blood, this blood will also rapidly take on a bright red color resembling that of arterial blood. To the naked eye cyanide blood and uranium blood look very much alike. It is to remembered, however, that retinal fatigue, and the constant color variations which are generally to be readily observed in freshly drawn blood when exposed to the air (and particularly if shaken or stirred), render close color distinctions in such cases as this very difficult to make. It would appear that the presence of a certain amount of available oxygen is absolutely necessary for this color reaction to take place when the blood has been treated with uranium. In order to test this point I tried the following experiment. In an etherized dog the external jugular vein was dissected out and clamped with a serresfin. The venous blood (dark) soon accumulated in the vein above the serresfin. A small glass-barreled hypodermic syringe was then partly filled with uranium solution, care being taken to exclude all air bubbles. The point of the syringe was then passed into the swollen vein and blood was drawn directly into the syringe until the barrel was three-fourths full. The point was then withdrawn and a little of the uranium solution was again drawn into the syringe. In this manner but very little opportunity was afforded for air to enter the syringe, which was filled with dark venous blood diluted with uranium solution. It was found that, so long as no air entered the syringe, the blood remained dark and very venous in appearance. But so soon as the contents of the syringe were emptied out into an open test tube and well aerated, the bright red arterial color at once appeared. This experiment is significant, inasmuch as it would appear to indicate that oxygen can readily pass through the walls of the red corpuscles and form a combination with the hæmoglobin within. Since it is not possible to detect any difference spectroscopically between normal blood and blood to which uranium has been added, it therefore becomes difficult to see how uranium could retard the reduction of oxyhæmoglobin so far as the blood itself is concerned. For if oxygen can readily pass into the corpuscles, and no special combination between the uranium and the hæmoglobin is formed, then it would seem that the oxygen might also readily pass out of the corpuscles again.

The bright red color which blood treated with uranium assumes in the air is not appreciably affected by the addition of disodium hydrogen phosphate. It seems probable that the retention of this color is, partly at least, due to changes in the proteids of the red cells. For the color of laked blood is not materially influenced by the addition of uranium.

If a sample of fresh blood be treated with uranium and diluted to a one or two per cent solution, and left standing in a stoppered bottle, it will become dark and show decomposition within one or two days. If a similar sample of blood be treated with a solution of potassium cyanide of corresponding strength and then be similarly diluted and left standing, it will retain its bright red color for several weeks.

It seems that no chemical combination whatever is formed between uranium and the hæmoglobin of the blood. In order to test this I made a long series of observations both with the spectroscope and with the diffraction grating. In the latter case photographic records were made[11]. I was unable to detect by either method any difference between normal blood diluted to one per cent or one-half per cent and blood which had been first treated with uranium and then diluted to one or one-half per cent. A comparison was also

[11] I am greatly indebted to Prof. R. R. Ramsey of the Department of Physics of Indiana University for much valuable assistance in making the photographic observations.

made between blood treated with uranium and blood to which potassium cyanide had been added.

The spectrum of cyanhæmoglobin differs but little from that of oxyhæmoglobin, but a longer time is required for its reduction by ammonium sulphide. Perhaps the reduction of blood treated with uranium may be slightly retarded, but considering the difficulty attendant upon the determination of the completion of the reduction process one would scarcely be justified in saying that the time was prolonged.

If a sample of methæmoglobin be made by the addition of either iodine or potassium ferricyanide to fresh blood and then the mixture be diluted to a one per cent solution, the addition of potassium cyanide will at once cause the formation of cyanmethæmoglobin[12], the spectrum of which very closely resembles that of reduced hæmoglobin. But if to a dilute solution of methæmoglobin, which has been made by the addition of either iodine or potassium ferricyanide to fresh blood, there be added a solution of sodium uranium tartrate, no change whatever can be made out in the spectrum of the methæmoglobin.

This seems to show that uranium does not form any combination with methæmoglobin, and it certainly indicates that the action of the metal is different from that of the cyanides so far as the hæmoglobin of the blood is concerned. The addition of disodium tartrate does not produce any change in the spectrum of normal blood.

Conclusions. (1) The intravenous injection of a solution of sodium uranium tartrate in any quantity up to the lethal dose does not produce a noticeable increase in the rate of lymph flow from the thoracic duct in the dog.

(2) The rise in blood pressure produced by the intravenous injection of a solution of sodium uranium tartrate into a dog is of a much more pronounced and prolonged character than the rise produced by injection of a corresponding quantity of a cyanide.

(3) The stimulating action which uranium exercises upon the respiration is vastly less vigorous than that manifested by the cyanides.

(4) The method by which uranium prevents the coagulation of blood appears to be different from that exercised by most other substances and probably consists in the formation of a close direct combination between the metal and some one or more of the proteid

[12] Kobert, *Maly's Jahresbericht*, 1891, 443; Haldane, *Journal of Physiology*, 1900, XXV, 230.

elements of the blood which are essential to the process of coagulation. Neither the addition of thrombokinase, fibrin ferment, nor calcium chloride to blood previously treated with sodium uranium tartrate will cause clotting to occur. Nor is it possible to bring about clot formation in such blood by precipitating the uranium with disodium hydrogen phosphate.

(5) Neither the spectroscope nor photographic records made by means of the diffraction grating reveal the formation of any chemical combination between uranium and the hæmoglobin of the blood. This is a variation from the action of the cyanides which form cyanhæmoglobin when added to solutions of hæmoglobin.

(6) If a solution of sodium uranium tartrate be added to a solution of methæmoglobin, no change whatever occurs in the spectrum of the solution. If, however, a cyanide be added to the methæmoglobin cyanmethæmoglobin is at once formed.

(7) The cyanides prevent the formation of a blue oxidation product from tincture of guaiac by the oxidizing ferments present in an aqueous extract of potato peelings. No such inhibitory action is exercised by uranium upon this reaction. The cyanides also prevent the evolution of gas when hydrogen peroxide is added to blood to which a small amount of cyanide has previously been added. But no inhibition is exercised upon this ferment action by uranium.

(8) It seems extremely probable that the pharmacological actions of the cyanides and of uranium differ from each other much more widely than has been generally believed.

2. The Effect of Starvation for Five Successive Generations on the Sex-Ratio in Drosophila Ampelophila.

Claude DuVall Holmes.

Introduction.—Born[1] and Yung[2] concluded that nutrition is a determining factor of the sex-ratio, an abundance of food leading to the development of a large proportion of females. Cuenot[3], using the larvæ of the same animals *(Rana temporaria)*, got contradictory results. He concluded, therefore, that food is not a determining factor of the sex-ratio. Kellog and Bell[4], using the larvæ of silkworms *(Bombyx mori)*, studied the possible effect of feeding, with special reference to the influence it had on the second generation. In their experiment, as they themselves say, they did not succeed, by a reduction of the food-supply, in producing any unmistakable results in the way of an over-production of males. Furthermore, the numbers in each of their experiments were too small to be of value. Kellog and Bell's experiment involved two generations, so that they varied the food of the grandparents and that of the parents of the generation in which the ratio was determined. Below I have reproduced their table, which summarizes their results:

KELLOG AND BELL'S TABLE.

Lot.	Fed.	Parents.	Grand-parents.	Deaths Before Maturity.	Males.	Females.
1	O	O	O	2	13	10
2	M	O	O	2	14	9
3	O	M	O	3	8	14
4	M	M	O	6	8	11
5	O	O	M	0	15	10
6	M	O	M	0	11	14
7	O	M	M	20	2	3
8	M	M	M	21	2	2

Note.—O means optimum food supply. M means minimum food supply.

It seemed, therefore, that an experiment in which the food factor was varied for a greater number of generations back, and with a form that furnished a larger number of individuals, was highly

[1] G. Born. Experimentelle Untersuchungen über die Entstehung der Geschlechtsunterschiede, *Breslauer Ärztliche Zeitschrift*, Bd. III, (1881).

[2] E. Yung, De l'influence des variations du milieu physicochimique sur le developpement des animaux, *Archives des Sciences physique et naturelle*, XIV, (1885).

[3] L. Cuenot, Sur la détermination du sexe chez les animaux, *Bulletin Scientifique de la France et de la Belgique*, XXXII, (1899).

[4] V. L. Kellog and R. G. Bell, Notes on Insect Bionomics, *Journal of Experimental Zoölogy*, I, (1904).

desirable. *Drosophila ampelophila* furnishes such conditions admirably, and the experiments to be detailed below have been performed on this species.

Method. The method employed was to starve, through a series of generations, the parental organisms, and then obtain the sex-ratio of the offspring. This was done as follows: On June 17, 1909, five pairs of these fruit-flies were caught on the banana stems in each of five different grocery stores in Bloomington, Indiana. Each of the five lots was placed in a vial one inch in diameter and three inches in length, sealed at one end, the other being covered by a piece of cheese-cloth secured by means of a rubber band. The vials were allowed to lie on one side in long narrow trays. Water was given the flies by soaking a piece of blotting paper and laying it in the vials. This paper was easily torn up by the larvæ and so made an excellent place for their pupation. A supply of food, dipped in yeast solution to prevent the growth of moulds, was given them in pieces of from one-fourth to one-half cubic centimeter of banana on the blotting-paper.

It is evident that the first to hatch had a decided advantage in securing plenty of food, and so pupated early, thus producing large, fully-developed imagos. Then, as the food-supply became low, the larvæ were forced to pupate early, and were hatched as undersized imagos because there was not sufficient food for their complete larval growth. In this process, it is clear, also, that a very great number of larvæ of all ages died, and some that had made sufficient growth to pupate were unable to emerge as adults. Each generation, thus, was characterized by a number of well-fed, fully-developed imagos, a few under-sized starved adults, a few pupæ unable to emerge, and a very great number of under-fed, unsuccessful larvæ of all sizes.

In starting a new generation great care was used in mating only the starved flies. These were easily picked out from the fed flies, since they were always the smallest of the hatch, due account being taken of the fact that well-fed males are smaller than well-fed females. Normally the males of these flies measure, from the anterior part of the head to the tip of the wings, 2.94 mm., on the average, and the females, 3.35 mm.; but from the extreme starvation to which these flies were subjected, the males were often as short as 2.5 mm., while the females were occasionally as short as 2.3 mm. Since the five strains were unrelated, it was possible to avoid excessive inbreeding by crossing, at times, one strain with another.

No special attempt was made to get the sex-ratio of the starved flies in the several generations, the only point being to get sufficient males and females to carry on the successive generations; but such as came off were kept and their ratio included in the tables. In the sixth generation, however, relatively large numbers were reared with the view of obtaining a measure of any modification of the sex-ratio that may have occurred as the result of five generations of starvation.

Results. The details of the lineage of the five strains are given in Tables I, II, III, IV and V. The ratios given, except in the sixth generation, are based for the most part on small numbers. These were mostly starved individuals. Strain 4 proved very unproductive, and so was discontinued after the third generation. In Table VI all the data for the five strains are summarized.

The normal sex-ratio of these flies, as determined by Dr. W. J. Moenkhaus in a count of over thirty thousand individuals reared under normal food conditions, was found to be 100 ♂'s 112 ♀'s. In the first generation of this experiment the ratio was 100: 108. We may, therefore, be certain that the normal sex-ratio is approximately, 1: 1.08. It will be seen by inspection of the ratios during the first five generations that they remained approximately the same. Any considerable deviation from the normal can readily be ascribed to the small number of individuals involved. Thus in the second generation the ratio changed to 1:.82, with only thirty-one individuals. As previously stated, only in the sixth gentration were a large number of offspring reared. In this generation a total of 4,733 individuals were obtained from four of the strains, strain 4 having been discontinued. The ratio of the total was 1: 1.14 (2,213♂'s, 2,520♀'s). Approximately the same preponderance of females obtained in the individual strains, except in Strain 3, where the ratio was 1: 1.34, with 912 individuals involved. An explanation of this unusual ratio could only be conjectural; the writer does not regard it as significant. The experiment is complete up to the sixth generation, but the breeding was continued in a somewhat desultory way for three more generations. These add nothing to the result except a larger final total from all the strains. This larger total, 9,874 individuals, again shows a ratio (1: 1.12) approximately equal to the original ratio.

Conclusions. 1. Rigid starvation for five (ten) generations does not influence the sex-ratio in *Drosophila*.

2. Starvation does not result in a greater mortality of one sex during development. This is probable because the sex-ratio remained the same whether there was an enormous mortality as the result of starvation or a relatively slight mortality when an abundance of food was supplied.

TABLE I.—History of Strain No. 1.

Generation.	*Five Pairs.*		*Total Individuals Counted.*	*Sex-Ratio. Males : Females.*
First	F	S	417	1 : 1.07 (201 : 216)
Second	F	S	12	1 : 1 (6 : 6)
Third	F	S	170	1 : 1.26 (75 : 95)
Fourth	F	S	243	1 : 1.13 (114 : 129)
Fifth	F	S	72	1 : 1.25 (32 : 40)
Sixth	**F**	**S**	**1009**	**1:1.06 (491 : 518)**
Seventh	F	S	207	1 : .85 (112 : 95)
Eighth	F	S	31	1 : 1.07 (15 : 16)
Ninth	F	S	(Not counted)	
Total			2161	1 : 1.07 (1046 : 1115)

TABLE II.—HISTORY OF STRAIN NO. 2.

Generation.	*Five Pairs.*		*Total Individuals Counted.*	*Sex-Ratio. Males : Females.*
First	F	S	372	1 : .8 (206 : 166)
Second	F	S	14	1 : 1 (7 : 7)
Third	F	S	110	1 : .89 (58 : 52)
Fourth	F	S	253	1 : 1.06 (123 : 130)
Fifth	F	S	60	1 : 1.07 (29 : 31)
Sixth	**F**	**S**	**1456**	**1 : 1.07 (702 : 754)**
Seventh	F	S	104	1 : 1.08 (50 : 54)
Eighth	F	S	163	1 : 1.36 (69 : 94)
Ninth	F	S	(With tenth)	———
Tenth	F	S	422	1 : 1.34 (180 : 242)
Total			2954	1 : 1.07 (1424 : 1530)

TABLE III.—HISTORY OF STRAIN NO. 3.

Generation.	Five Pairs.		Total Individuals Counted.	Sex-Ratio. Males : Females.
First	F	S	424	1 : 1.09 (202 : 222)
Second	F	S	5	1 : .25 (4 : 1)
Third	F	S	139	1 : .78 (78 : 61)
Fourth	F	S	289	1 : .95 (148 : 141)
Fifth	F	S	52	1 : 1.88 (18 : 34)
Sixth	**F**	**S**	**912**	**1 : 1.34 (389 : 523)**
Seventh	F	S	188	1 : 1.11 (89 : 99)
Total			2009	1 : 1.16 (928 : 1081)

TABLE IV.—HISTORY OF STRAIN 4.

Generation.	Five Pairs.		Total Individuals Counted.	Sex-Ratio. Males : Females.
First	F	S	417	1 : 1 40 (174 : 243)
Second	F	S	(Fed Flies)	
Third	F	S	90	1 : 1.19 (41 : 49)
Total			507	1 : 1.36 (215 : 292)

TABLE V.—HISTORY OF STRAIN No. 5.

Generation.	*Five Pairs.*		*Total Individuals Counted.*	*Sex Ratio. Males : Females.*
First	F	S	330	1 : 1.05 (161 : 169)
Second	F	S	(Not Counted)	
Third	F	S	186	1 : 1.14 (87 : 99)
Fourth	F	S	178	1 : 1.12 (84 : 94)
Fifth	F	S	19	1 : 1.71 (7 : 12)
Sixth	**F**	**S**	**1356**	**1 : 1.15 (631 : 725)**
Seventh	F	S	149	1 : 1.04 (73 : 76)
Eighth	F	S	25	1 : 1.78 (9 : 16)
Total			2243	1:1.13 (1052 : 1191)

TABLE VI.—SUMMARY.

Generation.	Strain No. 1.		Strain No. 2.		Strain No. 3.		Strain No. 4.		Strain No. 5.		All Strains.	
	Total.	Ratio.	Total.	Ratio.	Total.	Ratio.	Total.	Ratio.	Total.	Ratio.	Total.	Ratio.
1	417	1:1.07 (201:2.6)	372	1:.8 (206:166)	424	1:1.09 (202:222)	417	1:1.40 (174:243)	330	1:1.05 (161:169)	1960	1:1.08 (914:1016)
2	12	1:1 (6:6)	14	1:1 (7:7)	5	1:.25 (4:1)	Fed Flies.		a.		31	1:.82 (17:14)
3	170	1:1.26 (75:95)	110	1:.89 (58:52)	139	1:.78 (78:61)	90	1:1.19 (41:49)	186	1:1.14 (87:99)	695	1:1.05 (339:356)
4	243	1:1.13 (114:129)	253	1:1.05 (123:130)	289	1:.95 (148:141)			178	1:1.12 (84:94)	963	1:1.05 (469:494)
5	72	1:1.25 (32:40)	60	1:1.07 (29:31)	52	1:1.88 (18:34)			19	1:1.71 (7:12)	203	1:1.36 (86:117)
6	**1009**	**1:1.06 (491:518)**	**1456**	**1:1.07 (702:754)**	**912**	**1:1.34 (389:523)**			**1356**	**1:1.15 (631:725)**	**4733**	**1:1.14 (2213:2520)**
7	207	1:.85 (112:95)	104	1:1.08 (50:54)	188	1:1.11 (89:99)			149	1:1.04 (73:76)	648	1:1 (324:324)
8	31	1:1.07 (15:16)	163	1:1.36 (69:94)					25	1:1.78 (9:16)	219	1:1.35 (93:126)
9			b.								b.	
10			422	1:1.34 (180:242)							422	1:1.34 (180:242)
Totals	2161	1:1.07 (1046:1115)	2954	1:1.07 (1424:1530)	2009	1:1.16 (928:1081)	507	1:1.36 (215:292)	2243	1:1.13 (1052:1191)	9874	1:1.12 (4665:5209)

a. Not counted. b. Counted with generation below.

3. Studies on Perchloric Acid: The Preparation of Perchloric Acid from Sodium Perchlorate.

By Frank C. Mathers, Assistant Professor of Chemistry.

Methods of Preparation. The best known methods for the preparation of perchloric acid are:

1. Treat a solution of potassium perchlorate with fluosilicic acid[1]. The potassium fluosilicate forms a gelatinous precipitate which is separated by decantation and filtration from the aqueous solution of perchloric acid. This perchloric acid solution contains all of the impurities from the reagents, together with any excess of fluosilicic acid that was used in the precipitation, and small amounts of potassium fluosilicate. To obtain a pure solution of perchloric acid, this aqueous solution must be distilled. The great objection to this method is that the fluosilicic acid is as troublesome to prepare as the perchloric acid itself when other methods are used.

2. Evaporate a solution of chloric acid until the evolution of white fumes begins. This heating decomposes the chloric acid according to this reaction:

$$2HClO_3 = 2HClO_4 + 4ClO_2 + 2H_2O.$$

The gaseous chlorine dioxide is expelled from the solution during the heating. Pure perchloric acid is formed except for the impurities that were present in the original reagents. Chloric acid may be prepared[2] by a number of methods. The methods of making chloric acid are difficult. The yields of perchloric acid from the chloric acid are very low.

3. Treat barium perchlorate with an equivalent amount of sulphuric acid[3]. The barium sulphate thus formed settles rapidly and is easily separated by decantation and filtration from the aqueous perchloric acid. The perchloric acid prepared in this manner is generally impure. It is very difficult to add just the equivalent amount of sulphuric acid, so either Ba or SO_4 ions are present. Barium perchlorate is such an expensive starting material that this method cannot have a general application.

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[1] Serullas, *Annales de chimie et de physique*, XLV, 270; Caspari, *Zeitschrift für angewandte Chemie*, VI, 68 (1893).

[2] Millon, *Annales de chimie et de physique*, (3) VII, 310; Stadion, *Gilbert's Annalen*, LII, 197 and 339; Penny, *Liebig's Annalen*, XXXVII, 203; *Journal für praktische Chemie*, XXIII, 296; Serullas, *Annales de chimie et de physique*, XLV, 270; Crookes, *Select Methods of Chemical Analysis*, 7.

[3] Henry, *Liebig's Annalen*, XXXI, 345.

4. Distill a mixture of potassium perchlorate, sulphuric acid, and water[4]. The distillation should be made under reduced pressure to prevent the decomposition of perchloric acid. This is an excellent method and is perhaps best adapted for the preparation of perchloric acid cheaply and in large quantities. A complete description of experiments with this method will be published later.

5. Perchloric acid is produced in small quantities during the electrolysis of hydrochloric acid solutions. The action of sunlight upon aqueous solutions of chlorine or oxides of chlorine forms some perchloric acid. These devices[5], however, have never been suggested as methods for the preparation of perchloric acid.

6. Treat solid dry sodium perchlorate with an excess of concentrated hydrochloric acid[6]. The mixture is then filtered and the residue of sodium chloride, which is almost insoluble in the excess of hydrochloric acid, is washed with concentrated hydrochloric acid. The filtrate is a mixture of perchloric acid, hydrochloric acid and small amounts of the sodium salts of these acids. Sodium chloride is slightly soluble in the hydrochloric acid solution, so a portion of it is found in the filtrate. By heating this filtrate until white fumes of perchloric acid are evolved, the hydrochloric acid is volatilized and the perchloric acid remains behind. The boiling points of the hydrochloric acid and the perchloric acid with two molecules of water (119° and 203° respectively) are so far apart that a very satisfactory separation is obtained.

The object of this research was to determine the best conditions and the proper quantities of reagents to use in order to obtain the best results from this process of Kreider, since the original article gave only a qualitative description of the method.

Twenty grams of sodium perchlorate (weighed to 1 mg.) was placed in a 100 cc. beaker and treated with the concentrated hydrochloric acid. The contents of the beaker were filtered upon a Gooch crucible and the residue of sodium chloride washed with ten 1 cc. portions of concentrated hydrochloric acid. The filtrate, which contained the aqueous perchloric acid and the excess of hydrochloric acid together with small amounts of the sodium salts of these acids,

[4] Vorlander and Schilling, *Liebig's Annalen*, CCCX, 369.
Nativelle, *Journal für praktische Chemie*, XXVI, 404 (1842).
Van Wyk, *Zeitschrift für anorganische Chemie*, XXXII, 115; XLVIII, 4.
Van Emster, *Zeitschrift für anorganische Chemie*, LII, 270.

[5] Popper, *Liebig's Annalen*, CCXXVII, 161; Millon, *Annales de chimie et de physique*, (3) VII, 298; *Liebig's Annalen*, XLVI, 281; Stadion, *Gilbert's Annalen*, LII, 197 and 339.

[6] Kreider, *American Journal of Science*, (3) XLIX, 443, *Zeitschrift für anorganische Chemie*, IX, 343. Treadwell and Hall, *Quantitative Chemistry*, p. 47 (1904).

was evaporated upon a hot plate to volatilize the hydrochloric acid. The residue which did not volatilize below a temperature of 150° consisted of aqueous perchloric acid whose purity and yield depended upon the conditions of the experiment. These samples of perchloric acid were analyzed to determine the free perchloric acid, the sodium perchlorate and the hydrochloric acid. The residues of sodium chloride which were obtained by the first filtration upon the Gooch crucibles, were analyzed to determine the sodium perchlorate which they contained.

Methods of Analysis. Free acids were determined by titration, using methyl orange as indicator. The end point with perchloric acid was decisive and satisfactory. Volhard's method was used for the volumetric determination of the chlorides. The perchlorates in the free perchloric acid were determined by evaporating a measured portion to dryness in a platinum dish. The dish was then heated to near redness until the perchlorates were decomposed to chlorides. The end of this decomposition was easily detected, since the perchlorates were easily fusible and the chlorides were infusible at this temperature. The total residue, which consisted essentially of sodium chloride, was calculated to sodium perchlorate. Of course, this method would give correct results only with samples containing sodium perchlorate and volatile substances such as hydrochloric acid and perchloric acid. For the estimation of perchlorate in the presence of chloride, determine the chlorine in a portion in which the perchlorate has been decomposed into chloride. The difference between the chlorine in this sample and the chlorine in a portion which has not been decomposed represents the perchlorate. This decomposition can be accomplished very easily by the method of Dittrich and Hollenback[7]. The perchlorate is fused for several hours with sodium nitrite. The fused mass, after cooling, is dissolved in water and the chlorine is determined by the method of Volhard. Porcelain dishes are attacked by the fused sodium nitrite, so platinum vessels must be used. The sodium nitrite that was used in this research contained chlorine, so a blank was determined and the proper correction was applied to each analysis. This method gave uniformly accurate results and was satisfactory in every way.

Materials Used. A commercial preparation of sodium perchlorate was used. Its composition was: NaCl, 1.76, 1.86 per cent; $NaClO_4$, 95.38, 95.77 per cent; $NaClO_3$, trace.

[7] Dittrich and Hollenback, *Berichte der Deutschen Chemischen Gesellschaft*, XXVIII, 751 (1905).

Commercial barium perchlorate was used. The material was "caked" in the bottle and an average sample was difficult to obtain. An analysis showed 53.5 per cent of ClO_4. The C. P. hydrochloric acid which was used showed a specific gravity (spindle) of 1.16 at 24°. The commercial acid which was used in one experiment had a specific gravity of 1.14 at 24°, and each cc. contained 0.00097 gram of non-volatile matter.

TABLE I.—EFFECT OF WATER.

The sodium perchlorate (20 grams) was dissolved in 7cc. of water at 105° and then 20 cc. concentrated hydrochloric acid were added. For comparison the results without water are included in this table.

Grams water added.	$HClO_4$ in the filtrate. In terms of $NaClO_4$.		$NaClO_4$ in filtrate.	Total ClO_4 in filtrate. In terms of $NaClO_4$.		$NaClO_4$ in NaCl residue.
Cc.	Grams.	Per cent.	Grams.	Grams.	Per cent.	Grams.
7.0	15.48	81.6	2.63	18.11	94.7	0.2
0.0	16.97	88.4	1.65	18.62	97.4	0.46

The above results show that water should not be added.

TABLE II.—EFFECT OF THE QUANTITY OF HYDROCHLORIC ACID.

	$HClO_4$ in the filtrate. In terms of $NaClO_4$.		$NaClO_4$ in filtrate.	Total ClO_4 in filtrate. In terms of $NaClO_4$.		$NaClO_4$ in NaCl residue.
Cc. of HCl.	Grams.	Per cent.	Grams.	Grams.	Per cent.	Grams.
10	13.65	71.4	1.91	15.56	81.4	2.72
15	15.4	80.5	1.61	17.05	89.2	1.46
20	16.97	88.4	1.65	18.62	97.4	0.46
25	18.13	94.8	0.84	18.97	99.2	0.2
30	18.35	96.0	0.79	19.14	100.1	0.18
50	18.65	97.6	0.63	19.28	100.8	0.34

This table shows that 25 to 30 cc. of hydrochloric acid should be used for each 20 grams of sodium perchlorate.

TABLE III.—TO FIND THE TEMPERATURE NEEDED TO EXPEL THE HYDROCHLORIC ACID FROM THE FILTRATE.

Temperature.	Cl in the filtrate. In terms of $NaClO_4$. Grams.
120°	2.006
130°	0.06
135°	0.0
145°	White fumes of $HClO_4$.

The filtrates containing the perchloric and hydrochloric acids were heated upon a hot plate. The sides of the beaker should be brought to the temperature of the experiment since, otherwise, the drops of the liquid which condense upon the upper part of the beaker retain hydrochloric acid. When the temperature of the entire beaker was brought to 135° there was insufficient hydrochloric acid remaining to give an opalescence with silver nitrate. All of the hydrochloric acid could probably have been removed by maintaining the temperature somewhat below 135° for a period of time, but this experiment was not tried. This table shows that the hydrochloric acid is completely volatilized at a temperature of 135°.

TABLE IV.—LOSS OF PERCHLORIC ACID DURING THE VOLATILIZATION OF THE HYDROCHLORIC ACID.

Volume of aqueous $HClO_4$ used.	Cc. of substances added.		Grams of $HClO_4$ present.	$HClO_4$ lost.	
	H_2O.	HCl (conc.).		Grams.	Per cent.
40	0	..	6.97	0.09	0.13
40	50	..	6.97	0.14	0.20
40	..	90	6.97	0.19	0.27

The solutions, containing known amounts of perchloric acid and water or hydrochloric acid, were heated upon the hot plate until the temperature reached 135°. The maximum loss of 0.27 per cent is so small that it can be neglected in a method of preparation.

TABLE V.—AMOUNT OF WASHING NEEDED TO REMOVE THE PERCHLORIC ACID FROM THE SODIUM CHLORIDE RESIDUES.

The residue was first drained by suction. It was then washed with five 1 cc.-portions of concentrated hydrochloric acid, again drained by suction, then washed with a second five 1 cc.-portions of acid, and the operation repeated, altogether four times. Each five 1 cc.-portions was saved separately and analyzed.

Conc. HCl used in washing.	$HClO_4$ washed from the residue of NaCl. Grams.
First, five 1 cc.-portions	large amounts
Second, five 1 cc.-portions	1.65
Third, five 1 cc.-portions	0.19
Fourth, five 1 cc.-portions	0.08

After washing with twenty 1 cc.-portions of acid, 0.06 gram of sodium perchlorate still remained in the residue. This table shows that ten 1 cc.-portions of concentrated hydrochloric acid is the most economical amount to use in washing the residue from 20 grams of sodium perchlorate and 25 cc. of concentrated hydrochloric acid.

In one experiment 20 grams of barium perchlorate were treated with 60 cc. of hydrochloric acid. The precipitate of barium chloride was very bulky and voluminous, entirely filling an ordinary Gooch crucible. The 60 cc. of hydrochloric acid made the residue liquid enough so that it could be poured upon the filter. The yield of perchloric acid was 80.9 per cent of the theoretical. Washing with ten 1 cc.-portions of hydrochloric acid failed to wash the perchloric acid out of such a bulky residue. Another experiment showed that "commercial" hydrochloric acid did not give as good results as the "C. P." acid. This was due, no doubt, to the lower concentration of the "commercial" acid. The yield of perchloric acid was 88.7 per cent as compared with 96.0 per cent for the "C. P." acid. Potassium perchlorate cannot be used.

Summary.—These experiments were made to determine the conditions for the preparation of perchloric acid by the action of concentrated hydrochloric acid upon sodium perchlorate.

The sodium chloride is insoluble in the excess of concentrated hydrochloric acid and can be separated from the perchloric acid and hydrochloric acid by filtering upon an asbestos filter and by washing with concentrated hydrochloric acid. The hydrochloric acid can be volatilized away from the perchloric acid by heating the filtrate. The best conditions are: Use 25 to 30 cc. of concentrated hydrochloric acid for each 20 grams of sodium perchlorate. Do not add any water to the substances. Filter out the sodium chloride residue and wash with ten 1 cc. portions of concentrated hydrochloric acid. Heat the filtrate and washings to 135° to volatilize the hydrochloric acid. The yield of perchloric acid is about 95 per cent of the theoretical. Only about 1 per cent of the sodium perchlorate is lost in the sodium chloride residues. The other 4 per cent is in the perchloric acid as sodium perchlorate. The perchloric acid is free from chlorides. The process does not work with potassium perchlorate and is unsatisfactory with barium perchlorate.

4. Studies on Perchloric Acid: Electrodeposition of Lead from Perchlorate Baths.

By Frank C. Mathers, Assistant Professor of Chemistry.

General Statement. The electrolysis of most solutions of lead salts gives a loose crystalline deposit upon the cathode, which is valueless for refining or plating purposes. Betts has patented[1] the use of a lead fluo-silicate bath containing free fluo-silicic acid and small amounts of gelatine or glue. This bath gives dense, non-crystalline deposits which are commercially valuable.[2] Without the glue or gelatine, loose crystals are formed, such as are characteristic of the nitrate or acetate baths. "Fluo-silicic acid has some specific property not possessed by the nitrate and acetate solutions, and the solid deposit is not the result of the gelatine alone."[3] The addition of gelatine to acetate or nitrate baths does not give satisfactory deposits.[4]

The author[5] has found that a solution of lead perchlorate containing some free perchloric acid and a small amount of an addition substance, such as glue, tannin, licorice, but preferably peptone, works very satisfactorily as an electrolyte for the plating or refining of lead. Cathode deposits may be obtained over an inch in thickness, very smooth and of a density 11.36.

Lead perchlorate, $Pb(ClO_4)_2.3H_2O$, possesses many properties that are ideal for making electro-plating or refining baths. It is "extremely easily soluble in water—one part of salt dissolving in about one part of water."[6] Its great solubility permits the making of solutions of any desired concentration without danger of the crystallization of salts. It is not decomposed by boiling, by alkalies, by acids or by electrolysis. It is unacted upon by the air, and cannot be reduced by nascent hydrogen—not even by the zinc-copper couple. It can only be decomposed by fusion with sodium carbonate or with sodium nitrite. It does not easily give basic salts. When electrolyzed, it gives dense, solid deposits upon the cathode. The efficiency of corrosion of the anode and of deposition on the cathode is nearly theoretical, so the composition of the bath

[1] U. S. Patent, 713, 278.

[2] Betts, *Electrochemical Metallurgical Industry*, I, 407 (1903).
Ulke, *Engineering Mining Journal*, Oct. 11, 1902.

[3] Senn, *Zeitschrift für Electrochemie*, April 14, 1905.

[4] Kern, *Transactions American Electrochemical Society*, XV, 454 (1909).

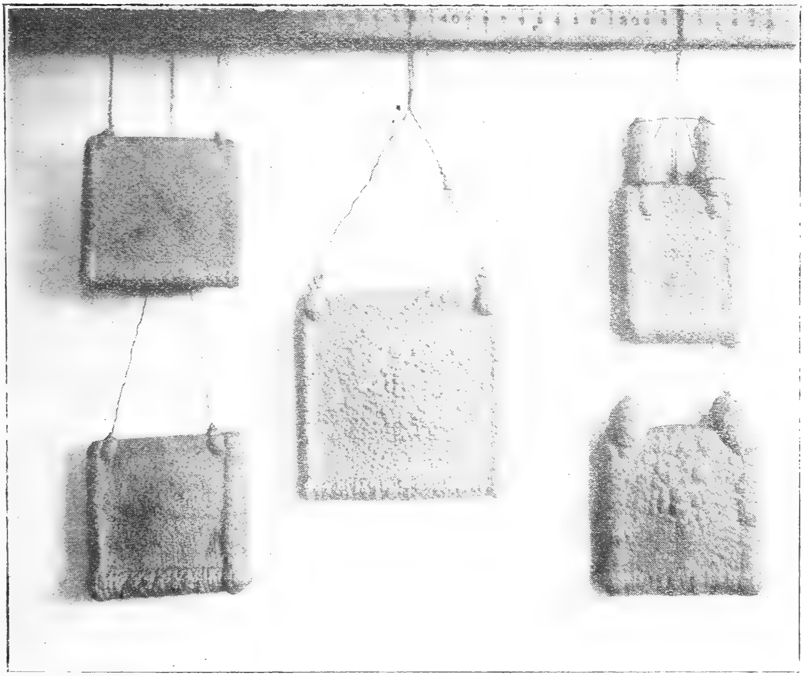
[5] U. S. Patent, 931, 944 (1909).

[6] Comey, *"Dictionary of Chemical Solubilities."*

Note.—This paper was presented at the Seventeenth General Meeting of the American Electrochemical Society, at Pittsburg, Pa., May 7, 1910.

remains approximately constant. It does not corrode glass or earthenware vessels, which is an advantage, at least in laboratory work. It conducts the electric current extremely well. Perchloric acid solution has a conductivity near that of hydrochloric acid and greater than sulphuric acid.

	Gram Equivalents per Liter.	Per Cent Composition.	Equivalent Conductivity at 18° in C. G. S. units, $\times 10^{13}$
HCl [7]	0.03	0.109	3581
$HClO_4$ [7]	0.0312	0.313	3840
H_2SO_4 [7]	0.03	0.147	2673
H_2SiF_6			Five per cent greater than H_2SO_4.[8]



I.—PHOTOGRAPH SHOWING THE GENERAL APPEARANCE OF LEAD CATHODES FROM LEAD PERCHLORATE BATHS.

The specific conductivity of perchloric acid of about 35 per cent strength[9] is 0.8395 (temp. 40°) compared[10] with 0.8257 (25°) for sulphuric acid of maximum conductivity (30 per cent).

[7] Whetham, *Theory of Solutions*, pp. 410, 436, 437 (1902).
[8] Betts, *Lead Refining by Electrolysis*, p. 21.
[9] Unpublished work by A. F. O. Germann, in this laboratory.
[10] Tower, *Conductivity of Liquids*, p. 35.

Preparation of Materials. Sodium perchlorate was used as the starting material for the preparation[11] of the perchloric acid. The solid, dry sodium perchlorate was treated with an excess of concentrated hydrochloric acid. After thorough stirring to break up lumps, the mixture was filtered through asbestos and the residue of sodium chloride was washed with successive small portions of concentrated hydrochloric acid. The filtrate, consisting of a mixture of aqueous perchloric acid, hydrochloric acid and small amounts of sodium perchlorate, was heated on the hot plate until the temperature reached 135°. This completely volatilized the hydrochloric acid with only an insignificant loss of perchloric acid. This aqueous perchloric acid is stable, and is no more dangerous to handle than nitric acid. Impurities, such as sodium chloride and sodium chlorate in the commercial sodium perchlorate, are entirely eliminated by this method, and are objectionable only since they act as filling agents, reducing the quantity of perchloric acid that may be obtained. The lead perchlorate was made by neutralizing this aqueous perchloric acid with litharge. There is no need of using white lead for this reaction, except perhaps for the sake of speed in the neutralization of the last small amounts of the perchloric acid. In the preparation of lead fluo-silicate, the fluo-silicic acid must be neutralized with white lead, because litharge is strongly enough alkaline to decompose the fluo-silicic acid into silica and lead fluoride. Perchloric acid is a stable acid that is not decomposed by an alkali. Perchloric acid may also be made by treating barium perchlorate with sulphuric acid. It is necessary to heat the perchloric acid thus obtained until the temperature reaches 135° in order to volatilize the hydrochloric acid, since chlorides are generally present in the commercial material. It is best to use an excess of sulphuric acid, which is precipitated later by the addition of the litharge.

The free perchloric acid in the lead perchlorate baths was determined by direct titration with standard sodium hydroxide using methyl orange as an indicator. The results obtained by this method are approximately correct. The lead was then determined as lead peroxide by deposition from a nitric acid solution.

Beakers were used as electrolyzing vessels.

The lead anodes were cast in graphite molds. They were suspended in the bath by means of copper wires passing through holes. Two anodes were placed in each beaker. The cathode of copper foil was suspended between them. The volume of the bath was 400 cc. in most of the experiments, although baths containing 2,000 cc.

[11] Mathers, *Journal American Chemical Society,* XXXII, 66 (1910).

were used in a few experiments. The solutions were stirred by a current of air during the day and by a current of hydrogen gas at night. The hydrogen generator was so connected that it automatically kept up the current of gas at those times when the laboratory air blast was not running. A very slow current of gas through the solutions seemed to be the best laboratory substitute for the circulation of the electrolyte from tank to tank which is practiced in commercial work. The greatest objection to the use of the current of gas is that it stirs up slime from the bottom of the vessel. Some of these impurities adhere to the cathode. This greatly lowers the purity of the deposited lead.

Addition Substances. The lead perchlorate bath does not give good deposits without the use of some "addition substance," except at very low current densities. Numerous experiments were tried, using high concentration of perchloric acid and of lead, but no satisfactory results were obtained.

The addition of small amounts of certain substances to plating and refining baths for the purpose of eliminating or restraining crystals and of improving the density, color and smoothness of the deposits, has been a very common practice, or, at least, has been frequently described.[12]

Perhaps the best known example in commercial work is the use of glue in the lead fluo-silicate bath described by Betts. His patent calls[13] for "reducing agents," and he finds that "gelatine, pyrogallol, resorcinol, saligenin, orthoamidophenol, hydroquinone and sulphurous acid" are available. He recommends gelatine because it is the cheapest and gives the best results.

In the course of this work many different addition substances were tried. Tannin, pyrogallol, resorcine, licorice and eucalyptus extract all helped to a considerable extent, but "trees" would form at the corners of the cathode whenever the deposit reached a certain thickness. Tannin might be successfully used if no better substance were available. A high-grade gelatine, which was purchased for use in bacteriology, gave poor results. A commercial grade of glue gave fair deposits. Ordinary commercial glue, which is used in the lead fluo-silicate baths instead of the more expensive gelatine, is a very impure product, containing many things, among them

[12] Kern, *Transactions American Electrochemical Society,* XV, 441 (1909).
Watts, *Electrometallurgy,* pp. 15, 46, 76 (1895).
McMillen, *A Treatise on Electrometallurgy,* p. 9 (1890).

[13] Betts, U. S. Patent, 713, 277 (1902).

a variety of peptone. Analyses[14] of some samples of glue and gelatine show:

	Per cent of Gelatine.
"Gelatine"	70.95
Superior glue	51.98
Common glue	23.71

Any decomposition of gelatine or glue by ferments or acids forms gelatin-peptones or gelatones. From the fact that the purest gelatine for bacteriological use showed a less favorable effect upon the lead deposits than a low grade commercial glue, the conclusion was drawn that some impurity in the glue was responsible for the good result. Glue which had been warmed for several hours with perchloric acid to form gelatin-peptone was tried. The results were uncertain—sometimes good, but more often bad. Acting along the line of this theory, meat peptones were tried. Two different brands of these meat peptones were used—Wittes', probably the purest to be obtained, and a commercial sample from Merck, which was five years old and badly decomposed. Both gave approximately the same results, consequently Wittes' peptone was used on account of its greater convenience and lack of foul odor. Experiments showed that about 0.03 to 0.05 gram of this peptone per 100 cc. of solution was required. This quantity should be renewed after four or five days, in other words, after the passage of about 25 ampere-hours per 100 cc. of solution. An excess of the peptone did not have any bad effect. The baths did not become ill-smelling even after long runs. There is some material present in or formed from the peptone which separates as a pale yellow flocculent precipitate. This precipitate is not always formed, and the conditions for its production are not known. The presence of this precipitate does not interfere with the working of the bath in any way.

Experimental Data. The current yields are near to the theoretical, as shown by the following table:

Grams of Cu in Coulometer.	Amperes per Sq. Dm.	Volts.	Cathode.		Anode.	
			Grams Lead Deposited.	Yield Per cent.	Grams Lead Dissolved.	Ampere Efficiency Per cent.
4.6475	2.8	0.2	15.1526	99.77	15.2111	100.15
1.2350	------	0.22	4.0277	99.8	4.0828	101.1
0.7290	1.2	------	2.3725	99.6	2.4124	101.3
1.4283	2	0 3	4.6580	99.8	4.7027	100.7
1.2054	1.4	0.2	3.7246	99.6	3.9656	100.7

[14] Allen, *Commercial Organic Analysis*, IV, 479 (1898).

The lead for the anodes had been once refined, but even then a small quantity of slime was formed. Betts has shown[15] that anodes of triple refined lead, which dissolve in the lead fluo-silicate bath without the formation of slime, gave corrosion efficiencies greater than 100 per cent. In some of his experiments, the anode corrosion efficiencies, in per cent, were as follows: 101.4, 101.8, 101.3 and 101.8. This shows that the free fluo-silicic acid is gradually changed to lead fluo-silicate. After a time the bath might even become alkaline. This extra loss from the anode is, no doubt, the result of chemical solution by the free acid in the bath. The perchloric acid in the perchlorate bath dissolves lead on open circuit, as shown by the following table. The bath contained 5 per cent lead and 5 per cent free perchloric acid.

Lead Suspended by	Area of Lead.	Grams Dissolved per Sq. Dm. per 24 Hours.
Platinum wire	10.2	0.495
Cotton string	10.2	0.339-0.414

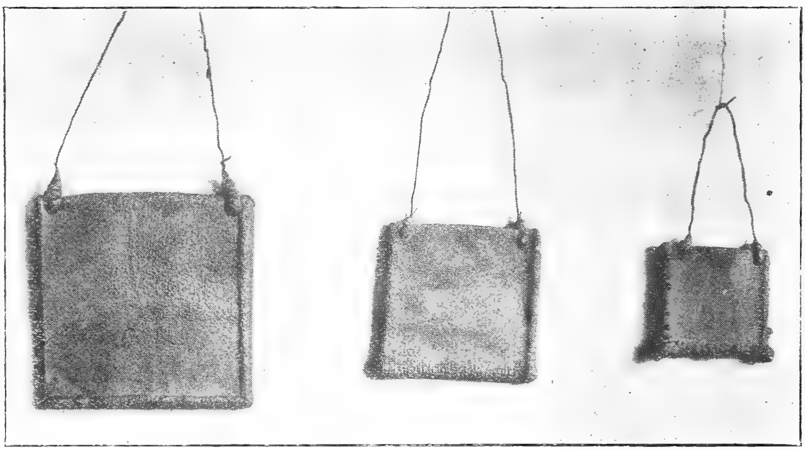
Contact with platinum wire increased the action, as was to be expected. The finely divided lead in the anode slime would be more rapidly attacked than the massive lead, owing to the greater surface exposed and to contact with more positive metallic impurities. The above experiments were made with refined lead, which would dissolve more slowly than bullion. The free perchloric acid which is thus gradually neutralized must be restored. Two methods were tried: Electrolyzing with platinum anodes. The objection is that some lead peroxide is formed on the anode. Of course, the cost of platinum would present difficulties in commercial work. Graphite cannot be used, because it disintegrates during electrolysis. A simpler method is to add the required amount of sulphuric acid to a portion of the electrolyte. Lead sulphate is precipitated and perchloric acid remains in solution. The filtrate is returned to the bath. This diminution in acidity is not rapid. It is greater, of course, with baths containing large amounts of acid. This may be seen from the following table:

Per Cent of Acid in the Bath.	Loss of $HClO_4$ in Per Cent Per Day.
1.6	0.025
4.5	0.07
4.9	0.05

Current Density. Many things have an effect upon the practicable current density. A high current density is favored by con-

[15] Betts, Transactions American Electrochemical Society. VI, 67 (1904).

centrated solutions, high per cent of free acid, large amounts of peptone, and good stirring. With 5 per cent lead, 5 per cent perchloric acid, 0.05 per cent peptone and enough stirring or mixing of the solution to prevent large differences in concentration between the top and the bottom, a current density of from 2 to 3 amperes per sq. dm. (18 to 27 amperes per sq. ft.) gives good deposits, as shown by the accompanying photographs. With lower current densities, less care need be taken with stirring, proper spacing of the electrodes, acidity and quantity of peptone. For plating purposes, low current densities are recommended. With 0.4 amperes per sq. dec., fair deposits may be obtained from baths containing only 0.2 per cent free perchloric acid. With higher cur-



II.—Photograph Showing the Effect of Current Density.
1 amp. per sq. dec., 5.5 per cent lead; 2 amp. per sq. dec., 4.5 per cent perchloric acid; 4 amp. per sq. dec., 0.05 per cent peptone.

rent densities, these neutral baths give poor deposits, even when large amounts of peptone are used.

Voltage. The relation between concentration of the solution, current density, and fall in potential or volts is shown in the following table. These measurements were made upon baths which had been running for several days and which were giving excellent deposits. The anodes were of ordinary commercial lead from a plumber's scrap pile. Two anodes were used—one on each side of the cathode. The anodes had been made purposely smaller than the cathodes to prevent, as much as possible, the thickening of the cathodes at the edges.

Experiment 1. Composition of the bath: 4.5 per cent $HClO_4$, 5.4 per cent lead, and 0.05 per cent peptone. The distance between anode and cathode was 2.2 cm. Volume of the solution was 400 cc.

Amperes Per Sq. Dm. Anode.	Cathode.	Volts.
3.2	1.6	0.21
4.0	2.0	0.27
5.6	2.8	0.38
8.0	4.0	0.55

Experiment 2. Composition of bath: 6.1 per cent $HClO_4$, 7.13 per cent lead, and 0.05 per cent peptone. The distance between anode and cathode was 4 cm. Volume of solution was 800 cc.

Amperes Per Sq. Dm. Anode.	Cathode.	Volts.
1.0	0.21	0.08
2.2	0.45	0.15
2.6	0.55	0.18
3.8	0.8	0.25
4.2	0.9	0.26
5.0	1.6	0.30
6.2	2.	0.34

The results were the same with new anodes or with anodes that were covered lightly with slime containing enough mercury to give a bright color.

Purification Results. The purity of the deposited lead which is obtained by the electrolysis of this bath is shown by the accompanying analyses of the different products.

	Cu Per Cent.	Sb Per Cent.	Pb Per Cent.	As Per Cent.	Ag Per Cent.	Bi Per Cent.
EXPERIMENT (1)						
Slime	1.89	37.56	6.49	----	6.29	30.83
Bullion	0.18	1.5	----	0.24	1.48	0.87
Refined Metal	0.005	0.004	99.984	none	0.003	0.004
EXPERIMENT (2)						
Slime	83.9	----	4.05	----	----	----
Bullion	0.45	----	----	----	----	----
Refined Metal	0.0007	----	----	----	----	----
EXPERIMENT (3)						
Slime	----	----	1.1	----	91.0	----
Bullion	----	----	----	----	1.84	----
Refined Metal	----	----	----	----	none	----

In these experiments, the copper, antimony, silver, arsenic and bismuth were added to the bullion in order to obtain a low-grade material. The anodes were suspended with platinum wires to avoid a slight contamination with copper which resulted when copper wires were used. The copper connecting wires, while not attacked very rapidly, nevertheless become appreciably smaller after being used for a long time in making connections to the anode. This might be avoided if the copper were cast into the anodes and not merely hooked through holes. The fact that these copper wires, in contact with the anodes, are only very slightly attacked gives a striking visible proof that lead may be easily purified from copper.

The analyses show that the refined lead from very impure bullion contains only minute quantities of impurities. These impurities[16] are, for the most part, due to the method of circulating the solution by a current of gas. This stirs up the slime from the bottom, some of which adheres to the cathode.

The slime contains only a small amount of lead. This is important, because it simplifies the subsequent treatment for the recovery of the valuable metals which are in the slimes.

Loss of Perchloric Acid. Some of the electrolyte is always mechanically trapped or held within the metal of the cathode. The loss of perchloric acid caused by this was determined by fusing portions of the cathodes with sodium nitrate. This treatment decomposes the perchlorate into chloride.[17] The chlorine was determined by Volhard's method and was calculated into perchloric acid. The results are:

	Gms. of Cathode Used.	Gms. of Chlorine in Terms of Perchloric Acid.	Per Cent Loss of Perchloric Acid.
Very smooth cathode	25.	0.0041	0.018
Very rough cathode	18.	0.0035	0.02

This represents a loss of about 0.4 pounds of perchloric acid per ton of lead deposited.

The perchlorate baths which had been used for months, did not give any test for chlorides with silver nitrate. This shows that there is no loss of perchloric acid by slight reduction.

The slime, even after careful washing, contains some of the perchlorate of the bath. One sample of slime showed 1.1 per cent. of perchloric acid. This result includes the chlorine from chlorides calculated to perchlorate. Some chlorine had come, perhaps, from the dust and fume of the laboratory. These chlorides, during electrolysis, would unite with the silver of the anode and thus remain in the slime. The total loss of perchloric acid in the slime repre-

[16] Kern, *Transactions American Electrochemical Society,* VI, 39 (1904).
[17] Mathers, *Journal American Chemical Society,* XXXII, 66 (1910).

sents a loss of 1.1 pounds per ton of lead refined if the bullion contained 5 per cent of impurities.

Thus the total loss of perchloric acid from unpreventable sources amounts to about 1.5 pounds per ton of lead refined. This does not include any loss from leaky tanks and pipes or careless handling.

Precautions. Chlorides and barium salts must be absent. A bath that has been giving good deposits will form very bad "trees" if a quantity of hydrochloric acid or some barium perchlorate is added to it. The injurious action of these substances was accidentally discovered from the fact that some baths, made from reagents containing these impurities, would not give good deposits. There are, perhaps, other salts that would act injuriously, but only those mentioned above have been tried.

Summary. This paper describes experiments with the lead perchlorate plating and refining bath. The properties of lead perchlorate which are of special value in a plating or refining solution are:

1. Great solubility.
2. Cathode deposits which are smooth, dense and free from "trees."
3. Approximately theoretical corrosion of the anode and deposition upon the cathode.
4. Absolute stability under all conditions to which it is subjected in a plating or refining bath.
5. Absence of polarization from the formation of lead peroxide on the anode.
6. Very high electrical conductivity.

The bath should contain about 5 per cent of lead, 2-5 per cent of free perchloric acid, and 0.05 per cent of peptone. A current density of from 2.3 amperes per sq. dm. (18-27 amp. per sq. ft.) may be used. The peptone is gradually used up, and after about four days a quantity equal to the original amount should be added. The free acid, which is very slowly neutralized by chemical solution of the lead, must be restored by the treatment of a suitable portion of the solution with the right amount of sulphuric acid. This precipitates lead sulphate and leaves perchloric acid in solution. The filtrate is to be returned to the bath. The bath gives excellent purification, the cathode being about 99.98 per cent pure. The deposit is smooth, coherent, and has a density of 11.36. As a plating bath, the lead perchlorate solution works exceptionally well on account of the absence of "trees" or loose crystals on the edges, even when the deposits reach a thickness of an inch. The bath shows no deterioration with use, and gives as good deposits after two months as at the beginning if the concentration, acidity and the required amount of peptone are maintained.

From the successful results obtained by the above method on a laboratory scale, I see no reason why it cannot be applied on a commercial scale especially for the plating of lead, since the deposits are of exceptional smoothness and are entirely free from "trees" or loose crystals on the edges or points.

5. Studies on Perchloric Acid: Mercurous Perchlorate Voltameter[1].

By Frank C. Mathers and Albert F. O. Germann.

General Statement. Metals which are electrolytically deposited for the purpose of measuring the amount of current passing through an electric circuit, must give quantitative, adherent deposits upon the cathode. Besides these essential requirements there are several other desirable qualities, such as convenience in using, cheapness, permanence, capacity, and reliability. Silver, copper, lead and mercury have been used.

Silver, from a solution of silver nitrate and nitric acid, is recognized as standard. However, accurate measurements require great skill in manipulation, and close adherence to the exact directions. The silver deposits upon the cathode in crystals, which are easily dislodged and lost during the washing.[2] Only small currents can be measured. Silver from a silver perchlorate solution has been used in a few experiments.[3]

Copper, from a solution of copper sulphate, sulphuric acid, and alcohol, is generally employed because of its cheapness and because large currents may be measured. The results, however, are not as accurate as when the silver nitrate voltameter is employed.

The lead fluo-silicate voltameter has not received much attention, although accurate results are claimed[4] for it.

Mercury, from solutions of mercury salts in both stages of oxidation, has been employed at different times by experimenters and has given accurate results. The electrochemical equivalents of these metals, silver, copper, lead, and mercury (ous) are 107.93, 106.9, 31.8, and 200 respectively. Therefore, equal quantities of electricity will precipitate approximately twice as much mercury (ous) as silver or lead, and about six times as much as copper. Other things being equal, the accuracies of voltameters using these metals will stand in this ratio.

The most satisfactory form of the mercury voltameter is that invented by Wright, of England, and used to some extent in that country as a meter. The solution of mercurous nitrate and nitric

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[1] From a thesis presented to the Faculty of Indiana University for the degree of Master of Arts, by Albert F. O. Germann, 1910.

[2] Richards, *Proceedings American Academy of Arts and Sciences,* XXXV, 121 (1899) and XXXVII, 413 (1902).

[3] Carhart, Willard, and Henderson, *Transactions American Electrochemical Society,* IX, 374 (1906).

[4] Betts and Kern, *Transactions American Electrochemical Society,* VI, 67 (1904).

acid, which was first used as an electrolyte, proved unsatisfactory. After prolonged electrolysis, basic salts were formed upon the anode. This increased the resistance of the cell and made it inaccurate. A double salt of potassium and mercuric iodides[5] was found to give satisfactory results. The electrolyte was made by nearly saturating a solution of potassium iodide with mercuric iodide. This solution was placed in a sealed cell containing an iridium cathode near the bottom and a mercury anode near the top. The dense solution, which flowed downward from the anode, mixed with the dilute solution, which arose from the cathode, and thus the electrolyte was automatically stirred. The precipitate of mercury was described as falling in a continuous rain of finely divided particles from the cathode into a graduated tube which was part of the apparatus. This tube was graduated in Board of Trade Units so that the amount of current could be read off directly. Since this voltameter can carry only a small amount of current, on account of the high resistance of the electrolyte, it is set up in a shunt circuit through which only a small fraction of the current passes. After making a reading, the mercury from the cathode can be transferred to the anode chamber by inverting the apparatus for a moment. The mercury is precipitated as divalent mercury (ic), whose electrochemical equivalent is 100. A mercurous mercury bath would produce twice as much mercury as this one.

It was the object of this research to devise a mercury voltameter, and to determine the conditions which are necessary for accurate results. A solution of mercurous perchlorate has properties which make it the most satisfactory material for the electrolyte. Mercurous perchlorate is very soluble in water, is absolutely stable, and may be easily prepared.

Preparation of Materials. Perchloric acid was made by treating barium perchlorate solution with an equivalent amount of sulphuric acid. The precipitate of barium sulphate was removed by filtration. The filtrate, containing the dilute perchloric acid, was heated on the hot plate until the temperature reached about 135°–150°. This treatment volatilized a large part of the water and all of the hydrochloric acid which was present as an impurity in the barium perchlorate. This solution was then distilled under reduced pressure. The low boiling products were rejected, while the distillate, corresponding to 201°–203° C. atmospheric pressure, was saved. This distillate had the approximate composition of $HClO_4 . 2H_2O$. The mercurous perchlorate which was used in the early experiments

[5] Wright, *London Electrician*, LX, 297 and 319.

in this research was prepared by dissolving freshly precipitated mercurous oxide in the perchloric acid. The mercurous oxide was made by precipitating a solution of pure mercurous nitrate with sodium hydroxide. The precipitate was filtered and was washed until free from nitrates. This solution always gave low results in the voltameter. Analysis showed the presence of small amounts of mercuric mercury. Mercurous oxide is unstable and easily decomposes into mercuric oxide and metallic mercury. The low values in the voltameter are explained by the fact that mercuric mercury has an electrochemical equivalent which is just one-half that of mercurous mercury. Pure mercurous perchlorate was prepared by an electrolytic method. The pure perchloric acid was electrolyzed in a small beaker with mercury in the bottom as anode. A small piece of platinum gauze, reaching just below the surface of the electrolyte, was used as the cathode. Connections were made to the anode by means of a platinum wire fused into a glass tube containing some mercury. The solution was stirred occasionally—just enough to break up the layer of crystallized salt which tended to form on the surface of the anode. The dense mercurous perchlorate solution remained in the bottom of the beaker on the mercury anode, and so hydrogen and only small amounts of mercury were precipitated upon the cathode. As the quantity of mercurous perchlorate increased, the stirring and diffusion brought mercury ions to the cathode in gradually increasing quantities, where they were precipitated. The electrolysis was terminated when large amounts of mercury began to be deposited upon the cathode. Water was added and the solution was stirred until the crystallized mercurous perchlorate dissolved. This solution, after filtration, was ready for use as a voltameter solution. The amount of free acid which always was present in the solution was about the quantity that was required to make a good voltameter electrolyte.

Conductivity Experiments. A good voltameter solution should have a low electrical resistance, so conductivity measurements were made to determine the best conducting solutions of mercurous perchlorate and perchloric acid. The determinations were made at 40° by the Kohlrausch method. The data for solutions of perchloric acid and of mercurous perchlorate were taken by starting with solutions of definite strength, and by adding 1 cc. portions of water until 10 cc. had been added to 10 cc. of the solution; and vice versa, by adding 1 cc. portions of the solution to 10 cc. of water until 10 cc. had been added. Data for the mixture of mercurous perchlorate and perchloric acid were obtained by the use of the above strong solutions, each diluted with an equal volume of water—then 1 cc. portions of this diluted acid were added to 10 cc. of the diluted mercurous perchlorate, until 10 cc. had been added. The concentration in grams per cc. is given with the curves and tables which follow.

CONDUCTIVITY DATA.

Solutions of $HClO_4.2H_2O$.				Solutions of $HgClO_4$.			
x cc $HClO_4.2H_2O$. in 10 cc. H_2O.		x cc. H_2O in 10 cc. $HClO_4.2H_2O$.		x cc. H_2O in 10 cc. saturated $HgClO_4$,40°.		x cc. sat. $HgClO_4$, 40° in 10 Cc. H_2O	
Cc. acid	Sp. Cond.=K	Cc. H_2O	Sp. Cond.=K	Cc. H_2O	Sp. Cond.=K	Cc. $HgClO_4$.	Sp. Cond.=K
0	10.119x10–5	0	0.4374	0	0.2809	0	10.119x10–5
0.1	0 08708	1	0.5192	1	0.2323	0.1	0.00732
0.2	0.09932	2	0.5811	2	0.2281	0.2	0.01364
0.3	0.15167	3	0 6435	3	0.2281	0.3	0.01935
0.4	0.1998	4	0.6903	4	0.2254	0.4	0.02502
0.5	0.2419	5	0.7307	5	0.2218	0.5	0.03016
0.6	0.2739	6	0.7756	6	0.2182	0.6	0.03462
0.7	0.3052	7	0.7934	7	0.2121	0.7	
0.8	0.3313	8	0.8208	8	0.2037	0.8	0.04455
0.9	0.3669	9	0.8298	9	0.1959	0.9	
1.0	0.3953	10	0.8388	10	0.1915	1.0	0.05272
1.5	0.5136					1.5	0.06935
2.0	0.5954					2.0	0.08637
3.0	0.6900					3.0	0.1150
4.0	0 7572					4.0	0.1350
5.0	0.8101					5 0	0.1520
6 0	0.8354					6 0	0.1558
7.0	0.8395					7.0	0.1672
8.0	0.8395					8.0	0.1740
9.0	0.8395					9.0	
10.0	0.8234					10.0	0.1915

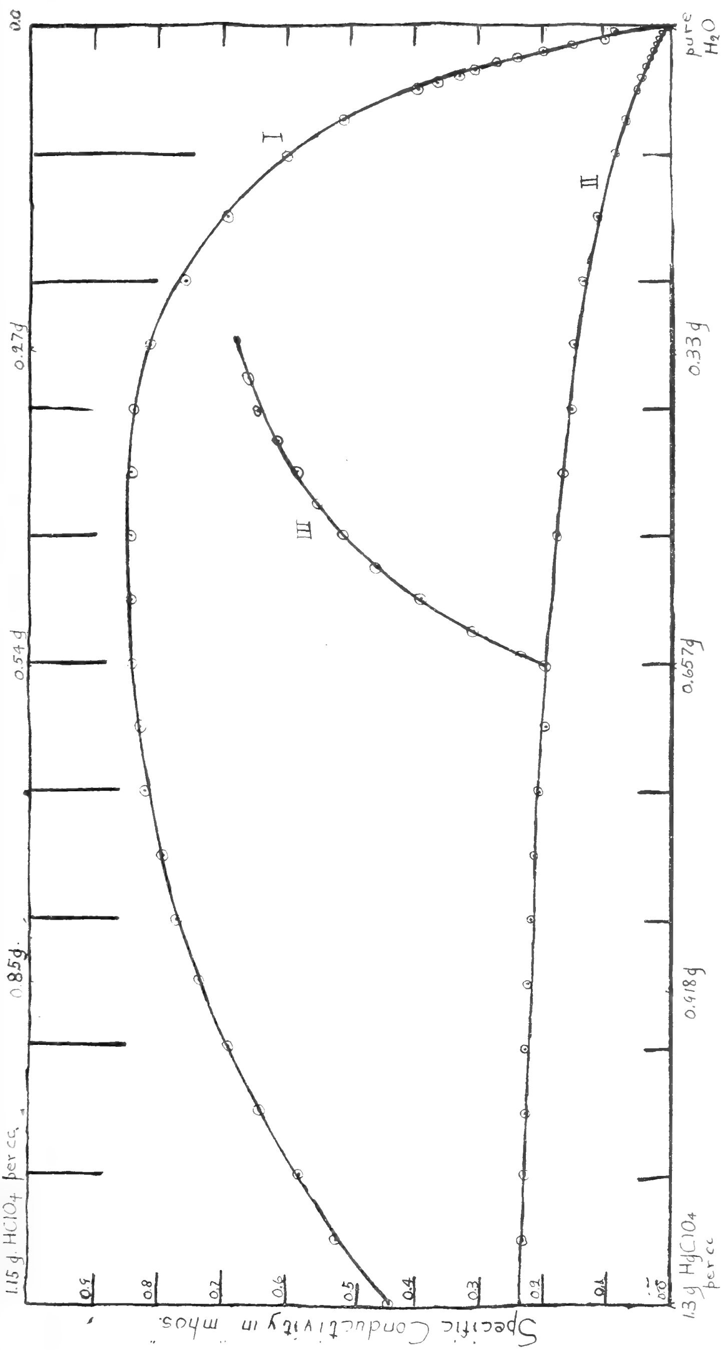
Solutions of $NaClO_4$.

Strength.	K. at 38°C.	K. at 25.8°C.
N	0.09377	0.08217
N/2	0.05245	0.04252
N/4	0.02903	0.02339
N/8	0.01555	0.01243
N/16	0.00824	0.006621
N/32	0.004407	0.003532
N/64	0.002378	0.001903
N/128	0.001258	0.001007

Solutions of $HgClO_4+HClO_4.2H_2O$.

x cc. $HClO_4$ $2H_2O$ (50%) in 10 cc. $\begin{cases} 5 \text{ cc. } H_2O \\ 5 \text{ cc. } HgClO_4 \text{ sat. at } 40°C. \end{cases}$

cc acid.	Sp. Cond.=K.
0	0.1895
1	0.3040
2	0.3867
3	0.4571
4	
5	0.5445
6	0.5829
7	0.6106
8	0.6402
9	0.6557
10	0.6718



I. $HClO_4.2H_2O$ from O to 100 per cent.
II. $HgClO_4$ from O to saturated solution at 40° C.
III. 5 cc. $HgClO_4$ saturated at 40° C. and 5 cc. H_2O, diluted with 50 per cent $HClO_4.2H_2O$.

The specific conductivities of perchloric acid are the average of several readings at different points on the bridge wire. The other readings were taken as near the center of the bridge as possible. The cell constant ranged from about 0.25 to 0.28, so that, in the case of high conductivities, the bridge reading with one ohm in the box, had to be taken some distance from the middle.

The curves show that:

1. A solution of perchloric acid containing 0.43 grams per cc. is the best conducting solution. (Curve I.)

2. The conductivity of mercurous perchlorate increases slowly with increase in concentration. (Curve II.)

3. The conductivity of solutions of mercurous perchlorate increases very rapidly with increasing amounts of free perchloric acid. (Curve III.)

Voltameter Experiments. The original intention of this research was to use the form of apparatus described in the London Electrician, merely substituting mercurous perchlorate for the potassium mercuric iodide. However, several difficulties arose, chief among which was the difficulty of securing an iridium cathode. Efforts were made to substitute platinum, palladium and magnetic oxide of iron, but with poor success, because the precipitated mercury stuck to the cathode. The magnetic oxide of iron, with proper precautions, might be successfully used as cathode material. A large piece of the oxide[6] was ground to the shape of a cone and the surface was polished. Electrical connection was made by pushing a platinum wire into a hole in the base of the cone. This connection was covered with sealing wax. The precipitated mercury fell from the cathode in a fine steady stream. The cathode soon began to disintegrate along some small cracks or imperfections in the magnetite. The small particles of the oxide which became detached in this manner mixed with the precipitated mercury. Since this disintegration of the magnetite could not be prevented, experiments with it were abandoned.

Mercury as cathode material was much more satisfactory, although one great difficulty appeared—the mercury deposit consisted in part of a black powder. Various substances were added to the electrolyte to modify the deposit. Alcohol, glue, aluminum perchlorate and sodium perchlorate were tried. Alcohol was effective temporarily, but had to be renewed at frequent intervals; glue was ineffective, as was the aluminum perchlorate. Sodium perchlorate

[6] Part of an anode which had been used commercially in the electrolysis of sodium chloride.

in small quantities did away with the black powder and gave a perfect deposit of mercury.

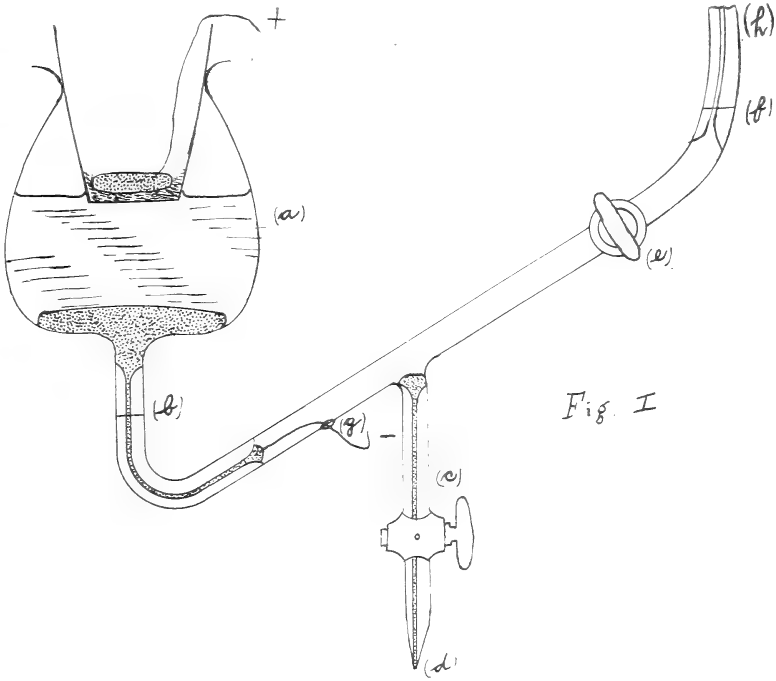


Fig. I

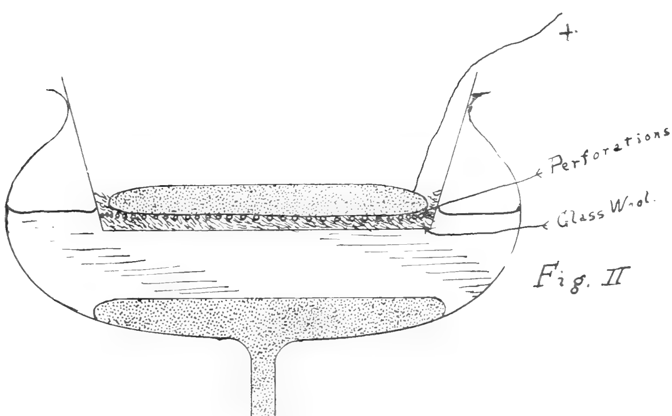


Fig. II

The form of the cell that was employed is shown in Figure I. The stem of a large thistle tube (a) was sealed to a capillary tube of about 0.6 mm. bore. To this was sealed a tube of larger diameter (3 to 4 mm.) containing a stop cock (e), and bearing a side arm capillary delivery tube with stop cock (c). At the end of the large bore tube, another capillary tube was sealed. Marks (b and f) were made upon these capillary tubes with hydrofluoric acid. The purpose of the large bore tube was to serve as a convenient reservoir for the constant excess of mercury which was required for cathode material. Connection was made with the cathode by means of a platinum wire which was sealed into the tube at (g). The anode cell used in these experiments was a Gooch crucible, containing a layer of glass wool, upon which rested 20 to 30 grams of mercury. This crucible was placed in the thistle tube (Figure II) so that it was partially immersed in the electrolyte. This arrangement of the electrodes provided for a very efficient and convenient stirring of the electrolyte. The heavy liquid falling from the anode mixed with the light liquid rising from the cathode, and thus the electrolyte was thoroughly stirred. At no time was any mechanical stirring or mixing required.

At the beginning of an experiment, the cell was filled with mercury between the marks (b and f). The mercury was then forced into the thistle tube by blowing, or by the use of a rubber bulb (attached at h), enough being left in the reservoir tube to make good contact with the negative terminal wire. At the termination of an experiment, the mercury was allowed to flow back to the mark (f), and the excess above the graduation (b) was run into a beaker to be weighed, or into small specially prepared graduated flasks for measurement. The data from a number of experiments are given in the following table:

Hg AND Cu VOLTAMETERS IN SERIES.

Exp. No.	Current.	N.D.$_{100}$ Anode.	N.D.$_{100}$ Cathode.	Wt. Cu Deposited.	Wt Hg Deposited.	Hg Calculated from Cu.	% Error.	Remarks.
3	0.135	4.18	1.89	0.3068	1.9386	1.9302	+0.43	Nos. 3-6, the depos. Hg was measured in a graduated capillary tube.
4	0.135	4.18	1.89	0.2207	1.3813	1.3880	−0.48	
5	0.410	12.71	5.74	0.3221	2.0180	2.0258	−0.38	
6	0.550	17.05	7.70	0.4935	3.1000	3.1037	−0.12	
7	0.850	26.35	11.90	1.0457	6.5578	6.5767	−0.28	
8	1.60	49.60	22.40	1.7712	11.0816	11.1396	−0.52	
9	2.30	71.30	32.20	1.4427	9.1225	9.0736	+0.53	Electrolyte warm.
10	3.10	96.10	43.40	1.6545	10.4013	10.4056	−0.04	Electrolyte very warm.
11	0.20	6.20	2.80	0.4936	3.1075	3.1044	+0 10	
12A	0.50	15.50	7.00	1.4220	8.9808	8.9421	+0 40	
12B	0.50	15.50	7.00	1.4220	8.9700	8.94[illegible]4	+0.30	
13B	0.85	26.35	11.90	1.49[illegible]6	9.4[illegible]48	9.[illegible]437	+0 43	
14A	0.50	15.50	7.00	1.2227	7.6707	7.6899	−0.25	
14B	0.50	15.50	7.00	1.2227	7.6908	7.6899	+0.01	

Hg, Cu AND Ag VOLTAMETERS IN SERIES.

Exp. No.	Current.	Wt. Ag Deposited.	Wt. Cu Deposited.	Wt. Cu Calculated from Ag.	% Error.	Wt. Hg Deposited.	Wt. Hg Calculated from Ag.	% Error.
13B	0.85	5.0711	1.4936	1.4941	−0.03	9.4348	9.3970	+0.40
14A	0.50	4.1451	1.2227	1.2213	+0.11	7.6707	7.7003	−0.38
14B	0.50	4.1451	1.2227	1.2213	+0.11	7.6908	7.7003	−0.12

The conditions for the above experiments were:

Anode area was about 3.14 sq. cm.

Cathode area was about 7 sq. cm.

Distance between anode and cathode was about 2.5 cm.

Volume of the electrolyte was about 35 cc.

Composition of the electrolyte was: 0.6420 gm. $HgClO_4$ per cc., 0.2836 gm. $HClO_4$ per cc., and 0.04 gm. $NaClO_4$ per cc.

Changes in temperature during the course of the experiment affect the accuracy of the results. The electrolyte should be at the same temperature when readings are taken before and after electrolysis. When the electrolyte is heated by the current, it should either be allowed to regain its original temperature before reading, or a correction should be made for the thermal expansion of the amount of mercury in the reservoir.

The advantages of the mercurous perchlorate voltameter are:

1. A very high current density may be used.

2. Mercurous perchlorate is very soluble in water and the solutions, thus formed, are entirely free from any decomposition or precipitation of basic salt.

3. The amount of metal deposited, being a liquid, may be very rapidly determined by measurement rather than by weighing.

4. Equivalent quantities of electricity deposit from two to six times greater weight of mercurous mercury than of any other metal. This gives greater accuracy.

5. The deposited metal on the cathode is in such form that it may be transferred to the anode for further use without any other treatment.

6. The Preparation of Ammonium Selenate: A New Method.[1]

By Frank C. Mathers and Roy S. Bonsib.

Introductory Statement. Owing to the ease with which ammonium selenate will react with the higher metallic oxides, it is one of the most convenient starting materials for the preparation of the corresponding salts of selenic acid. For example:

$$(NH_4)_2SeO_4 + CuO = CuSeO_4 + 2NH_3 + H_2O.$$

This reaction shows the desirability of a quick and convenient method for the preparation of ammonium selenate.

The only method[2], described for the preparation of ammonium selenate is the saturation of selenic acid with ammonia. This method is undesirable because the selenic acid, itself, is difficult to prepare.

Ammonium selenate may be much more easily prepared by treating barium or lead selenate with a strong solution of ammonium carbonate. The barium or lead selenate is changed into insoluble barium or lead carbonate and soluble ammonium selenate. Evaporation of the filtrate from this mixture completely volatilizes the excess of ammonium carbonate and precipitates the small amounts of barium and lead selenates which are dissolved. Pure ammonium selenate may be obtained from this filtrate by crystallization.

The barium and lead salts of selenic acid were selected as starting materials on account of the ease with which they may be obtained in a pure condition. Pure selenic acid is not necessarily required for the preparation of the barium or lead salt, for selenic acid solutions containing the by-products of its formation may be used. The barium or lead selenate thus formed is purified by washing thoroughly with distilled water. The solubility of lead selenate was determined in order to find the loss caused by this washing. Four closely agreeing determinations showed the solubility to be 0.006 gram in 100 cc. of water at 23° C.

The selenic acid solution mentioned above may be easily obtained by several well-known methods. For example: Treating a nitric acid solution of selenium dioxide with an excess of potassium permanganate or by adding selenium dioxide to fused sodium peroxide or sodium nitrate.

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[1] From a thesis to be submitted to the Faculty of Indiana University, for the degree of Master of Arts, by Roy S. Bonsib, 1911.

[2] Gmelin-Kraut, *Handbuch* (old edition); Dammer, *Handbuch;* Ladenburg, *Handwörterbuch der Chemie.*

In a method[3] similar to the one described in this research, barium selenate is treated with a slight excess of a solution of potassium carbonate. The filtrate from this mixture contains potassium selenate and the excess of potassium carbonate. The disadvantage of this process is that there is no good way of eliminating the excess of potassium carbonate and potassium selenate can not be used for the preparation of other salts by the method indicated above.

General Methods for the Preparation of Selenic Acid. Briefly, the processes which are used the most widely for the preparation of selenic acid and the selenates, are as follows:

(1) Treat silver selenite with bromine, which forms selenic acid with the precipitation of silver bromide. This does not give an absolutely pure acid, as it contains traces of bromine.[4]

(2) Decompose lead selenate with sulphuric acid or hydrogen sulphide.[5]

(3) Decompose barium selenate with sulphuric acid.[6]

(4) Electrolytic method: Pass chlorine through pure selenium dioxide suspended in cold water, which forms selenic acid and hydrochloric acid. Neutralize with copper carbonate[7] and, near the end of the reaction, with freshly precipitated copper hydroxide. This forms copper selenate and copper chloride. Evaporate the solution; the copper selenate being the less soluble, crystallizes out. The copper selenate crystals, which are recrystallized until free from chlorides, are dissolved in water and the solution electrolyzed[8] between platinum electrodes until all of the copper is deposited. This method gives a pure acid, but is more or less inconvenient.

The following research work was undertaken in order to ascertain, if possible, a cheap, convenient and quick method for the preparation of ammonium selenate. Flue dust, obtained from the roasting of anode slimes from a copper refinery, was used as a source of selenium. The selenates of barium and lead were prepared and gram portions treated with varying quantities of "ammonium carbonate," for different periods of time.

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[3] Gerichten, *Liebig's Annalen*, CLXVIII, 214.

[4] Thomsen, *Berichte der Deutschen Chemischen Gesellschaft*, II, 598.

[5] Wohlwill, *Liebig's Annalen*, CXIV, 169.

[6] Wohlwill, l. c.

[7] Wohlwill, l. c.

[8] R. Metzer, *Comptes rendus hebdomadaires des séances de l'académie des sciences*, CXXVII, 54 (1898).

EXPERIMENTAL MANIPULATION.

Extraction of Metallic Selenium[9]. Five hundred grams of flue dust was digested with two hundred grams of potassium cyanide and six hundred cubic centimeters of distilled water. The sulphur and selenium dissolved as potassium sulphocyanate (KCNS) and potassium selenocyanate (KCNSe). Some of the tellurium formed potassium telluride, which, however, readily decomposed by the oxygen of the air with the precipitation of tellurium. To make sure that the tellurium was completely eliminated, air was blown through the filtrate. Upon the addition of hydrochloric acid, selenocyanic acid (HCNSe) was formed, which, being unstable, broke down into hydrocyanic acid and selenium, a red precipitate. The sulphocyanic acid (HCNS) is stable and remained undecomposed. The mixture was filtered and the residue of selenium washed well with distilled water. The residue was heated about three or four hours on the hot plate. The selenium was changed to the stable modification and became black, hard and brittle, which greatly facilitated filtration and washing.

Preparation of Selenic Acid. The metallic selenium was triturated with distilled water until the last traces of hydrocyanic acid were removed. After thus being thoroughly washed the selenium was treated with concentrated nitric acid and heated on the water-bath until it was completely dissolved. This solution was diluted with distilled water and filtered. The filtrate was treated with a concentrated solution of potassium permanganate until it assumed a permanent pink color, and then warmed on a water-bath for twenty or thirty minutes. The permanganate oxidized the selenious acid to selenic acid with the precipitation of manganese dioxide. This managanese dioxide was removed by filtration. The selenic acid thus formed was in the filtrate. The pink color caused by the slight excess of permanganate was discharged by the addition of a few drops of hydrogen peroxide.

Barium nitrate was then added to the above filtrate and the mixture allowed to stand over night and filtered. The residue was washed free from barium nitrate with distilled water. The barium selenate thus formed was treated with a concentrated solution of "ammonium carbonate" and allowed to stand twenty-four hours, with occasional stirring. Any sulphur which might not have been eliminated by the potassium cyanide treatment would remain in the residue as insoluble barium sulphate. The mixture was filtered and the residue thoroughly washed with distilled water. The fil-

[9] Nilson, *Berichte der Deutschen Chemischen Gesellschaft,* VII, 1719.

trate and wash water were evaporated on a water-bath until the "ammonium carbonate" was completely eliminated; then made slightly acid with nitric acid, diluted to a large volume and treated with a hot ten per cent solution of barium nitrate. A white precipitate of pure barium selenate was formed, which was placed on filter paper, washed thoroughly with distilled water and dried in an air bath for four hours at a temperature of from 115° to 130° C.

Lead selenate was prepared in an analogous manner, by precipitating the selenic acid with a pure lead nitrate solution.

Preparation of Ammonium Selenate. The *materials used* were:

Barium selenate prepared as above.
Lead selenate prepared as above.
"Carbonate of ammonia" (Merck).

The following analysis was made to determine the composition of the "carbonate of ammonia":

NH_3	21.80 per cent.	21.40 per cent.
CO_2	27.73 per cent.	27.92 per cent.

Procedure. Gram portions of barium or lead selenate were weighed out into small beakers and treated with varying quantities of distilled water and the powdered "carbonate of ammonia." After different periods of time, the mixtures were filtered and the residues washed with distilled water, until free from ammonia, and then analyzed to determine the yields.

Method of Calculating Yields. The following is the reaction, M being either lead or barium:

$$MSeO_4 + (NH_4)_2 CO_3 = MCO_3 + (NH_4)_2 SeO_4.$$

The residue of either the barium or lead carbonate obtained after filtering from the ammonium selenate and the excess of the "ammonium carbonate," were washed with distilled water until there was no coloration produced when the wash-water was treated with Nessler's reagent. This residue was dissolved in an excess of standard hydrochloric acid and titrated with standard sodium hydroxide solution. Methyl orange was used as an indicator. For every molecule of barium or lead selenate decomposed by the "ammonium carbonate," a molecule of barium or lead carbonate is formed. The barium or lead carbonate thus produced reacts with the hydrochloric acid and the amount of ammonium selenate may be easily determined.

The advantages of this method are that the manipulation is comparatively simple and that the results of a given experiment may be determined within a short time after its completion.

The standard method for the determination of selenium—reducing selenium from the selenic to the selenious condition by heating with hydrochloric acid and precipitating the metallic selenium with sulphur dioxide, filtering and weighing—was used in a few experiments as a check to show that the new method of calculating yields was introducing no error into the work. The following table contains the results obtained by the two methods:

No. of Sample.[10]	Titration Method.	Reduction of Se Method.	Difference.
I.	72.91 per cent.	72.86 per cent.	0.052 per cent.
II.	83.33 per cent.	83.30 per cent.	0.030 per cent.
III.	96.03 per cent.	95.99 per cent.	0.040 per cent.

The differences shown by the above table are negligible and within the limits of experimental error.

EXPERIMENTAL DATA.

Results with Barium Selenate: Assuming the reaction

$$BaSeO_4 \times (NH_4)_2CO_3 = BaCO_3 \times (NH_4)_2SeO_4$$

one gram of barium selenate is equivalent to 0.344 gram "ammonium carbonate." An analysis of the "ammonium carbonate" showed that it contained only 62 per cent as much carbon dioxide as is contained in the body of the composition $(NH_4)_2CO_3$. This analysis of the "ammonium carbonate" was not made until near the close of the research, which accounts for the fractional equivalent molecules of carbonate used in the tables.

In the following tables 0.7 gram of "ammonium carbonate" represents 1.24 molecules of carbon dioxide to one molecule of barium selenate, 1.48 grams of "ammonium carbonate" equal 2.48 molecules and 2.8 grams equal 4.96 molecules of carbon dioxide to one molecule of barium selenate.

[10] Nos. I and II are results obtained from barium selenate and No. III with lead selenate.

TABLE I.

Amount of Ammon. Carb.	Amount of Bar. Selen.	Time Treated.	Amount of Water.	Yield Per Cent.
0.7 gram	1 gram	15 hrs.	5 cc.	46.87
0.7 gram	1 gram	29 hrs.	5 cc.	53.38
0.7 gram	1 gram	35 hrs.	5 cc.	55.99
1.4 gram	1 gram	18 hrs.	10 cc.	75.52
1.4 gram	1 gram	24 hrs.	10 cc.	87.23
1.4 gram	1 gram	39 hrs.	10 cc.	91.14
2.8 gram	1 gram	4 hrs.	10 cc.	40.36
2.8 gram	1 gram	8 hrs.	10 cc.	62.50
2.8 gram	1 gram	12 hrs.	10 cc.	74.21
2.8 gram	1 gram	24 hrs.	10 cc.	87.23
2.8 gram	1 gram	28 hrs.	10 cc.	96.35
2.8 gram	1 gram	36 hrs.	10 cc.	97.65
2.8 gram	1 gram	61 hrs.	10 cc.	97.65

This table shows that a large excess of "ammonium carbonate" is required, a near theoretical yield being obtained only with five equivalents of "ammonium carbonate" to one of barium selenate. The use of "ammonium carbonate" in excess of 2.8 grams is not advisable, since this quantity will not dissolve in the amount of water used. The above table also shows that the reaction takes place slowly, about thirty hours being required to obtain a yield approximately theoretical.

TABLE II.

In the following table one gram portions of barium selenate were treated with 2.8 gram portions of "ammonium carbonate" in small beakers.

Time Treated.	Amount of Water.	Yield Per Cent.
17 hrs.	15 cc.	72.91
17 hrs.	20 cc.	63.80
17 hrs.	25 cc.	57.29
17 hrs.	30 cc.	49.48
28 hrs.	15 cc.	83.33
28 hrs.	20 cc.	82.03
28 hrs.	25 cc.	72.91
28 hrs.	30 cc.	60.01

This table shows that it is more advantageous to use concentrated solutions of "ammonium carbonate," since the yields are larger.

Results with Lead Selenate: Assuming the reaction

$$PbSeO_4 + (NH_4)_2CO_3 = PbCO_3 + (NH_4)_2SeO_4$$

one gram of lead selenate is equivalent to 0.2744 gram "ammonium carbonate." In the following tables 0.27 gram "ammonium carbonate" represents 0.62 molecules of carbon dioxide to 1 molecule of lead selenate; 0.55 gram "ammonium carbonate" represents 1.24 molecules of carbon dioxide to 1 molecule of lead selenate and 1.1 grams "ammonium carbonate" represent 2.48 molecules of carbon dioxide to 1 molecule of lead selenate.

TABLE I.

Amount of Ammon. Carb.	Amount of Lead Selen.	Amount of Water.	Time Treated.	Yield Per Cent.
0.274 gram	1 gram	10 cc.	0.5 hr.	47.20
0.274 gram	1 gram	10 cc.	1 hr.	48.72
0.274 gram	1 gram	10 cc.	2 hrs.	50.45
0.274 gram	1 gram	10 cc.	4 hrs.	53.71
0.274 gram	1 gram	10 cc.	6 hrs.	55.31
0.274 gram	1 gram	10 cc.	8 hrs.	56.79
0.274 gram	1 gram	10 cc.	12 hrs.	56.79
0.274 gram	1 gram	10 cc.	24 hrs.	58.59
0.55 gram	1 gram	5 cc.	0.5 hr.	94.32
0.55 gram	1 gram	5 cc.	1 hr.	94.32
0.55 gram	1 gram	5 cc.	3 hrs.	98.46
0.55 gram	1 gram	5 cc.	16 hrs.	97.65
0.55 gram	1 gram	5 cc.	22 hrs.	99.28
0.55 gram	1 gram	5 cc.	28 hrs.	97.65
0.55 gram	1 gram	5 cc.	30 hrs.	97.65
1.10 gram	1 gram	10 cc.	0.5 hr.	96.02
1.10 gram	1 gram	10 cc.	1 hr.	96.02
1.10 gram	1 gram	10 cc.	4 hrs.	96.02
1.10 gram	1 gram	10 cc.	0.25 hr.	96.02
1.10 gram	1 gram	5 cc.	1 hr.	93.58
1.10 gram	1 gram	5 cc.	2 hrs.	96.02
1.10 gram	1 gram	5 cc.	6 hrs.	96.02
1.10 gram	1 gram	5 cc.	24 hrs.	96.02

This table shows that it is necessary to use 1.2 molecules of "ammonium carbonate" to 1 molecule of lead selenate, and that the reaction takes place comparatively rapidly. The change of dilution from five cc. to ten cc. is apparently of no effect as long as there is an excess of "ammonium carbonate."

Experiments not given here show that stirring with air or continually shaking is of no advantage, as there is little if any change in the yield.

These tables show that almost theoretical yields may be obtained. It is impossible to obtain a yield of 100 per cent because a certain amount of lead selenate dissolves in the "ammonium carbonate" solution and in the wash-water. When the solution of ammonium selenate and the washings are evaporated to drive out the excess "ammonium carbonate" and to crystallize the ammonium selenate, the lead selenate is precipitated. This is, of course, filtered out in order to prevent contamination of the ammonium selenate. In one experiment the amount of this lead selenate was found to be 1.72 per cent; adding this to the yield of the ammonium selenate obtained, gives a total of 99.47 per cent, which accounts for practically all of the lead selenate.

Results with Lead Sulphate: Since lead sulphate is analogous to lead selenate, the following experiments were made to see what effect "ammonium carbonate" would have upon lead sulphate. One gram portions of lead selenate and ten cc. distilled water were used in all of the experiments. The results may be tabulated in the following manner:

Amount of Ammon. Carb.	Time Treated.	Yield Per cent.
0.3171 gr.	1 hr.	47.75
0.3171 gr.	2 hrs.	56.17
0.3171 gr.	4 hrs.	56.17
0.3171 gr.	6 hrs.	56.17
0.6342 gr.	1 hr.	70.21
0.6342 gr.	2 hrs.	71.21
0.6342 gr.	4 hrs.	75.83
0.6342 gr.	6 hrs.	75.83

It may be seen from the above table that lead sulphate is not nearly so rapidly decomposed by "ammonium carbonate" as is lead selenate.

SUMMARY.

The object of this research was to determine the best conditions for the preparation of ammonium selenate by the treatment of either barium selenate or lead selenate with an excess of "ammonium carbonate." This reaction forms insoluble barium carbonate or lead carbonate with ammonium selenate and the excess of "ammonium carbonate" in solution. This mixture is filtered and the filtrate evaporated. During the heating the "ammonium carbonate" volatilizes and any barium or lead selenate which is in solution is precipitated. This precipitate is filtered off and the pure ammonium selenate allowed to crystallize.

The best conditions, when using barium selenate, were found to be:

(1) 2.8 grams "ammonium carbonate" to one gram barium selenate, which is about five molecules of carbon dioxide to one molecule of barium selenate.

(2) 10 cc. of water to each gram of barium selenate.

(3) The mixture should stand about thirty hours, with occasional shaking.

Increase of temperature, stirring with air or carbon dioxide, or carrying out the reaction in sealed tubes does not increase the yield.

The best conditions, when using lead selenate, are:

(1) 0.55 gram "ammonium carbonate" to one gram of lead selenate, which is about 1.24 molecules of actual carbon dioxide to one molecule of lead selenate.

(2) 5 cc. water to each gram of lead selenate.

(3) The mixture should stand about one or two hours to get the best yields, although good yields may be obtained in fifteen to thirty minutes.

The results of these experiments show that lead selenate is the better material to use, because (1) it is more easily prepared, as the precipitate is more easily filtered and washed; (2) it gives a better yield and requires less "ammonium carbonate" and less time than does barium selenate.

7. A Continuous Function Having Nowhere a Derivative.

By Rainard B. Robbins, A. M.

It had been generally assumed until the latter part of the nineteenth century that a continuous function of a single variable has a definite, finite derivative for all values of the variable except for isolated singular points. There is nothing in the writings of Gauss, Cauchy, or Dirichlet to indicate that they doubted this assumption[1]. It seems that Riemann was the first to state positively that this asumption was wrong. He made this statement about 1861, or possibly earlier, to some of his students and gave as a function for which the assumption was wrong,

$$F(x)=\sum_{1}^{\infty}{}_n \frac{\sin(n^2x)}{n^2}$$

His proof has been lost. Several mathematicians have since dealt with continuous functions having no derivative at any one of an infinite number of points in an arbitrary small interval of the variable, but Weierstrass[1] was the first to find a function having a derivative for no value of the variable. The function which he considered is represented by the series

$$f(x)=\sum_{0}^{\infty}{}_n b^n \cos(a^n x\pi)$$

in which a is an odd integer, and $o<b<1$. When the product ab exceeds a certain limit, $f(x)$ has no derivative. Wiener[2] has since written the most complete discussion of this function that has as yet appeared, presenting it analytically and geometrically.

The purpose of this paper is to show that another function,

$$f(x)=\sum_{0}^{\infty}{}_n b^n \sin(a^n x\pi)$$

has the same properties with regard to the derivative as the function discussed by Weierstrass and Wiener, when restrictions are placed on a, and b, slightly different from those which they used. The same method will be used as was used by Weierstrass. The notation will not be essentially different from that of Weierstrass, but in a few cases will be somewhat simpler.

To prove that the function $\sum_{0}^{\infty}{}_n b^n \sin a^n x\pi$ *in which* $o<b<1$ *and* a *is odd, has no derivative when* a *and* b *satisfy certain conditions.*

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[1] Weierstrass, *Werke*, II, 71.

[2] *Journal für Mathematik*, Bd. 90, 221.

Let x_0 be the abscissa corresponding to a point on the curve of the function, and m an arbitrary whole number; then

$$o < (a^m x_0 - \alpha) \leqq 1, \text{ determines an integer } \alpha.$$

Let $a^m x_0 - \alpha = x_1$. Then $o < x_1 \overline{<} 1$.

$$\text{Let } x' = \frac{\alpha - \frac{1}{2}}{a^m}; \quad \text{and } x'' = \frac{\alpha + \frac{3}{2}}{a^m}$$

$$\text{Then } x' - x_0 = -\frac{\frac{1}{2} + x_1}{a^m}; \quad \text{and } x'' - x_0 = \frac{\frac{3}{2} - x_1}{a^m}.$$

$$\frac{f(x') - f(x_0)}{x' - x_0} = \sum_{0}^{m-1} n \left[\frac{(ab)^n}{a^n (x' - x_0)} (\sin a^n x' \pi - \sin a^n x_0 \pi)\right]$$

$$+ \sum_{0}^{\infty} n \left[\frac{b^{m+n}}{x' - x_0} (\sin a^{m+n} x' \pi - \sin a^{m+n} x_0 \pi)\right]$$

$= A + B$, letting A stand for the first summation and B for the second. By choosing m sufficiently large $x' - x_0$ can be made to differ as little as we please from zero. It is evident that the limit of the above fraction

$$\frac{f(x') - f(x_0)}{x' - x_0}$$

as $x' - x_0$ approaches zero is a value of the derivative at x_0.

Our problem is therefore to evaluate this fraction, when $x' - x_0 \doteq o$.

To evaluate A:

$$\frac{\sin a^n x' \pi - \sin a^n x_0 \pi}{a^n (x' - x_0)} = \frac{2 \cos a^n \frac{x' + x_0}{2} \pi \cdot \sin a^n \frac{x' - x_0}{2} \pi}{a^n (x' - x_0)}$$

$$= \frac{\pi \cos a^n \frac{x' + x_0}{2} \pi . \sin a^n \frac{x' - x_0}{2} \pi}{a^n \frac{x' - x_0}{2} \pi.}.$$

This expression is less than π in absolute value, since

$$-1 < \frac{\sin y}{y} < 1, \qquad \text{and } -1 < \cos y < 1.$$

Substituting this value in the series A we have,

$$\sum_{0}^{m-1} n \left| \left[(ab)^n \frac{\sin a^n x' \pi - \sin a^n x_0 \pi}{a^n (x' - x_0)}\right] \right| < \pi \sum_{0}^{m-1} n \, (ab)^n < \frac{\pi (ab)^m}{ab - 1}.$$

To evaluate B: When a is of the form 4n + 1, (n being an integer),

$$\sin a^{m+n}x'\pi = \sin a^n(2\alpha - 1)\frac{\pi}{2} = -(-1)^a,$$

$$\left(\text{since } x' = \frac{\alpha - \frac{1}{2}}{a^m}\right),$$

$$\sin a^{m+n}x_0\pi = \sin a^n(x_1 + \alpha)\pi,$$

$$(\text{since } x_1 = a^m x_0 - \alpha),$$

$$= \sin a^n x_1 \pi \cos a^n \alpha\pi + \cos a^n x_1 \pi \sin a^n \alpha\pi$$

$$= (-1)^a \quad \sin a^n x_1 \pi,$$

$$(\text{since } \sin a^n\alpha\pi = 0, \quad \text{and } \cos a^n\alpha\pi = (-1)^a).$$

Substituting these values in B, we have

$$\sum_0^\infty {}_n \left[\frac{b^{m+n}}{x' - x_0}(\sin a^{m+n}x'\pi - \sin a^{m+n}x_0\pi)\right]$$

$$= \sum_0^\infty {}_n \left(\frac{b^{m+n}}{x' - x_0}[-(-1)^a - (-1)^a \sin a^n x_1 \pi]\right)$$

$$= (-1)^a \ (ab)^m \sum_0^\infty {}_n\ b^n \frac{1 + \sin a^n x_1 \pi}{\frac{1}{2} + x_1}$$

Each term of the last summation is positive, and the first is $\geq \frac{2}{3}$, since $\sin x_1\pi$ is positive.

But $\underset{x'' = x_0}{lt} \dfrac{f(x'') - f(x_0)}{x'' - x_0}$ is also a value of the derivative at x_0.

To find the value of this fraction we break it up into two series as above, and call them A and B.

A evaluates exactly as before.

To evaluate B:

$$\sin a^{m+n}x''\pi = \sin\left[a^n(2\alpha + 3)\frac{\pi}{2}\right] = -(-1)^a.$$

This shows that the numerator remains unchanged, while the denominator has the sign opposite to that of $x' - x_0$.

Therefore, *when* $a = 4N + 1$, and $o < b < 1$,

$$\frac{f(x') - f(x_0)}{x' - x_0} = (-1)^a (ab)^m \left(\frac{2}{3}\eta + \varepsilon\frac{\pi}{ab - 1}\right),$$

where $\eta > 1$, and $-1 < \varepsilon < 1$.

$$\frac{f(x'') - f(x_0)}{x'' - x_0} = -(-1)^a (ab)^m \left(\frac{2}{3}\eta_1 + \varepsilon_1 \frac{\pi}{ab - 1}\right),$$

where $\eta_1 > 1$, and $-1 < \varepsilon_1 < 1$.

Then if we choose a and b such that $\frac{2}{3} > \frac{\pi}{ab-1}$, these two ratios have opposite signs, and when m increases indefinitely, *i. e.*, when $x' - x_0$ and $x'' - x_0$ approach zero, each becomes infinite.

Therefore, under the conditions,

1) $a = 4N + 1$, (N being an integer),

2) $o < b < 1$,

3) $\frac{2}{3} > \frac{\pi}{ab-1}$, or otherwise stated, $ab > 1 + \frac{3}{2}\pi$, the function $f(x) = \sum_{0}^{\infty}{}_n\, b^n \sin a^n x\pi$, has neither a definite finite nor infinite derivative.

The nature of the graph of this function can be best studied by writing the function thus:

$$f(x) = \sum_{0}^{\infty}{}_n\, b^n \sin a^n x\pi = \sin x\pi + b \sin ax\pi + b^2 \sin a^2 x\pi + \ldots + b^n \sin a^n x\pi + \ldots$$

The graph of each term of this summation differs from that of the ordinary sine function only in wave length and amplitude. We can approach as nearly as we please to the graph of the function $f(x)$ by adding the ordinates of a sufficient number of terms of the summation.

Since $\sin x \leq 1$, and $o < b < 1$, we can easily find the maximum of the function,

$$f(x) \leq 1 + b + b^2 + b^3 + \ldots + b^n + \ldots = \frac{1}{1-b}.$$

The maximum given by the terms after

$$b^{n-1} \sin a^{n-1} x\pi \text{ is } b^n + b^{n+1} + \ldots = \frac{b^n}{1-b}.$$

With this data, although we cannot make a graph of the complete function, we can enclose a region in which it must lie.

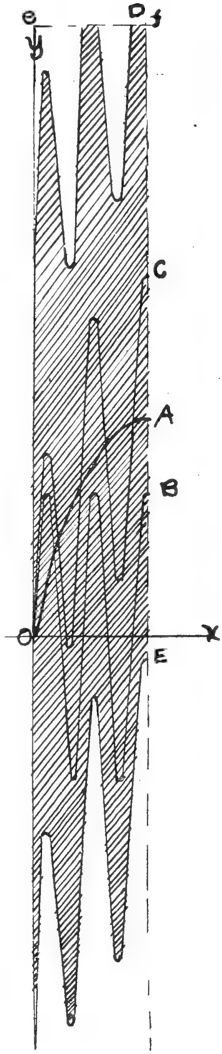
In the accompanying drawing, $a = 9$, and $b = .64$.

The ordinates of the graph (A) of $\sin x\pi$ and (B) of $b \sin ax\pi$ are added to form the graph (C) $\sin x\pi + b \sin ax\pi$. The maximum given by the other terms is $\frac{b^2}{1-b} = 1.13 + .$

The graphs D and E are formed respectively by adding and subtracting from the ordinates of C, the maximum of the remainder, 1.13. It is evident that the graph of the complete function must lie between these two curves. Further, since the maximum of the complete function is

$$\frac{1}{1-.64}=2.8-,$$

we can limit this region still more by a line (ef) whose equation is $y=2.8$.



Discussion. It is well to notice some peculiar facts about this function and the proof.

1. All the conditions placed upon a and b, excepting that

$$o < b < 1,$$

are sufficient conditions, nothing having been said about their being necessary conditions. This is important because, since it is true, it may be possible to show that some of the restrictions are unnecessary.

2. This type of function differs from ordinary functions not in having points at which no derivative exists; such functions are common, and such points are called cusps; but in this function every point has this property, that is, we may think of the curve as made up of nothing but cusps.

3. $x''-x'$ is always equal to $\frac{2}{a^m}$.

This is a restriction on the nature of the increments of the variable used in determining the derivatives. Wiener shows that by placing different restrictions on $\triangle x$ we get different results. His discussion of Weierstrass's Function is important in that it shows that our conclusions regarding the derivative depend entirely upon how we choose the increment on x. This is a very peculiar property of the function.

Wiener's results for the cosine function can be developed for the sine function, with the same change in the restrictions as was needed to give Weierstrass's proof of the sine function.

8. The Derivation of Poisson's Equation by Means of Gauss's Theorem of the Arithmetic Mean.

By Kenneth P. Williams, A. M.

The equation

$$\triangle V \equiv \frac{\partial^2 V}{\partial x^2} + \frac{\partial^2 V}{\partial y^2} + \frac{\partial^2 V}{\partial z^2} = -4\pi\rho,$$

where V is the Newtonian potential function and ρ the density of the distribution, has been the subject of investigation by different mathematicians since it was first given by Poisson in 1813.

The proofs of this equation that are usually met with in treatises on the potential function can be divided into three classes: (1) proofs depending on a particular case, (2) proofs by the aid of Gauss's theorem of the integral of the normal component of the force over any closed surface, (3) proofs by direct differentiation of the integral giving the potential.

It is the purpose of this discussion to review briefly these methods and to give a proof depending on Gauss's theorem of the arithmetic mean of the potential over a sphere.

I.

1. **Proofs depending on a particular case.** The characteristic of this method is that the potential of a distribution of some special form is actually calculated, after which it is possible to find the desired second derivatives. Historically, Poisson's proof was of this nature.

The special distribution selected is that of a sphere of constant density ρ. It can easily be shown that at an interior point

$$\frac{\partial^2 V}{\partial x^2} = \frac{\partial^2 V}{\partial y^2} = \frac{\partial^2 V}{\partial z^2} = -\frac{4}{3}\pi\rho,$$

whence,

$$\triangle V = -4\pi\rho.$$

The general case is now treated by dividing the distribution into two parts, a small sphere enclosing the point in question, and the portion outside this. The latter by Laplace's equation contributes nothing to $\triangle V$. We have then merely to find $\triangle V_1$, where V_1 is the potential due to the matter within the sphere. In case the distribution is such that the density can be said to be constant as this sphere becomes smaller and smaller we can apply the result obtained for a homogeneous sphere and we have immediately

$$\triangle V = -4\pi\rho,$$

where ρ is the density at the given point.

Proofs of this nature are given by Green[1], Price[2], and Routh[3].

2. **Proofs by means of Gauss's theorem.** One of the simplest ways of proving Poisson's equation is that due to Stokes[4]. It is based upon the theorem due to Gauss, that if V is the potential and S any closed surface, then

$$\iint_S \frac{\partial V}{\partial n} ds = -4\pi M,$$

where n is the exterior normal, and M the mass within the surface.

When applied to a rectangular parallelopiped with edges dx, dy, dz, Gauss's theorem becomes

$$\left(\frac{\partial^2 V}{\partial x^2} + \frac{\partial^2 V}{\partial y^2} + \frac{\partial^2 V}{\partial z^2}\right) dx.\, dy.\, dz = -4\pi\bar{\rho}\, dx.\, dy.\, dz,$$

where $\bar{\rho}$ is the average density. Now letting the parallelopiped become infinitely small, and dividing by $dx.\, dy.\, dz$, we find,

$$\triangle V = -4\pi\rho,$$

where ρ is the density at the point around which the parallelopiped vanishes.

This proof is given by English and American writers[5].

If in connection with Gauss's theorem we use the modified form of Green's theorem that

$$\iiint_T \triangle V d\tau = \iint_S \frac{\partial V}{\partial n} dS,$$

where T represents the volume enclosed by the surface S, and n is the exterior normal, we have a simple means of proving the theorem, which is given by Webster[6] and Peirce[7].

3. **Proofs by direct differentiation.** Proofs of this nature are given by the German and French writers. They show rigorously the

[1] George Green, *Mathematical Papers*, p. 20.

[2] Bartholomew Price, *Infinitesimal Calculus*, Vol. III, p. 320.

[3] E. J. Routh, *Analytical Statics*, Vol. II, Art. 80.

[4] George Stokes, *Cambridge and Dublin Mathematical Journal*, Vol. IV, p. 215.

[5] B. O. Peirce, *Newtonian Potential Function*, p. 61; A. G. Webster, *Dynamics of a Particle and of Rigid Elastic and Fluid Bodies*, p. 361; E. J. Routh, *Analytical Statics*, Vol. 2, Art. 83; Bartholomew Price, *Infinitesimal Calculus*, Vol. III, p. 328.

[6] Webster, *Dynamics*, p. 360.

[7] Peirce, *Newt. Pot. Funct.*, p. 66.

conditions that must be satisfied by the density in order that Poisson's equation should hold. The proofs given by Dirichlet[8], Poincaré[9] and Wangerin[10], assume that the density has finite first derivatives. Dirichlet really proves that Poisson's equation is true at the center of a sphere of variable density if the density satisfies the above condition. By surrounding any point of a given distribution with a sphere and making use of Laplace's equation for the matter outside this, Poisson's equation is seen to be true at all points. Later proofs by Hölder[11], Morera[12], and Petrini[13], have lessened the conditions that must be imposed upon the density.

II.

Proof by Gauss's theorem of the arithmetic mean. This theorem, which is made the basis of the following proof of Poisson's equation, states that: *The average value of the potential function on the surface of a sphere is the same as the value at the center of the sphere if the matter is without the sphere, and if the matter is within the sphere it has the same value that it would have if all of that matter were concentrated at its center.*

This theorem can be established without the use of Gauss's theorem of the integral of the normal component of the force over a closed surface by direct integration[14].

To apply the theorem, take the point in question as origin, O, and develop the potential by Taylor's theorem. We have then that in the vicinity of O,

$$V - V_o = \Sigma x\left(\frac{\partial V}{\partial x}\right)_o + \frac{1}{2}\,\Sigma x^2\left(\frac{\partial^2 V}{\partial x^2}\right)_o + \Sigma xy\left(\frac{\partial^2 V}{\partial x \partial y}\right)_o + \ .\ .\ .\ .$$

where the subscript O means evaluation at the origin.

About O construct a small sphere of radius R and integrate the value of $V - V_o$ over its surface, giving

$$\iint(V - V_o)dS = \Sigma\left(\frac{\partial V}{\partial x}\right)_o \iint x\,dS + \frac{1}{2}\Sigma\left(\frac{\partial^2 V}{\partial x^2}\right)_o \iint x^2 dS + \Sigma\left(\frac{\partial^2 V}{\partial x \partial y}\right)_o \iint xy\,dS$$
$$+ \ .\ .\ .\ .\ . \qquad (1)$$

[8] P. Lejeune-Dirichlet, *Vorlesungen über die im umgekehrten Verhältnis d. Quadrats d. Entfernung wirkenden Kräfte, hrsg. v. F. Grube*, 1887, §6.

[9] H. Poincaré, *Théorie du Potentiel Newtonien*, p. 88.

[10] A. Wangerin, *Theorie des Potentials und der Kugelfunktionen* I, p. 73.

[11] O. Hölder, *Diss. Tübingen*, 1882, p. 10.

[12] G. Morera, *Lomb. Ist Rend.* (2) Vol. 20, p. 302.

[13] H. Petrini, *K. Vet. Akad. Oefvers. Stockholm*, 1899; *Acta Mathematica*, Vol. 31, 1908, p. 127.

[14] Peirce, *Newt. Pot. Funct.*, p. 68. Peirce shows it by direct calculation only for the case of exterior matter. A mere change in limits will make his same integral apply to interior matter.

By symmetry,

$$\iint x\,dS = \iint y\,dS = \iint z\,dS = \iint xy\,dS = \iint xz\,dS = \iint yz\,ds = 0,$$

and

$$\iint y^2 dS = \iint z^2 dS = \iint x^2 dS.$$

By calculation, we find

$$\iint x^2 dS = \frac{4}{3}\pi R^4.$$

Let $\overline{V}$ be the average value of V on the sphere, then we have on substituting in (1),

$$4\pi R^2(\overline{V} - V_0) = \frac{2}{3}\pi R^4\left(\frac{\partial^2 V}{\partial x^2} + \frac{\partial^2 V}{\partial y^2} + \frac{\partial^2 V}{\partial z^2}\right)_0 \cdots\cdots \quad (2)$$

where the terms that are omitted contain powers of R higher than the fourth.

To calculate the quantity $\overline{V} - V_0$, let V_1 be the potential at O due to the matter outside the sphere, and V_2 the potential due to the matter within. As the sphere becomes smaller the density approaches its value ρ_0 at the center, if the density is continuous. Therefore,

$$V_0 = V_1 + V_2 = V_1 + \int_0^R 4\pi\rho_0 r\,dr = V_1 + 2\pi\rho_0 R^2.$$

and

$\overline{V}$ = (average value on the surface due to the matter without) + (average value on the surface due to the matter within). Or, by applying Gauss's theorem of the arithmetic mean,

$\overline{V}$ = (potential at O due to matter without the sphere) + (potential on sphere if all the matter within were concentrated at the center)

$$= V_1 + \frac{4}{3}\pi\rho_0 R^2.$$

Hence

$$\overline{V} - V_0 = \frac{4}{3}\pi\rho_0 R^2 - 2\pi\rho_0 R^2 = -\frac{2}{3}\pi\rho_0 R^2.$$

Substituting in (2), we have

$$-4\pi\rho_0\frac{2}{3}\pi R^4 = \frac{2}{3}\pi R^4\left(\frac{\partial^2 V}{\partial x^2} + \frac{\partial^2 V}{\partial y^2} + \frac{\partial^2 V}{\partial z^2}\right)_0 + \text{terms above } R^4.$$

Whence, dividing by $\frac{2}{3}\pi R^4$, dropping subscripts and the terms in R, we have in the limit

$$\frac{\partial^2 V}{\partial x^2} + \frac{\partial^2 V}{\partial y^2} + \frac{\partial^2 V}{\partial z^2} = -\ 4\pi\rho.$$

For an outside point (2) gives us Laplace's equation, for in that case,

$$V - V_0 = V_1 - V_1 = 0.$$

The method that has been used above for deriving Poisson's equation for the Newtonian potential can be applied to the case of the logarithmic potential by developing over a circle instead of a sphere.

After Poisson's equation has been derived as indicated, Gauss's theorem of the integral of the normal component of the force follows immediately on the application of Green's theorem.

In developing the Newtonian potential it is customary to derive as one of the first examples the potential due to a homogenous spherical shell both at an exterior and interior point. The integrals involved in this are of precisely the same form as those referred to above in deriving Gauss's theorem of the mean. The latter theorem is therefore really shown at an early stage in the subject. The above method then gives Poisson's equation, and with the aid of Green's formula, Gauss's theorem of the normal component of the force. This order of developing the subject is the reverse of the order generally given in American texts.

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INDIANA UNIVERSITY STUDIES

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INDIANA UNIVERSITY STUDIES

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Prefatory Note

The main purpose of the INDIANA UNIVERSITY BULLETIN is the publication of the official statements of the various subdivisions of the University, including their announcements of courses. From time to time this publication has further been used to present addresses given at the University, educational studies which are of value to teachers of the State, and other matters which may interest the University alumni and its patrons.

This issue of the BULLETIN comes under a sub-series known as the 'University Studies', in which from time to time are published some few of the contributions to knowledge made by instructors and advanced students of the University. At present not more than two or three such numbers are issued a year, but ultimately the scope of the work, it is hoped, may be enlarged. The 'Studies' are continuously numbered, and, as needed, a title-page and table of contents will be issued, for binding them up in volumes. For information concerning these 'University Studies' address

THE EDITOR OF PUBLICATIONS,
Indiana University,
Bloomington, Indiana.

NOTE

Each of the following studies was originally prepared as a Master's thesis in the Department of Economics and Social Science. Although five years have intervened since Mr. Lockhart's research was made, it is believed that the results obtained fairly represent the conditions now prevailing in the stone industry. In connection with the investigation of which Mr. Adams' paper treats, special acknowledgment is due the Charity Organization Society of Indianapolis, and particularly its General Secretary, Mr. C. S. Grout.

U. G. Weatherly.

9. The Oölitic Limestone Industry of Indiana.

By Oliver C. Lockhart, A.M., Assistant Professor of Economics in Ohio State University; late Assistant in Economics and Social Science, Indiana University.

Introduction. The oölitic limestone industry of Indiana is not only one of the important industries of the State, but, owing to its localization in a comparatively small region, it presents a degree of uniformity in its various features which affords unusual opportunities for a concrete study of industrial conditions. These facts furnish the motive for this paper.

The present study is by no means exhaustive in scope, but attempts only to describe the more important features of the industry. Throughout, emphasis has been laid upon the production of oölitic stone as a building material, which is the fundamental fact in the entire industry. The treatment of the various phases of the industry has at all times been narrowly limited by the insufficiency of data.

The difficulties encountered in the present study have lain primarily in the collection of material. No systematic study of the industry as a whole has ever before been attempted, though the reports of the Indiana Department of Geology have contained some excellent sketches and studies of the industry from the geological and commercial points of view. Hence the greater part of the paper is based upon the results of personal investigation among men actually engaged in the industry. Not only is it often difficult or even impossible to obtain information from such sources, but such as is obtained is not always free from personal color. However, it is a pleasure to record that the employers and men were as a rule found to be courteous and affable; and it is felt that the views of those most competent to speak concerning the industry have been obtained. It is, therefore, hoped that this paper will prove both of interest and of value to the student of industrial conditions as well, perhaps, as to the general reader. It is but just to add that the writer owes much to the kindness of friends engaged in the industry, without whose assistance the study could hardly have been concluded.

The printed materials used in the preparation of this paper are almost without exception official documents. The greatest aid was derived from the Annual Reports of the Indiana Department of Geology and Natural Resources. For statistical information the Biennial Reports of the Indiana Bureau of Statistics, the Annual Reports of the Indiana Department of Inspection, and the reports on Mineral Resources of the United States, issued by the United States Department of Geology, have been of service. The Fourth Annual Report of the Indiana Labor Commission has been of great value in the preparation of the sections on the unions and the Bedford strike of 1903.

The Bedford Oölitic Limestone.[1] The Bedford oölitic limestone[2] occurs in a sinuous band from two to fourteen miles in width, extending from Montgomery County south to the Ohio River and beyond, outcropping in Indiana in the counties of Montgomery, Putnam, Owen, Monroe, Lawrence, Washington, Floyd and Harrison. It does not occur in commercial quantities north of Gosport, and the productive area is now within the counties of Owen, Monroe and Lawrence; although some stone, chiefly for lime burning, is quarried at Salem, Washington County. Beginning on the north, the first region of production is at Romona in Owen County; the next, at Stinesville, Ellettsville and the Hunter Valley district in the northern portion of Monroe County, and the active quarries at Clear Creek, Sanders, Smithville, Victor and Harrodsburg in the southern portion; the productive area in Lawrence County is in and immediately around Bedford, at Oolitic, Dark Hollow and Reed.

The oölitic limestone is a remarkably pure carbonate of lime, a sort of calcareous sand rock. The grains have the shape of the fish roe, whence the name oölitic, and are made up of shells and shell fragments, mostly foraminifera and bryozoa, upon whose size the coarseness or fineness of the stone depends. The grains are cemented together with calcite, whose relative amount and purity determine the hardness and compactness of the stone.

Geologically the stone belongs to the lower carboniferous age. It is of sedimentary character, and was doubtless deposited in the deep trough of the great inland sea which then covered the larger part of the Mississippi Valley. Yet it is remarkably free from bedding planes, although the deposits vary from a few feet to one hundred feet in thickness. The stone seems to occur in practically inexhaustible quantities.

The Bedford stone has an enviable reputation for building

[1] The material for this section is drawn largely from the annual reports of the Indiana Department of Geology and Natural Resources, especially from the study by Hopkins and Siebenthal in the Twenty-first Annual Report.

[2] The Bedford oölitic limestone is the term which best describes geologically that formation which is more popularly known as the Bedford stone or the Indiana oölitic stone.

purposes all over the United States, and considerable quantities are shipped to foreign countries. Chief among the reasons for this extended use is the fact that it is easily worked. Occurring in large masses, it can be quarried in blocks of almost any required dimensions; and its freestone nature adapts it especially well to cutting and carving. Probably no other building stone quarried in this country is so well adapted to carving. Like most stones, it is much less easily worked after seasoning.

The color of the stone is regularly either blue or buff. Both occur even in the same quarry, and the line of cleavage between them is very irregular, so that a considerable quantity of "mixed" stone either is waste or is sold at low prices for rough work. The buff stone is supposed to be the product of the oxidation of the iron and organic matter in the blue, a process that is carried on chiefly by the oxygen in solution in the meteoric water. The oxidation sometimes extends to the depth of the deposits, sometimes only a few inches, since the circulation of the water is not equal in all parts of the stone. The difference between the colors is naturally more marked in large blocks than in small pieces, and is more pronounced after seasoning. Either the buff or blue from any one quarry is remarkably uniform in shade, and is quite generally free from patches, streaks, or stains of other colors; and this uniformity is an additional cause for the popularity of the stone.

In texture there are even greater variations than in color, yet, as a rule, the coarser fossils are clustered, and not scattered indiscriminately throughout the bed, so that the separation of the finer stone, which is more desirable commercially, is not difficult.

Durability, unfortunately, is not always a quality of what is often considered good building stone. The Indiana oölitic stone, however, appears to have a high average durability, evidences of which may be seen in the bold cliffs and smooth faces on many outcrops; in the sharp corners, square blocks and faces of old quarries; in the condition of a number of old buildings which have stood for a half century or more; as well as in chemical and physical tests. Some of the earliest uses of the stone were in the foundation of the courthouse at Bloomington, and in the stone chimney on the Dr. Foote homestead near Bedford. Here the stone, after an exposure lasting through two generations or more, is still in good condition.

The accessibility of the oölitic stone plays a large part in its extended use. It lies near the surface, and for the most part but a few feet of overlying dirt and stone need to be removed. In some cases, however, the layer of hard top is so thick and increases the cost of stripping so greatly as to result in the abandonment of the opening. The slight southwesterly dip is so gentle as to make the work of quarrying quite easy. Furthermore, the location of the quarries in the midst of a populous district with good transportation facilities makes it possible to put the stone on the market at a moderate price.

Though the importance of the oölitic stone industry depends upon the use of the stone for building purposes, it is well adapted to various other uses. Considerable quantities are used for monuments and for ornamental work, for which use it is adapted because easily worked. A large amount of it is sold for flagging and curbing, and it is used quite generally in the region of its occurrence for road-metal and riprap. Its high degree of purity fits it especially well for the making of a pure lime, for Portland cement and for flux for furnaces, but its use for these purposes is in a large part dependent upon the quarrying for building purposes; for it is generally the stone rejected for the chief use which is utilized for the other purposes.

The manufacture of lime, however, has some claim to be considered a separate industry. Before the development of transportation facilities, lime for local use was commonly burned throughout the oölitic belt, and abandoned kilns may still be seen near Romona, Ellettsville, Bloomington and Bedford.[3] The oölitic stone is now quarried for lime-burning only at Salem, where, it is said, lack of railway competition[4] and the necessity of transferring the stone to the east and west lines[5] render freight rates so high as to make the quarrying of building stone unprofitable, although the Salem stone is of good quality and formerly had a rather extended use. The waste from the quarries of the Perry-Matthews-Buskirk Stone Company, located near Bedford, is manufactured into lime by the Horseshoe Lime and Cement Company, a firm wholly independent of the quarrying company, whose advantage in the arrangement is the getting rid of the troublesome piles of waste.

The lime from these kilns is a ''hot'', quick-slaking lime, very pure in composition. That from the Salem kilns is used chiefly for mortar and plaster, but large quantities are used also in tan-

[3] Ind. Geol. Report, xxviii, 219, 254.
[4] Ind. Geol. Report, xxvii, 104.
[5] Ind. Geol. Report, xv, 146.

neries and paper mills[6]; that burned at Bedford is used mainly by the chemical trade.[7] The lime is not barreled, but is shipped wholly in bulk.

In view of the occurrence in the State of so much limestone that is well suited for the production of lime, it may be doubted whether lime-making from the oölitic stone is destined to become an important independent industry, but the fitness of the stone for the production of a high-grade, chemically pure lime seems sufficiently demonstrated, both theoretically and practically, to make lime-burning a profitable means of the utilization of waste in the future.[8]

The suitability of the Indiana oölitic limestone for the manufacture of Portland cement has frequently been shown by chemical analyses and chemical tests. The stone must be ground much finer than the natural Portland cement stone[9], such as that found in the Lehigh Valley region, in order to secure the proper mixing of the ingredients; but when first quarried the oölitic is soft and yields readily to grinding. The difficulty has been to find a suitable clay to mix with the stone. However, the oölitic belt adjoins the coal-bearing counties to the west, where not only suitable shales and clays but also fuel may be had abundantly and cheaply, and it seems quite reasonable to expect the development of this industry in the not distant future.[10]

In 1900 the Bedford Portland Cement Company was organized and purchased a tract of land near Bedford upon which occurs oölitic stone, common clay and kaolin. Samples of these materials were submitted to chemists and cement experts, whose reports indicated the fitness of the stone and clay for the manufacture of a high grade of Portland cement.[11] However, the enterprise did not prove successful until recently. The company is now using a shale found a few miles southeast of Bedford, and is producing daily about fourteen hundred barrels of cement of a good quality.[12]

[6] Ind. Geol. Report, xxviii, 250.

[7] *Ibid.*, p. 256.

[8] Ind. Geol. Report, xxviii, 256, 257. But compare also, xxi, 17.

[9] Ind. Geol. Report, xxv, 11.

[10] *Ibid.*, p. 330.

[11] Ind. Geol. Report, xxv, 328, 329.

[12] A description of the plant of the Lehigh Valley Portland Cement Company, located at Mitchell, is omitted from the text, because, contrary to popular belief, the stone used by this concern is not the Bedford oölitic limestone, but an overlying stone known as the Mitchell limestone. This is in some places as truly oölitic as the Bedford stone, but is distinguished from it by the character of fossils and by a peculiar form of weathering (Ind. Geol. Report, xxi, 299). The Mitchell plant has been quite successful. It employs about four hundred men, and produces about two thousand barrels of cement daily.

Development of the Industry.[13] Data are not available for an adequate sketch of the early history of the oölitic stone industry. One of the first uses of the stone was in the foundation and the window sills of the Monroe County Court House, begun in 1819. The stone was hauled eight miles to the site of the building, and there erected upon stone of the same kind and of equally good quality. Among the earliest quarries was that of Richard Gilbert, opened near Stinesville in 1827. The stone was then used chiefly for bridge work, and was comparatively unknown outside the region of its occurrence. In 1853 the Erving Quarry near Bedford furnished the stone for the United States Custom House in Louisville. About the same time Messrs. Biddle and Watts, of Pennsylvania, established near Stinesville a plant upon what was then considered a large scale. In the northern district, however, the Ellettsville field seems to have had the longest continuous history, for there in 1862 John Matthews & Sons opened a quarry that is still in operation.

In the early period the quarrying was all done by blasting, and the sawing by hand. The industrial revolution of the stone industry came with the construction of the Monon Railway and the introduction of the steam channeler. The first of these machines operated in the oölitic belt was installed in 1877 by John Matthews & Sons.

From this time on the quarrying and dressing of oölitic stone assumes the dignity of a regular industry. About 1879 the large Hoosier quarry was opened near Bedford, and within the next decade most of the more important quarries of that region were opened. In the Bloomington district, the development of the Clear Creek region began in 1888, while the Hunter Valley quarries were not opened until 1891. The quarries near Salem, important in the earlier period, are not now operated for building stone.

As has been suggested, the development of the oölitic stone industry is intimately connected with the development of transportation facilities. The Monon Railway was the pioneer in reaching the stone belt. The New Albany & Salem Railroad, as it was then called, was built as far as Bedford in 1852, and was extended through Monroe County in 1854. Through Washington, Lawrence and Monroe counties, quarries were opened as needed for bridge work and ballast along the line of the railway,

[13] The data for the historical part of this section are chiefly derived from the Twenty-first Indiana Geological Report.

and the railway company's quarry near Stinesville furnished stone for the bridges along the northern portion of the line. The Romona district was given commercial importance by the building of the Indianapolis and Vincennes Railway in 1870. In 1876 the region northwest of Bedford was opened up by the building of the narrow gauge Bedford and Bloomfield Railroad, now a branch of the Monon and of standard gauge. More recently the Baltimore and Ohio Southwestern and the Southern Indiana railways have entered the southern portion of the stone belt. The building of the Bedford Belt Railway in 1892 was of material benefit to the industry in Lawrence County. Built by the Bedford Quarry Company, it has since been organized separately as the Bedford Belt Railway Company, and has connections with all the railways entering Bedford and with many of the quarries in that vicinity. The Indiana Stone Railway, a branch of the Monon, connecting Clear Creek Station and Harrodsburg, was built in 1899, and has rendered accessible a linear extent of fifty miles of the stone bearing ledge.[14]

The following table gives the figures, so far as they are ascertainable, for the oölitic production since 1860. They are incomplete, it is true, but care has been taken in selecting them, and it is believed they are fairly accurate for the years included. The figures for capital invested, as recorded in official reports, are manifestly incorrect, and have been rejected for that reason. In 1904, thirty-seven establishments reported 2,797 men in their employ. Of these about sixty per cent. are employed in the Bedford district.

	Product.	
Year.	*Cubic Feet.*	*Value.*
1860	....	$64,000
1870	....	372,000
1877	341,055	....
1878	421,575	....
1879	443,520	141,850
1881	651,200	....
1882	579,109	....
1883	980,598	....
1884	869,695	....
1887	2,360,000	....
1889	....	913,530
1892	3,924,000	892,714
1894	4,580,418	1,154,246
1895	5,368,307	1,523,260
1896	5,455,582	1,209,632

[14] Ind. Geol. Report, xxv, 391.

Year.	Product. Cubic Feet.	Value.
1897	5,382,589	1,344,158
1898	5,630,046	1,389,204
1899	7,128,121	1,646,501
1900	7,035,000	1,699,649
1901[15]	....	2,123,237
1902[15]	....	1,813,577
1903[15]	....	1,880,561

Methods of quarrying have radically changed in the oölitic stone belt within the last generation. Blasting, formerly almost the only means of getting out the stone, is now used only in rock stripping, *i. e.*, in clearing off the hard limestone which may overlie the oölitic, or in quarrying stone for lime and cement. After the surface of the oölitic stone has been uncovered, the channeler is put to work. This machine is a small locomotive running back and forth on a portable track, carrying a gang of chisels on one or both sides. The first block, thus channeled loose on four sides, is got out in the easiest way possible. The others, and they may be very long, are wedged loose at the bottom by plugs and feathers or simple wedges driven in holes made by the steam drill. The block is then pulled over on its side by the derrick, and is broken into approximately the required dimensions by drilling and wedging. The blocks are then ready to be sent to the mill, where they are sawed, planed, or turned, as may be required.

The machinery used in the quarries consists of channelers, drills, derricks and hoists, with engines and perhaps an air compressor. In the mills are required derricks or overhead travelers, saw-gangs and appliances, planers, jointers and lathes. The wire saw or cable channeler is used in some places. The power used may be steam, compressed air, or electricity.

Though the machinery is constantly being improved, its general character has not changed within recent years. The diamond saw is the most important exception to this rule. This saw may consist of a heavy steel blade, much on the order of the ordinary saw, but having the edge set with black diamonds; or if of the newer pattern, it may be circular. With the old gang-saw, which is still by far the most commonly used, sand and water must be continuously fed; the diamond saw requires no abrasive. Its rate of cutting is much faster than that of the old

[15] For these years the figures are for that part of the limestone produced in Indiana which is used for building stone, and are approximately correct for the oölitic production.

saw, and its use is said to have reduced the cost of production materially. It is primarily adapted for cut stone work, and can be profitably used only in those mills which do a considerable amount of such work.

More important are the changes in the kind of power used. At first everything was done by hand with great labor. Nowadays, the hand work is usually confined to the clearing up of spalls and dirt, occasionally also to stripping or a part of it, and to the scabbling, or rough squaring of the blocks with a sort of pick. Steam, for a long time the only power used, is now being in part supplanted in many quarries and mills by compressed air and electricity. Electricity is very generally employed as the motive power in the overhead travelers or cranes. Compressed air is being used in place of steam in the drills and channelers, and where applied has saved the service of one man on each channeler, has reduced the amount of coal required, and has tended to lessen the responsibility and at the same time the wages of the machine runner.

The introduction of improved machinery, while decreasing the cost of production, has not had the effect on labor usually observed in such cases, owing to the normal scarcity of labor in the oölitic district. So far as is known, the introduction of improved machinery has in no case resulted in non-employment, but the labor thus supplanted has almost immediately been reabsorbed into the industry.

Commercial Features of the Industry. The forms of business organization in the oölitic limestone industry roughly register its growth from a small, local industry to one of national importance. Until within the last two decades, perhaps, during which the industry has attained its real importance, the individual or partnership type of organization was practically universal. Gradually the inefficient companies have been weeded out, while the more efficient ones, almost without exception, have been incorporated. Today only one or two of the firms actually engaged in the industry are not incorporated.

The conditions of the quarrying industry are such as to give some special advantages to the large producer. Often there are slight variations in the texture of the stone at different levels; and the large concerns, operating several openings in the same bed, may quite readily secure stone of uniform texture for a particular contract. Thus they have an important advantage in handling large or rush orders. The ordinary advantages of large scale production, such as economy in the use of capital and labor, and in management, are generally secured. However, the large companies do not make the most of their opportunities in the way of utilization of waste material, probably largely because competition has not yet forced them to do so.

It is natural, therefore, that production on a large scale should be increasing. There are as yet no great corporations seeking a monopoly of the oölitic business, though an abortive attempt at monopoly appears to have been made by Mr. John Crofton during the period of industrial depression from 1894 to 1897. Nor would it appear that such a monopoly would be especially profitable, owing to the great variety of building materials and the resulting variability in the demand for the stone. There is, however, a considerable complexity of interests—one man often owning stock in a number of companies—a fact which may be supposed to exert some tendency toward a further consolidation. There is at least one case in which four companies, supposedly separate, have a unified control. Generally, however, the large companies are nominally, as well as in fact, single concerns.

The smaller companies may be grouped roughly into two classes: (1) those which have been in the field for some time, and whose manager is usually a practical quarryman and one of the chief stockholders; and (2) those newer companies, rather more speculative in character, whose stockholders have little or no technical knowledge of the business, and generally hire uninterested managers.

It would appear that companies of the second class have not, on the whole, been so successful. Often they have not the advantage of being directed by a personally interested manager, nor are they able to pay the high salaries necessary to secure the most efficient superintendents. Sometimes the failure of these companies is directly traceable to poor management; in other cases the cause of failure is less easily found. A comparison of wage scales shows some variations in the rates of pay in the same region, but the variations appear to be about as frequently in favor of the small companies as the contrary. It is possible that the smaller firms have been discriminated against by the railways, but this does not seem to be generally true at present.

Doubtless the most common cause of the failure of such companies is insufficient capital. Usually the shares issued by them are non-assessable, and the capital is small. What surplus funds there are after the purchase of land and machinery are soon tied up in wages and unsold product. Stockholders of such companies are as a rule slow to see the wisdom of investing more to gain the larger reward. This lack of funds often prevents the opening of other deposits of stone which may be of a more salable quality; and thus the operations of a company are often crippled and not infrequently it is forced to suspend its activity altogether. Moreover, the small concerns seldom operate mills, and must either refuse orders for sawed stone or depend upon other mills for their sawing, paying freight charges to the mills and taking chances of costly delays during the busy season.

The advantages of large companies over small ones engaged in the industry are thus by nature considerable, and many producers are inclined to think that a company having, say, a financial backing of less than one hundred thousand dollars has very much smaller chances of success than the larger ones. There is no effort on the part of the large producers to crowd out the small ones; economic forces take care of that, and the future is likely to see the oölitic field in the possession of a group of large producers, though the possibilities of monopoly appear slight.[16]

The methods of capitalization in the oölitic stone industry vary considerably, owing to the circumstances of organization. In companies of small capital the stock is often full-paid, and both land and machinery are purchased directly with funds thus secured. Other small companies capitalize rather highly, but retain a considerable portion of their stock as so-called treasury stock, or require only a percentage of the face value of the shares to be paid in cash. This plan appears to work better than the former, since it gives the company a means of extending its operations through the sale of the unissued stock or the calling for further payments on shares. The land of these companies may be purchased with stock, but is not as a rule greatly overvalued. Many companies, however, are over-capitalized through the appraisement of their

[16] Just as the above lines go to press, there comes to hand information concerning the union of two of the largest companies in the oölitic field with a large firm operating in the Cleveland sand stone district. The Cleveland Stone Company, now the biggest corporation of its kind in America and probably in the world, has purchased from the receivers the Bedford Quarries Company, formerly controlled by John R. Walsh. The new purchase is to be financed through an issue of $1,500,000 six per cent joint bonds of the Cleveland Stone Company, the Bedford Quarries Company, and the Perry-Mathews-Buskirk Quarries, which were acquired by the Cleveland concern about a year ago. See *Ohio Journal of Commerce*, November 12, 1910.

land at a fictitious value, and in this way promoters derive their profits. This plan is followed by many small companies, as well as by larger ones. How much "water" is in this way introduced into the stock of some of the companies cannot, of course, be definitely ascertained, but it is comparatively small as compared with large corporations in other lines of industry. For an example, there may be cited the case of a company whose land, probably worth thirty thousand dollars at a good price for undeveloped stone land, was purchased from the promoter at seventy-five thousand dollars in stock. It is to be remembered, however, that the value of the property is greatly increased by development; and in many cases an initial over-capitalization has been wiped out by a real increase of the value of the property. There are, on the other hand, a few cases in which the actual amount of money invested has been increased without a corresponding increase in capitalization.

The methods of business management vary widely, yet a certain rough correspondence to the size of the organization can in most cases be traced. The largest companies have their general offices in some large city, usually Chicago, and the local superintendent supervises in the main only the more mechanical part of the business. He is a salaried man, an experienced quarryman, but rarely a stockholder in the concern that employs him. Superintendents of the small quarries are also usually hired servants, and may have charge of the office work as well as of the mechanical work of the quarry. The office work may, however, be done by a member of the company—the president or secretary usually—while the superintendent combines the functions of superintendent and foreman in himself. On the other hand, the superintendent of the middle-sized plant, which may be called the "large concern" as distinguished both from the largest and the small ones, is much more likely to be a member of the corporation, or even its moving spirit. He attends to the office work and has foremen to carry out his orders in the quarry. There is likely to be also a mill superintendent under him, if a mill is operated. It is generally the small quarries organized on this plan, it may be remarked, which have been successful and have frequently entered the list of the middle-sized or large quarries.

Sales of stone are, for the most part, accomplished through stone brokers, only one or two companies in the district maintaining traveling salesmen. These brokers are found in the large stone centers, especially in Chicago, and a few are in the region of production. A broker is not as a rule employed by one concern only, but by several. When a contract for stone is to be let, he distributes specifications to the various companies, who then make their bids. The brokers are paid by commission and handle almost all the sales.

The Bedford stone is of such wide popularity that the industry seldom suffers for want of purchasers. New York City is probably the chief single market for the stone; but many producers consciously seek to broaden their markets, in order that the effect of local conditions may be minimized. For example, the building trades strike of 1903 in New York injured that market during its continuance, and many companies suffered a temporary loss through inability to shift quickly their sales to other markets. Some producers do not cultivate the eastern market at all, preferring to ship their stone west and south and to smaller markets generally, where, as they think, they are not so likely to lose because of local industrial conditions. Chicago is perhaps the chief secondary market for the stone, and serves as the distributing center for the greater part of the entire product. The stone finds purchasers in all parts of the United States and in Canada, and is even shipped to South America.

Transportation rates, so far as is known, have not varied for many years; certainly there has been no change in the past decade. The rates appear to be fair; at least complaints are few, although it is said that the quarries at Salem and Corydon have been forced by high freight rates to suspend operations.[17] The schedule per hundred pounds to the principal markets follows:

New York	28 cents
Chicago	11 cents
Indianapolis	7 cents

It is very difficult to learn whether or not discrimination in rates is practiced. Some of the smaller producers suspect it; the larger ones think there is none of it. That discrimination did exist some years ago, there is little doubt. One producer states that he used to get a sufficient amount in rebates to run his business, but that he can no longer get them. Recently it was rumored that one of the largest concerns was receiving rebates, but an agent of a competing concern made an investigation of the rumor, and satisfied himself that it was false. It seems fair

[17] Ind. Geol. Report, xxvii, 104.

to conclude that discrimination in rates has not recently been practiced.

The same difficulty arises in the question of the distribution and setting of cars. The small producer is likely to think there is discrimination if he does not get cars when he wants them; but in reply it is stated that the railway is perfectly fair in its distribution, although it is natural that the small shipper may often fail to get cars if the supply is less than the demand. It is impossible to ascertain the truth in this matter, but here also the charges of discrimination are much fewer than the denials of it, which at least suggests that it is neither frequent nor flagrant. The fact that some of the railways, through their directors, are interested in a number of the quarries, increases the tendency towards belief in the existence of discrimination of both kinds.

In some respects the oölitic limestone industry presents a peculiarly fertile field in which to apply those economies in the use of material which are so characteristic of modern large-scale industry. Not only does the accumulation of waste stone about a quarry represent a loss in labor and wear of machinery incident to its quarrying, but there is often an absolute loss in the space it occupies. Hence it is that so much stone is practically given away at the quarries, or sold at merely nominal prices which hardly cover the cost of loading. Much stone unsuited for the superstructure of buildings can, of course, be worked into stone for flagging and curbing, but larger quantities are sold at low prices for foundation or bridge work, or for use as riprap, or are crushed for use as road-metal. Of late an increasing quantity has been sold for flux in iron furnaces. For this purpose the stone must be broken into medium-sized spalls, and this means of disposing of the waste often affords a slight profit over the cost of preparing and loading. However, only furnaces having direct railway connections with the stone belt can purchase the waste for this use. The Illinois Steel Company uses considerable quantities of it, and then works the slag up into a sort of cement.

Very few of the quarry companies have made any attempt to utilize their waste stone in by-products. Some have rock crushers at their quarries. The Bedford Belt Railway was ballasted with stone crushed by the Bedford Quarries Company, and is one of the best ballasted roads in the State.[18] However, the

[18] Ind. Geol. Report, xxi, 336.

plentiful outcrops of other limestone in the oölitic belt, equally suitable for road-metal and similar purposes, render the operation of crushers at the quarries less profitable than it might otherwise be.

That the near future will witness a greater effort for the utilization of waste appears undoubted. The natural conditions of the industry will make for it. Increasing competition and the growth of large scale production normally lead to the fullest possible utilization of materials, and these forces are now making themselves felt in the oölitic field.

At the present time lime-burning seems the most promising method of waste utilization. Most producers say that the lime burned from the oölitic stone is too hot, too quick-slaking, and that its production would be unprofitable, but very few have tried it. The possible reasons why lime-making from the oölitic has been so little attempted have been stated as follows: "1. Freight rates, the cost of bringing in the coal and shipping the lime. 2. A prejudice in the local markets against rich lime. 3. Want of a large market, as the oölitic quarries are situated in the midst of the Mississippi Valley, with large deposits of limestone on all sides. 4. The lack of some enterprising person to push the business into prominence, as all the stone dealers are interested in the sale of building stone and not lime. The last is probably the most important reason."[19]

No quarry is at present burning lime as a by-product. It is said that the Perry-Matthews-Buskirk Stone Company derives no profit from the operations of the Horseshoe Lime Company in their quarries, except the convenience of having their piles of waste kept cleaned up. But the recent success of this company, and the long continued success of lime-burning at Salem point the way to a possible source of profit from material that is now a dead loss, which enterprising producers cannot much longer afford to ignore.

As yet there have been no attempts to manufacture Portland cement as a by-product. However, as the field becomes more fully developed and competition increases, the present wastefulness will undoubtedly be replaced by a more intensive utilization of material, and the development of the manufacture of Portland cement from the waste in the oölitic quarries may confidently be expected.

[19] Ind. Geol. Report, xxi, 337.

Another by-product which is likely to appear in the near future is stone brick, made from the crushed waste. Of recent years sand brick and cement brick have taken their places among the building materials, and experiments are now being made with the manufacture of stone brick from the waste from the mills in New York City. The success of these experiments now seems well-nigh assured, and if they do prove successful, the introduction of the manufacture of stone brick will be only a question of time.

The oölitic limestone industry presents certain profit-determining features peculiar to itself. The depth of stripping has in many cases increased the cost of production so greatly as to result in the abandonment of the particular quarry opening. This is especially likely to occur where the opening is along the side of a rather steep hill, for, as the almost horizontal strata are worked backward into the hill, the stripping becomes deeper and deeper. Those quarries opening on the top of the hill are less likely to incur this difficulty.

There is compensation for this loss, however, in the fact that within certain limits the amount of waste in the quarry is in inverse proportion to the depth of the stripping[20]; for the heavier the stripping the less likely is the disintegration of the good stone due to the percolation of surface waters carrying with them more or less acid. Besides the disintegration of the upper portion of the bed, waste may result from "mixed" stone, from coarseness of texture, from the vertical joint seams, and from the stylolites or suture joints—"crow-feet" or "toe-nails," the quarrymen call them. Ordinary lamination planes are very rare in the interior of the bed, but these extraordinary bedding planes, though nearly horizontal, probably cause more waste than any other structural feature of the stone.[21]

Many other causes contribute to a considerable variation in the rate of profits. Personal relations between employers and workmen occasionally operate to hold wages at a lower level and thus increase profits. Location near the homes of the workmen may give a particular quarry an advantage in labor cost over another, whose employees must use the railway in going to and from their work. In some cases such an adavantage may be partially offset by increased taxation, but not altogether so. It seems, however, that many workmen prefer to live in town rather

[20] Ind. Geol. Report, xxi, 326.
[21] Ind. Geol. Report, xxi, 305.

than in the small quarry settlements, even at the expense of railway charges.

In general it would appear that profits are fair. Some of the smaller companies, it is true, are apparently always on the margin, and frequently such companies are forced to abandon their quarries, or perhaps to sell to some of the larger corporations. During the industrial depression from 1893 to 1897, many small quarries owned by local capital were bought up by capitalists from a distance, and some of the largest companies now operating had their inception at that time. It is said that many of the smaller companies rarely or never pay dividends, but not infrequently this is because earnings are tied up in unsold stock or in improvements. The lack of dividends may thus result from insufficient capital, and does not always indicate the absence of real earning power. On the other hand, a number of men are known to have acquired considerable wealth in the business, and some quarries are now reputed to be making their owners very large profits.

The development of transportation facilities and the improvement of quarry methods and machinery have resulted in a more or less gradual reduction of prices. Before the introduction of channelers in 1877, the stone was all marketed either in rough blocks, or as scabbled to dimensions. The following table shows the prices per cubic foot at various times:[22]

Years.	*Mill Blocks.*	*Scabbled. Dimension Blocks.*	*Sawed.* 2 *Sides.*	*Sawed.* 4 *Sides.*
1866–1872	25c–35c	45c–$1	.....	.....
1873–1877	30c	.....	.....	.....
1878	25c	.....	.....	.....
1881	25c	30c–35c	55c	75c
1891–1895	20c	25c–30c	35c	50c
1896	11c–20c	20c–25c	28c–35c	43c–50c
1904	15c–20c	20c–25c	35c	50c

Prior to 1895 there appears to have been no effort to establish a uniform scale of prices; what uniformity there was resulted from general consensus rather than from definite agreement. In March, 1895, the Indiana Oölitic Stone Association[23] was formed, which, though existing for about a year, really lost its vitality in October of the same year when several of the larger firms withdrew, after which time each quarry fixed its own prices. This failure of the agreement in a time of industrial depression is

[22] Ind. Geol. Report, xxi, 341f.
[23] Ind. Geol. Report, xxi, 342.

significant: as one producer put it, "when times are good we don't need any association to maintain prices, and when times are bad a voluntary association can't keep the members in line." For here, as in many other industries, fixed charges are an important item, and, especially in a business which normally pays good profits, men will cut prices in order to get trade which will help them meet their fixed charges.

About 1902 another attempt to form an employers' association was made, with similar results. For a time the association seemed to prosper, but price agreements were not strictly maintained and the organization was soon given up.

Under pressure of the Bedford strike of 1903 the producers of that region formed the most successful employers' combination that the oölitic industry has yet known. This association took an active part in the adjustment of the difficulties which led to the strike, and has since maintained its activity in general price regulation and in the making of uniform credit regulations. Its most effective work seems to have been done in preventing, chiefly through its maximum wage scale, the frequent shifting of workmen from one employer to another. The relative success of this organization would seem to demonstrate the necessity of outside pressure to secure uniformity of action by the members of such an association.

During the winter of 1904-1905 the Monroe County Stone Club was organized, composed of almost all the producers in the county. The formation of such an association seems to have been facilitated by the strike in the Bedford field in the preceding year. The objects of the club are thus stated in the second article of its constitution: "The mutual benefit of its members by eliminating from the trade poor-paying customers; by maintaining a fair price for the product of the quarries, mills and yards; by taking proper steps to regulate measurements; by preventing any discrimination or restriction against the use or transportation of Indiana oölitic stone (rough, sawed, planed, turned or cut); and by the adoption of such rules and regulations as shall from time to time seem necessary for the proper conduct of the quarrying, milling and cutting business; to protect its members in their right to manage their respective businesses in such a manner as they may deem proper; to adopt a uniform system whereby members may ascertain who is and who is not worthy of their employment; to investigate and adjust by the proper officers and committees of the Club, all differences arising between members of the Club and their employes when such questions shall be submitted to the Club for adjustment; to make it possible for any person to obtain employment without being obliged to join a labor organization.''

It was, of course, not to be expected that such a comprehensive list of objects could be at once attained, and opinion varies as to the probable future success of the club. Some dissatisfied members have already withdrawn, and the constitutional provision requiring a three-fourths vote of the members for disbandment will hardly prevent the club's gradual dissolution if it does not perform some valuable service for its members.

The omission from the list of objects of an express provision for establishing a uniform scale of wages is significant, as is also the inclusion there of the phrases: ''to protect its members in their right to manage their respective businesses in such a manner as they may deem proper,'' and, ''to make it possible for any person to obtain employment without being obliged to join a labor organization.'' It is evident that the employers wish to discourage the union idea; and, while actually preparing to meet the problem of unionism when it shall arise—which many of them think is but a question of time—they wish to avoid as far as possible all appearance of an organization on their part, which might lead to similar action on the part of the workmen.

One of the chief motives for the organization of the club was the desire to do away with the practice of many employers in bidding for individual workmen already in the employ of other producers. Although the members of the club voted to discontinue this practice, they did not in fact do so. The attainment of this object might have been furthered by the adoption of a uniform scale of wages, but although the members of the association agreed to fix a maximum scale, they have thus far failed to adopt one.

It is not to be thought that these associations actually go to the length of fixing prices in all cases. The most they have been able to do is to establish a sort of standard to which all producers as a rule rather closely conform. On specifications calling for cut and sawed stone, producers can often cut prices while nominally observing the agreement, for small pieces of good grade stone can be cut from blocks of mixed color which would otherwise be waste or low grade stone. Moreover, small companies when hard pressed have often asked for and received permission from such organizations to sell at less than the agreed rate. On stone of the first grade, there is in the entire district little or no price-cutting, with or without producers' agreements, for custom appears to have fixed a price which, in the absence of severe competition on this grade of stone, has been quite stable. The New York market uses practically all the strictly first-class stone, which it takes in the form of mill blocks, and the supply, which is rather more limited than that of the other grades, rarely outruns the demand. Price-cutting is more frequent in the lower grades of stone, in which there is keener competition, owing to greater supply, greater variety of grades, and more opportunity for bidding on specifications for sawed stone.

Besides these local organizations, many of the producers of oölitic stone are members of more general quarrymen's associations, having for their objects the general interests of the quarry industry, especially as to the development of trade and the regulation of credit. These, however, have little direct influence on the local industry.

Wages and Employment. The following table, showing the classification and wages of the workmen employed in the oölitic stone industry, is derived from data furnished by the producers. While it comprises only about one-third of the workmen, it may fairly be considered representative, since all the important places of production are included in the table except Stinesville and Romona:

	Bedford District.		*Bloomington District.*		*Annual*
Class.	*No.*	*Rate per Hr.*	*No.*	*Rate per Hr.*	*Earnings*
Cutters[24]	20	50c	14	50c	$1,040
Head sawyers	..	....	2	17½	455
	5	22½	3	22½	585
	..	....	1	23	598
	..	....	1	25	650
Second sawyers	2	20	..	....	520
Assistant sawyers	..	....	2	16	416
	..	....	10	17½	455
	..	....	1	18	468
	13	18½	..	....	481
Head hookers	..	....	1	17½	455
	9	22½	1	22½	585
Hookers[25]	..	....	8	15	390

[24] Cutters work eight hours per day.

[25] Hookers in the quarries, or derrick helpers as they are also called, receive somewhat less than do hookers in the mills, where their employment is also more constant.

Class.	Bedford District. No.	Bedford District. Rate per Hr.	Bloomington District. No.	Bloomington District. Rate per Hr.	Annual Earnings
Hookers	..	....	28	16	416
	26	17	26	17	442
	..	....	4	18	468
	22	18½	..	....	481
Car blockers	3	20	..	....	520
Blacksmiths	4	28½	..	....	741
Lathemen	6	28½	..	....	741
Planermen	31	28½	..	....	741
	..	....	6	30	780
Tool grinders	3	21	..	....	546
Engineers	..	....	2	17½	455
	..	....	4	20	520
	..	....	3	22½	585
	6	25	2	25	650
Firemen	..	....	2	15	390
	2	16	1	16	416
	..	....	2	17	442
Traveler runners	1	27½	..	....	715
Channeler runners	..	....	8	20	520
	..	....	10	22	572
	18	22½[26]	18	22½	585
	31	25	9	25	650
Sidemen on channelers	62	15	66	15	390
	36	16[27]	10	16	416
	..	....	6	17½	455
Steam drill runners	..	....	1	16	416
	..	....	1	18½	481
	14	21	7	21	546
	..	....	3	22½	585
Steam drill helpers	..	....	2	12½	325
	12	15	10	15	390
Breakers	10	21	..	....	546
Head powermen	4	18½	..	....	481
	1	22	..	....	572
Powermen	12	15	2	15	390
	..	....	7	16	416
	..	....	4	17	442
	..	....	3	17½	455
	..	....	1	18	468
	..	....	4	20	520
Derrick runners	1	17	4	17	442
	12	21	8	21	546
	..	....	4	22½	585
	..	....	1	25	650
Scabblers	..	....	4	16	416
	6	17	30	17	442

[26] Wardwell machine runners.
[27] Firemen on channelers.

Class.	Bedford District. No.	Rate per Hr.	Bloomington District. No.	Rate per Hr.	Annual Earnings
Scabblers	..	....	4	17½	455
	30	18	11	18	468
Laborers	85	15	74	15	390
Boys[28]	1	75	2	75	195
	19	85	..	....	221
	1	1 00	1	1 00	260
	..	....	4	1 25	325
	..	....	5[29]	1 50	390
Total	508	....	448	....	....
	448	....	..	....	....
Grand total	956	....	..	....	....

Variations in the rates of pay for the same kinds of work are more noticeable in the Bloomington district than in the Bedford district, where organization both of employers and workmen has tended to obscure the operation of causes making for variation. In the Bloomington district, for example, the wage rate has normally been higher in the Clear Creek region than in the Hunter Valley region, owing to the necessity many of the workmen in the former region are under of going to and from their work on the railway. A similar condition may be observed in the Bedford district, where those quarries which are located in the town or on its outskirts, usually pay slightly less than do those located farther out. In a few cases the use of improved machinery or power, as, for example, of compressed air in the channeling machines, results in lower wages. Personal reasons often operate to produce variations, as where long employment by one company, custom, or preference for a particular quarry or employer, induce workmen to accept slightly less than the competitive wage. Some of the most successful quarries are in this position. On the other hand, some employers are accustomed to attempt to remedy a shortage in their labor supply by offering slightly higher wages, or even by tempting individual workmen away from their employers. Such methods are quite naturally condemned by employers who have thereby lost workmen or been compelled to raise wages in order to retain their men. While this practice has thus contributed to advance wages, it does not appear to have permanently increased the supply of labor in the industry, perhaps in part because of the seasonal

[28] The wages of boys are given by the day.

[29] These boys are employed in running the "dinky" boilers for steam drills.

character of the work, in part because wages in other employments were rising even more rapidly.

The employers' associations both at Bedford and at Bloomington have attempted to establish maximum wage scales; and at Bedford, owing in part, it is believed, to the organization of the workmen, the effort has resulted in a practically uniform scale. There remain some variations, but they are few and relatively unimportant, and although the employers claim to exercise the privilege of paying according to the workman's ability, except as they are limited by the maximum scale, the actual rates of pay obtaining in that district appear to prove the tendency of a published scale, whether maximum or minimum, to become the actual scale.

The producers in the Bloomington district, on the other hand, have not been forced by outside agencies to maintain a uniform scale, and so far as a scale can be said to exist it is the result of custom, combined with a local scarcity of labor. The Monroe County Stone Club has as yet developed no means of enforcing its recommendations. Its proposed scale is little more than an approximation to the norm of the actual rates obtaining, and, though adopted item by item, has not yet been accepted in its completed form. For purposes of comparison, the scales of both the Monroe County and the Lawrence County (Bedford) associations are given:

Class.	*Monroe County. Rate Per Hour.*	*Lawrence County. Rate per Hour.*
Head sawyers	22½c	22½c
Sawyers	17½c	18½c
Traveler runners	27½c	27½c
First hookers	22½c	22½c
Second hookers	17½c	18½c
Mill laborers	15c	15c
Planermen	30c	28½c
Sullivan runners	25c	25c
Ingersoll runners	25c	25c
Sidemen	15c	15–16c[30]
Wardwell runners	22½c	22½c
Sidemen	15c	15–16c[30]
Steam drill runners	21c	21c
Steam drill helpers	15c	15c
Breakers	21c	21c
Laborers	15c	15c
Head power men	18½c	18½c
Power men	17c	15c

[30] Firemen get 16c.

Class.	Monroe County. Rate per Hour.	Lawrence County. Rate per Hour.
Derrick runners	21c	21c
Derrick helpers	17c	17c
Scabblers	17c	18c
Teams	30c	35c

If the two scales be compared, it will be found that differences occur in a few cases only and that they are relatively small. Moreover, the higher rates for certain classes of labor in one district are offset by lower rates for other classes, so that the average rate of pay is probably very much the same.

The Romona and Stinesville regions are rather more isolated and their wage scales are not so dependent upon the wages paid in other regions of the oölitic area. The labor cost in these regions seems to be appreciably lower than in the districts farther to the south. Especially is this true at Stinesville, where the chief producer is still able to get his labor supply largely from farm laborers, who, though less skilful, soon learn the business and willingly accept lower rates of pay than the workmen of the more southern regions would consider.

The men are usually paid bi-weekly and in cash, though in a few cases checks are used. The reason for using checks is the desire to avoid the danger of carrying money some miles to the quarry, and the abuses common to such modes of payment seem to be infrequent. Some companies pay weekly, but the workmen appear generally to prefer bi-weekly payment, chiefly because of habit and the belief that they can save more from the larger payment. This reason would have more weight if the men were accustomed to buy for cash.

The table of annual earnings is based upon the assumption that the average workman in the stone industry is employed two hundred and sixty days in the year. The actual time of employment cannot be accurately determined; it varies not only from season to season according to the severity of the winter, but also in different quarries, owing to purely local conditions. However, under prosperous business conditions, employers operate their establishments to the limit which conditions permit, and the above assumption is below rather than above the estimates of the employers. Moreover, the mills often run practically all the year, and employers generally seek to retain the higher grades of their employees by finding for them some kind of work about the quarry or mill, which gives them fairly continuous employment throughout the year. Hence two hundred and sixty days of employment and the annual earnings estimated upon that basis may, under normal conditions, fairly be considered the minimum.

In the following table the adult workmen are grouped according to estimated annual earnings:

Annual Earnings.	*Number of Workmen.*
$1,040	34
780	6
741	41
715	1
650	49
598	1
585	64
572	11
546	54
520	21
481	40
468	47
455	29
442	99
416	91
390	333
325	2

This is not a high scale of earnings, but when the relatively low cost of living in the oölitic area is considered, it compares favorably with earnings in similar lines of industry. In most cases workmen might increase their incomes by utilizing the garden plots furnished with their homes, but comparatively few do so. During the idle season, some of the workmen—especially those of the lower grades—find odd jobs and temporary employment of various sorts, and thus add to their earnings. The majority, however, make very little effort to find work, but are content to live on their savings or on their credit.

There is a tendency to instability of employment on the part of many of the workmen, which is evinced both by their fondness for holidays and by their frequent changes from one quarry to another. Employers have never been able successfully to combat these tendencies, especially the desire for frequent "days off." As to changes of employment, the blame lies in part at the door of the employers, who have generally not scrupled to entice workmen from the employ of other producers. Recently employers' associations have with greater or less success endeavored to prevent this, and where a uniform scale has been put into operation, one of the workmen's motives for such changes is removed; but the practice has by no means ceased.

Individual operators, through their personal relations with employees, often secure a much greater stability of employment. Several companies have a number of employees who have been in their service continuously for a term of years. One firm offers a reward for continuous service by contracting with its workmen to pay them five per cent of their annual earnings after the completion of the first year's service. The payment is made at Christmas time, and has proved an effective device for securing continuity of service.

The Workmen. The workers in the Indiana oölitic stone industry are for the most part men who were reared in the stone district or in the counties adjacent thereto and whose ancestors were immigrants into this portion of the State from some of the Southern States, especially North Carolina, Tennessee and Kentucky. Some of the first quarrymen appear to have come from the quarries in the neighborhood of Madison, Indiana, and from Pennsylvania, but the quarryman's trade is not highly skilled, and was readily taken up by the young farmers in the vicinity of the quarries. It is probable that the tenant farmers furnished the great majority of this class of workmen, though no data on this point could be had; they drifted here in considerable numbers from the surrounding counties when the industry began to assume large proportions.

Until comparatively recent years the proportion of foreign labor in the industry was very small. But of late the industry has expanded much more rapidly than the local supply of labor has increased, and the consequent normal scarcity of labor has resulted in the employment of foreigners, sometimes brought into Indiana expressly for the purpose, sometimes taken on when they chanced to apply. So far as is known, the first employment of foreigners in quarries was by David Reed, who employed about twenty Italians in his quarry and mill near Bedford about 1882. Of recent years railway construction in the oölitic belt has brought into the region considerable numbers of foreigners, many of whom have been given employment in the quarries. The total number of foreigners in the industry is as yet not great, though it seems to be growing. The greater part of them are Italians, but there are also some Hungarians and Greeks.

Most of these foreigners are employed in the lowest grades of labor as shovelers, and the native workmen have sometimes objected to their doing any higher class of labor. However, one of the mills at Bedford is almost entirely operated by Italians, one of whom is their efficient foreman. Generally they are thought to be more steady than the American laborers, but less capable of the higher kinds of work. Most employers prefer not to employ them, believing that in the long run American labor is more satisfactory.

The stone cutters, many of whom are foreigners, do not properly come within the province of this paper, since they are for the most part itinerant workmen, going wherever there is work for them. Relatively few of the producers of cut stone employ a considerable number of cutters continuously. Most cutters are employed by contractors and do their work on the site of building.

The reports of the Department of Inspection indicate that few or none of the workmen in the oölitic industry are below sixteen years of age. This statement is inaccurate, but the proportion is quite small and probably does not exceed two or three per cent of the total number of workmen. Many employers avoid the employment of boys because of their greater liability to injury through their own carelessness or inexperience. Such as are employed serve as signal boys to pass the orders of the ledge boss to the derrick runner, as helpers on drills, as water boys, and rarely as side-men on channelers or as operators of "dinky" boilers for steam drills. Their wages vary from seventy-five cents to one dollar and fifty cents per day of ten hours.

It might seem that the annual earnings of the workmen in the limestone industry would scarcely be sufficient to keep them above the want line, nor indeed would they be if the conditions of life were not unusual. For the environment of the workers is still essentially rural. Many live in small cottages built on land belonging to the producer who employs them; even those who live in towns may be said to lead a rural life, since the towns are small. Neither Bloomington nor Bedford, the largest towns in the oölitic area, boasts a population of more than eight thousand. Under such conditions the cost of living is relatively low, and what would be a starvation wage in the city may afford a comfortable living here.

The standard of living among the workmen in the oölitic stone industry is fairly good, judged by that of the working classes in general. Wages may fairly be considered adequate during the period of employment. Some of the more frugal ones save a little money, or buy provisions for the idle season during the months of employment, but the great majority use their income as they get it. The native laborers live rather better than the foreigners, many of whom are said to save and send money home.

During the weeks of severe winter weather, however, when the extreme cold makes work in the quarries impossible and often prevents work in the mills, the men are frequently sore pressed. Many have not the instinct of saving and live from hand to mouth, and those who have saved at all have rarely sufficient to carry them through this period of trial. When out of funds, they do not, except in rare cases of continued sickness, have recourse to charity, as might be supposed. The records of the charity society of Bloomington in two years show but two cases of relief to men whose regular work is in the stone industry, and in these cases the amounts were small and the cause prolonged sickness of the wage earner.

Credit in the stores is the chief source of support to these people during the idle season. Merchants quite generally give credit to the workmen in the stone industry from pay-day to pay-day during the term of employment, and the workmen usually pay such accounts promptly. Hence it is quite natural that the merchants should feel inclined to extend credit to such customers when they are out of work.

These conditions would seem to favor such an institution as company stores. There are, however, no such stores in the oölitic district. The nearest approach to such a system is found in those cases where an employer in the stone industry is also engaged in the mercantile business, and gives credit rather freely to the quarrymen in his employ, expecting to take his pay directly from the wages of his employees. Usually the workmen give the merchant orders upon the stone producing company and these orders may be based upon wages actually earned or merely anticipated. Such merchants are usually quite willing to "carry" the workmen employed in their quarries through the idle winter season, since their ultimate payment is secured by the prospective earnings of the men. But in these cases the temptation to evade payment by changing the place of employment is correspondingly increased, for the amount of indebtedness thus accumulated sometimes reaches a hundred dollars or more—an amount which the average workman finds it very hard to repay. One of these employer-merchants states that his losses in this way have amounted to four thousand dollars in a period of six years, and he has decided for that reason to put his employees on the same plane with the general public as regards the giving of credit.

These stores do not confine their credit to the employees of their own quarries, although, owing to the supposed greater ease of collection, they are likely to grant credit to their own men rather more readily than to others. Merchants who have no connection with the quarries also commonly give credit to the quarrymen during the idle season, and the fact that they do not seem to complain quite so bitterly as do the employer-merchants of losses at the hands of their creditors may perhaps indicate a somewhat natural tendency on the part of the quarrymen to apply slightly different codes of morals to their dealings with their employers and to those with other men. But the independent merchants are doubtless more careful in granting credit than are the other merchants.

The credit system is thus of great value to the quarrymen, many of whom could scarcely live through the winter without its aid, or the aid of charity. The prices charged the workmen do not appear to be exorbitant, though they are doubtless somewhat higher than would be necessary if the business were on a cash basis. From the ethical point of view, the cash basis would be better for many of the workmen. As conditions actually are, those who pay their bills are benefited by the system, since, without degrading them morally, it offers a means of subsistence through the idle season by stretching their income over the entire year, and in many such cases the credit system appears to induce an economy which otherwise might not exist.

Almost all the larger companies own houses near their quarries which they rent to their employees. The other workmen live for the most part in town, going to and from their work on the morning and evening "accommodation" trains. While the motives of the employers in building these houses were probably not all altruistic, it does not appear that they have built them as a distinct investment; it was rather to get and keep the workmen near the place of employment. Incidentally, the plan seems in many cases to make for morality, since the temptation to loaf about the saloons in town is to a large extent removed, and many employers recognize in this building of homes a means of benefiting both their employees and themselves.

These houses are a fair type of the homes of all the workmen. They are small cottages of three, four or even five rooms, built cheaply it is true, but as well, perhaps, as the poorer rental properties in the smaller towns and cities. The rent varies from four to six dollars per month, and is taken out of the pay. A garden plot is given with the house, but this is often not cultivated. Sometimes workmen may buy these cottages on small monthly payments, and one employer who is also interested in a building and loan association has given special attention to the effort to provide his employees with homes in this manner. His success in this has not been altogether flattering; although several men have obtained homes in this way, many do not want to be bothered with property, as they put it. This apparent lack of what may be called the property sense in so many of the workmen is one of the most discouraging things in their social condition. Doubtless this fact is connected with their tendency to instability of employment, and has its root in the same general instability of character. The hope lies in the building up of character through the encouragement of the property interest, as is being done by some employers.

The conjugal condition of the workmen, it is to be regretted, is a point on which no satisfactory data could be secured. The impressions of employers as to the number of employees who are heads of families are various, some thinking that less than one-half are heads of families, others putting the proportion as high as four-fifths. One would naturally expect the heads of families to be more ambitious than the others in their efforts to secure a better living; on the other hand, their greater responsibility makes them cautious of unemployment. This explains why some employers in the Bedford district are inclined to think the single men largely responsible for the agitation of the union idea and the demand for increased wages, which have in recent years somewhat disturbed the industry in that region.

The morality of the workmen can, of course, be treated only in general terms. There is much drinking, especially among the younger men. However, it does not seem to exceed that found in other trades, and it is doubtless much less than in many, such as the glass industry, for example. In the small quarry communities the practice of clubbing together to buy whiskey in quantities is quite common, and is doubtless much better for the men than accessibility of saloons would be. Superintendents and foremen try to prevent men from working when under the influence of liquor, for the danger of injury through carelessness is great.

The workmen quite generally display a fondness for petty gambling. "Crap-shooting" is such a favorite sport with them that some employers have thought it necessary to prohibit its practice on their property. The petty gambling device of "raffling" is very common, and there is a tendency to substitute it for regular sale wherever possible. One man has butchered a beef and has more than he needs; another has a wornout horse or buggy that he wishes to get rid of; still another has a gun or a watch to sell, and all use the raffle by preference. The seller of chances not infrequently becomes a real nuisance to the management on pay-day. Anything which offers a chance of winning something for nothing seems to appeal with special force to the quarrymen. In such an atmosphere there doubtless flourish more serious forms of gambling, which are not so open and well known.

Despite all this the workmen are in the main honest and industrious, more so, perhaps, than some of the employers are inclined to represent. In the southern district especially, their experiences with the union men seem to have caused employers to look with suspicion upon their workmen, and to regard rather too seriously such traits as have been mentioned.

Church membership appears to be comparatively rare among the quarrymen. Attendance also is small. This brings up the question which has of late been so often asked: What is the church doing to reach the working people? A prominent member of one of the churches of Bloomington is authority for the statement that the fault lies with the church and not so much with the people, as was shown him a few years ago when a young pastor, who had built up his membership roll from among the quarrymen, was forced to resign because he was bringing an uncongenial and undesirable class of members into the church. Yet many pastors are doing good mission work, assisted in occasional instances by employers. Perhaps the workmen can hardly be said to be averse to religious influences, yet they are not easily interested in church work.

To a considerable extent fraternal societies take the place of the church in the life of the quarrymen. The membership of some of these societies contains a large proportion of quarrymen.

To a much less extent the wives of the quarrymen become members of similar societies. The character of these societies varies from those in which the social or fraternal feature predominates to those in which the element of insurance is prominent. The prominence of these societies perhaps helps to explain why the unions in the Bedford district have not developed the social side of their organizations to any considerable degree.

Relations of Employers and Employees. The business of quarrying is one in which the workmen are peculiarly liable to injury by accidents. For the most part these accidents are such as do not admit of prevention by safety appliances of any sort, but which only constant care may prevent. No accurate record is kept of these accidents, either by the producing companies or by public officials. Of twenty-seven suits filed in Monroe County praying for damages for personal injuries sustained in the quarries in the five years from 1900 to 1904, eleven were the outcome of serious injuries and six of fatal injuries, while in ten cases the nature of the injuries could not be learned. This takes no account of cases compromised out of court.

Employers generally carry accident insurance on their workmen, though there are a few producers who prefer to carry their own insurance. Such a system of insurance is thought by some lawyers to be contrary to public policy, and its benefit may well be questioned. The policies generally provide for payment of indemnity to the producer only after he has been defeated in the courts, and thus the possibility of compromise is lessened. Moreover a suit in court means both expense and delay to the plaintiff, who can ill afford it. It is thought, too, that producers are less careful of their men where the indemnity for injury is to be paid by a third party, and that on this account the number of accidents is much greater than it otherwise would be.

The experience of the few companies who do not carry insurance gives some support to the contention frequently made that such insurance is after all unprofitable to the insured. These self-insured companies have had as a rule fewer accidents than have the others, but many of the smaller companies might be swamped by the necessity of paying damages on account of an accident wholly beyond their power to prevent. Hence, from the point of view of the financial interest of the insured, the carrying of insurance is in the long run profitable.

Only incomplete data can be had on the question of compensation for injuries either through compromises or suits at law. Of twenty-seven suits for damages filed within five years in the Monroe Circuit Court, ten are yet pending, five have been venued and the records are not available, while five have been dismissed. Two have been compromised with the sanction of the court, and judgment has been given in favor of the plaintiff in five cases, in two of which appeals were taken to the appellate court, where they are still pending. So far as compensation for injuries to workmen goes, the courts give no more satisfactory service here than in other lines of industry.

The closeness of personal relations between employers and workmen in the oölitic industry varies, as in all industries, with the personality of the employer, the size of the establishment and the relative absence of artificial restraints upon the communication between employer and employee. For the most part the employers are inclined to be free and easy in their relations with their men. The social environment obtaining in the oölitic district naturally leads to this, for there are here no wide differences in social rank, such as tend to appear where the population is denser. Comparatively few employers, it is true, manifest much active interest in the welfare of their employees, but these few are frequently in a very real sense friends of their employees, and some court that relation.

Two classes of employers—the largest and the smallest—are from the very nature of the organization of their establishments unlikely to come into direct personal contact with their employees, who are supervised and directed in their work chiefly by hired superintendents. This lack of personal relations has been thought to be a cause of the organization of labor unions in the Bedford district, where the largest establishments are located. Certain it is that there has been far less agitation of the union idea in other districts, where, for the most part, establishments of medium size obtain, but the earlier development of the industry in that district, and the organization of the workmen in other lines of industry at Bedford, to a much greater degree than prevails in other portions of the oölitic belt, must also have influenced quite materially the formation of unions among the quarry workers.

The first class of laborers to be organized in the oölitic limestone industry were the cutters, who have through their national organization a monopoly of the labor supply in their trade. The local industry has adjusted itself to these conditions, and the cutters are no longer a problem. Only once in recent years have they threatened to prove a serious disturbance to the industry. In the fall of 1904 the national organization demanded that all planermen be taken into the cutters' union, and that five men be employed on each planer under the cutters' wage scale. For a time, owing to the strength of the organization, this demand appeared formidable, though it was unreasonable. The problem, however, was general and not merely local, and in the following spring the demand was withdrawn.

About 1900, other classes of labor in the industry around Bedford began to organize. At first the charters of organization were held directly from the American Federation of Labor; and the Federal Labor Union, the Stone Sawyers' Union, the Planermen's Union and the Quarrymen's Protective Union were organized in that way. The engineers, including those in other industries, were organized under the International Union of Stationary Steam Engineers. The sawyers and planermen have more recently secured charters from the Federation. These organizations are not mutually exclusive. The Federal Labor Union comprises employees of other industries, as well as some classes of quarry employees which the Quarrymen's Protective Union also admits to membership.[31]

During the months of May and June, 1903, practically all the quarries and mills in the Bedford district were closed on account of labor troubles. The total number of men affected is estimated at eighteen hundred, of whom the great majority were non-union men.[32]

Previous to 1903, the wages paid by different establishments for the same kind of work had varied widely. The dissatisfaction which this condition caused was doubtless increased after the formation of the unions, owing to the more accurate knowledge of conditions which organization brought about. The sawyers' union was the first openly to complain of this condition. The wage rate for head sawyers varied from twenty cents to twenty-six cents per hour, while for assistants the range of rates was from fifteen cents to twenty-two and one-half cents. In January of 1903, therefore, the union asked for a uniform scale of wages for all sawyers in the Bedford district, to take effect May 1,

[31] Ind. Labor Com., IV, 47, 49, 51.

[32] For details of the strike and its settlement, I have drawn largely upon the Fourth Annual Report of the Indiana Labor Commission, supplemented by interviews with employers and workmen.

1903. They asked also that a second sawyer be employed in each mill having nine or more saw-gangs.[33] There were no further developments of note until April 9, when the Federal Labor Union proposed a scale of wages for its members, also to take effect May 1, 1903.

So far, the avowed cause of the strike was the inequalities in the wages paid for the same kind of labor. The scale asked for, however, was higher than the average prevailing rate, although it was not above the maximum rate. Moreover, a scale proposed by the operators was rejected because it proposed an insufficient increase; and hence it may reasonably be concluded that a desire for higher wages was one of the causes of the strike.

Employers generally name the desire for recognition of the union as an important cause of the strike. Union men deny this, and indeed only one union in the district asked for recognition. This was the Quarrymen's Protective Union, which, some time after the strike had begun, asked the Bedford Quarries Company to recognize their union and to employ only union men. The demand does not appear to have been insisted upon, however, and can hardly be regarded as one of the principal causes of the strike. The statement made by several employers that "strike fever" was a cause doubtless has some degree of validity, in accordance with the tendency of comparatively new unions to emphasize their existence by means of a strike. However, of these various causes, that of the inequalities of wage scales appears to have been the primary and moving cause.

After the submission of the demand of the Federal Labor Union, the employers formed an association, and on April 17, 1903, submitted a scheme for a more general revision of wage rates than had yet been proposed. This was rejected by the workmen on the ground that it made an insufficient advance upon the prevailing rates, and the Federal Labor Union, acting as a central body, made a counter proposition which was in turn rejected by the employers. On the 29th of April, the Planermen's Union submitted to the employers its request for a uniform scale. No agreement having been reached by the first of May, the members of the two organizations walked out and the mills and quarries shut down indefinitely. Following this action the Stationary Engineers and the Quarrymen's Protective Union each presented a formal request for a new scale, the latter organization asking also for recognition and the closed shop.

[33] Only two companies at that time employed these second men.

Meanwhile the channeler runners, who were then unorganized, had asked for an advance in wages, and on May 16, 1903, the employers proposed a more comprehensive scale than had yet been considered. The employers believed that this scale would be accepted, and arranged to resume operations on May 18, but such a small number of men appeared ready to work, that the shut-down was of necessity continued.

Mr. McCormack and Mr. Schmidt, the State Labor Commissioners, now undertook to bring about a better understanding between employers and employees, by means of direct negotiations between them. Hitherto, the proposals made by the employers had been given to the general public, and direct dealings with the workmen had been avoided. Now, however, the members of the employers' association agreed to deal with their respective employees, though not with representatives of the unions as such, lest this should amount to a recognition of organized labor. The employers' association accordingly drew up a list of names, chiefly of non-union employees, with committees from which they would meet for negotiation. This proposition the unions very naturally rejected.

Now ensued a series of public mass meetings, originating among disinterested parties, but tending to hinder rather than to further an adjustment, owing to the rather extravagant claims made, and to the feeling aroused thereby. In the temporary absence of the Labor Commissioners, the negotiations were carried on by Mr. Cal Wyatt, a general organizer of the American Federation of Labor, but all efforts to bring about a settlement were for a time fruitless. Finally, through the efforts of the Bedford Commercial Club, employers and workmen met for the first time on June 11, and it was agreed that each operator should meet separately committeemen representing his own employees. After a series of such conferences, separate votes were taken on the question of the adoption of the scale proposed by the employers. All the unions at length voted favorably, and on Monday, June 29, 1903, work was resumed in all the quarries and mills of the Bedford district. The basis of the settlement was the scale proposed by the employers on May 16, 1903, with only slight modifications. In order to show the increase of wages during the period of organization (only a small part of which increase, however, is attributable to the work of the unions), the scale of 1903 is given alongside that obtaining in March, 1900.[34]

[34] Ind. Labor Com., IV, 53.

	Rate per Hour. 1900.	1903.
Head sawyers	20	22½
Second sawyers	..	20
Sawyers	17½	18½
Head hookers	20	22½
Hookers	16	18½
Car blockers	16	20
Mill laborers	12½	15
Planermen	20–25	28½
Tool grinders	17½	21
Assistant tool grinders	12½	17
Wire saw men	14	15
Traveler runners	25	27½
Ingersoll runners	20	25
Ingersoll helpers	12½	15
Ingersoll firemen	14	16
Wardwell runners	20	22½
Wardwell helpers	12½	15
Wardwell firemen	14	16
Steam drill runners	17½	21
Steam drill helpers	12½	15
Breakers	17½	21
Ledge laborers	12½	15
Head powermen	16	18½
Powermen	12½	15
Derrick runners	17½	21
Derrick helpers	14	17
Teams	30	35
Strippers	12½	15
Scabblers	14	18

At the time of the settlement of the strike it was agreed that all workmen should be taken back and that none should suffer discrimination on account of the part taken in the strike. This agreement was observed in all but two cases. One man who had been promoted to the place of head sawyer shortly before the strike began was refused that position, but employed in a subordinate one; and another who was refused a place by his former employer, later secured work in another mill.

Although only about one-sixth of the men involved in the Bedford strike were organized, union and non-union men seemed to be in substantial harmony throughout the strike, and the unorganized workmen shared in the beneficial results of the strike as well as their organized fellows. There were no attempts to operate the quarries and mills against the opposition of the workmen, nor were there any disturbances or hostile demonstrations.

the whole struggle being merely a peaceful attempt to secure what the workmen seemed to have felt was their just due. On the other side, the employers seem to have been for the most part perfectly open in their dealings with the workmen, although it is charged that two companies who favored the granting of the workmen's demands were discriminated against in the matter of setting cars and furnishing transportation facilities by the Monon and Southern Indiana railways, some of whose directors were heavily interested in certain of the involved companies; and it is also claimed, though without very convincing evidence, that there was an attempt to blacklist some of the workmen who found employment during the strike in the building of a cement factory at Bedford and in track construction on the Southern Indiana Railway.

In the matter of wages, complete data cannot be had for an estimate of the total result of the strike. In general the wage rate was slightly raised. Of the two hundred and twenty-eight sawyers, planermen, hookers and traveler runners involved, the wages of one hundred and forty-seven were increased, those of twenty-two were decreased and those of fifty-nine (including thirty-four who got the rate demanded) remained the same. This meant an average advance of about one cent per hour for these classes. The condition of the sawyers was practically unchanged, although their request was granted except as to the wages of head sawyers. Furthermore, it was agreed that sawyers might work twelve hours per day in cases of emergency, receiving one and one-half time for all overtime. The planermen fared rather better as to net increase of wages, though none of them got the rate demanded.

The strike also caused some migration of workmen between the Bedford and Bloomington districts. A number of men involved in the Bedford strike found work during its continuance in the quarries and mills about Bloomington, and when the strike was ended some of them remained in the more northern district. On the other hand, many quarrymen in the Bloomington district sought employment in the Bedford region soon after the settlement of the labor dispute, attracted in part by the slightly higher wages, in part by a less valid reason—their desire for change.

Though careful to avoid all appearance of recognizing the unions during the continuance of the strike, the employers soon after consented to the appointment of a "shop steward" for each firm, whose duty it should be to collect the dues from the union members there employed and to try to settle differences arising between the men and their employers. This was clearly a step in the direction of strengthening the union. A central labor union, however, organized at Bedford while the strike was still unsettled, is now the regularly constituted means of arbitrating disputes, and the functions of the shop steward have on that account become less important than they were expected to be. The central body has as yet done nothing, there having been no disputes to bring before it.

The results of the strike upon the union spirit appear to have been rather discouraging. Though there have been some additions to the unions, these have probably been more than counterbalanced by the suspensions for delinquency in payment of dues. These delinquencies, it is true, are usually made up during the summer months, but the general condition of union labor in Bedford at present does not promise any considerable progress in unionism in the near future. Even the American Federation of Labor, formerly a leading force in Bedford labor circles, is admitted to be in a very poor condition. The attitude of the employers is almost universally one of opposition to unions, and the general public manifests very little interest in them.

While the strike was in progress, production in the Bedford district was practically at a standstill. At the same time orders were piling up, and building in various parts of the country was being delayed. The work on the federal building at Indianapolis was very seriously hindered through the inability of the Bedford producers to get even mill blocks quarried to send to their customers.

Except in cases of emergency, contractors were generally very lenient with the Bedford companies. Had they insisted on the prompt filling of their orders the outcome of the strike might have been somewhat different. In fact, most companies are said to have had strike clauses in their contracts, by which they escaped the payment of damages for non-fulfillment of contract.[35] Many orders cancelled during the strike, or refused by the Bedford producers on account of it, were filled by the producers of the Bloomington and northern districts, and some of this trade appears to have been lost permanently to the Bedford producers.

In general the results of the strike were not so one-sided as is usually claimed. It is true that only a few classes of workmen

[35] Indianapolis News, May 9, 1903.

secured their demand, but the general scale of wages was advanced, and the chief cause of discontent—the inequalities of the wage scales in different establishments—was removed. On the other hand, the scale proposed by the employers was the basis of settlement, and this differed but slightly from the scale they first proposed. Yet the settlement was essentially a compromise. The advance in wages, as many employers state, would doubtless have come without the unions, as has been the case in the Bloomington district, for the prosperity of the country and the conditions of the industry were naturally making for such an advance. But it may well be argued that without the unions the rise in wages would have been somewhat delayed. However, the influence of the strike on the union spirit was undoubtedly depressing, and from this point of view it is clear that the workmen lost in the struggle.

10. An Investigation of Housing and Living Conditions in Three Districts of Indianapolis.

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Introduction. During the winter of 1910 a special investigation of housing and living conditions in certain parts of the city of Indianapolis was made for the Charity Organiaztion Society of that city. The primary object behind the investigation was a desire on the part of the organized charity workers to have in their possession definite information concerning conditions under which certain classes of people live. It is their invariable custom to make a special investigation of each particular family which applies to them for assistance. But this general investigation was not confined to families who needed aid. It covered all of the families of certain districts, including not only the poor and needy but those who were living comfortably within their incomes. The figures secured show the average of the district. In the future, when individual cases arise for investigation and aid, it is hoped that a comparison of the figures secured at the time in regard to the particular case with the general statistics secured from this investigation will be of assistance to those into whose hands the case falls. This is not the only benefit which will accrue from the investigation. At some future time, perhaps five or ten years from now, another investigation can be made over the same territory. The figures got at that time can be compared with those secured this year, and changes in the general trend of life in the district will be brought out.

Briefly we might say that this investigation is one of several steps now being taken by the Charity Organization Society to place their work on a higher plane. They desire not only to handle specific requests for charity but to have a comprehension of the broader situation. They wish to be in a position to help society in general as well as certain individuals in particular.

Three districts were selected in which the investigation was to be made. They were chosen, not because they were worse than any others in the city, but because, in the opinion of those having charge of the work, they were typical average districts.

The investigation was planned and carried on through the united efforts of the special committee of the Charity Organization Society and the Department of Economics and Social Science of Indiana University. Professor U. G. Weatherly of the University, prepared the schedules and exercised general supervision over the work. The writer of this thesis, a graduate student in the Department of Economics, was in active charge of the details of the investigation. Most of the actual work was done by different people in the employ of the Charity Organization Society, but they were assisted in the Christamore district by six volunteer workers from the University.

Many obstacles were encountered. Most of them were overcome, but a few seemed insurmountable under the circumstances and caused a change in the plans of the workers. On the whole the work was most interesting and instructive to the writer, and it is hoped that the report presented in this thesis, supplemented by the schedules which were filled out by the workers, will prove of some value to those who are engaged in social work in Indianapolis.

Most of the schedules were incomplete on some points, as very few families were willing to give all the information desired. For this reason it was deemed best to omit from this thesis the figures secured concerning a number of points. Only by a careful study of all of the schedules can one be led to understand the whole situation in its many phases and all its difficulties.

SCHEDULE USED IN THE INVESTIGATION.

THE FAMILY.

Colored or White............................ Date............................
Address ....
Name .... Father ....
Mother ....
Male children ages..
Female children ages..
Family Normal.................. Father dead .... Desertion ....
Mother dead .... Desertion ....

EXTRACTION.

Indianapolis born ....
Indiana born ....
American born ....
Foreign born ....
Length of residence in district..
Length of residence in city..

HOUSING.

Character of neighborhood....................

Condition of street....................

Kind of house—Condition....................

Number rooms—Size ....

Walls and floors....................

Windows.................... Dark rooms....................

Cellar.................... Sewerage.................... Plumbing....................

Water supply.................... Location of well....................

Closets.................... Location....................

Lighting.................... Garbage disposal....................

Laundry.................... Conditions of washing and drying....................

Yard.................... Character.................... Size....................

Sleeping accommodations—Number in rooms....................

Cooking ....

Character of furniture....................

Home ownership—How purchased....................

Mortgage ....

Lodgers or boarders....................

Bathing facilities ....

General cleanliness and order....................

Rent per month....................

Landlord ....

INCOME AND EXPENSES.

Weekly earnings of breadwinner....................

Other family earnings....................

Average family earnings per week....................

Income aside from earnings....................

Savings—

- Savings bank ....
- Building and loan....................
- Dime savings ....
- Other savings ....

Insurance.................... Chattel Loans.................... Rate....................

Purchase on installment....................

Expenses—

- Rent ....
- Clothing ....
- Food—Chief things cost....................
- Heating ....
- Lighting ....
- Recreation, amusement ....
- Car fare ....
- Taxes, dues, contributions....................
- Other items ....

INDUSTRIAL STATUS.

Occupation of chief breadwinner..

Wages..Skilled or unskilled

Day or night work..

Employed married women..

Details ....

Children employed ....

Details ....

Other members employed..

Home conditions of employed women..

Unemployment—Amount per year..

SOCIAL CHARACTERISTICS.

Church membership ....

Church attendance.................... Sunday school....................

Children at school.................... Truancy....................

Clubs.................... Fraternal orders....................

Labor organizations.................... Means of recreation....................

Child-helping agencies ....

Charity received.................... Drinking habits....................

Gambling.................... Character of reading....................

General moral status..

REMARKS.

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District Number Twelve.

Our special investigation of housing and living conditions was begun in the southwest part of Indianapolis. The district covered is bounded on the north by the Vandalia Railroad tracks; on the east by Capitol Avenue; on the south by Morris Street and on the west by White River. No special characteristics set off as a unit, separate from other parts of the city, the district within the boundaries just named. The Indianapolis School Board has arbitrarily made it into a school district, and for the purpose of this investigation we chose the same territory. Even as a school district the feeling of solidarity is not as great as it might be. This is due to the fact that a large number of children go to parochial schools instead of to those provided by the State.

This is a district of homes. The inhabitants are mostly laboring men, a large percentage of whom are native born whites. Of those who come as immigrants from other countries, the greater part are Irish and German. There are not over ten families of South Europeans within the district. Along two streets in the best residential part of the district are found a number of Jews. In recent years they have been buying property here, apparently with the intention of making a neighborhood of comfortable Jewish homes. In the southwest part of the district there is a small colony of negroes. They live on one or two streets, more or less set apart from the remainder of the district. With the few exceptions just named the population is made up principally of white American born laboring people.

There are within the district two planing mills, a furniture factory, two packing houses, a brewery, two freight depots and several other industrial concerns, but they furnish employment for only a part of the men who live near them. Many of the others cross the river and work in the stock yards, the packing houses or one of the numerous manufacturing establishments of West Indianapolis. Others go north or east into adjacent parts of the city, finding employment in various lines of business.

Only a small per cent. of the women of the district have any employment other than their housekeeping duties. Of those who do add to the family income by their labors, 78 per cent are engaged in laundry work in their own homes or in doing housework away from home. The other 22 per cent includes women who work in factories, in mercantile establishments and offices, as well as a few who are professional nurses, dressmakers and teachers. With a few rare exceptions child labor is unknown within this district during school months. The truancy department of the city schools has been very efficient in stamping out this evil. During the summer months when truancy officers are not active one or two establishments in the district are said to employ a large number of children. It is the duty of the state factory inspectors to prevent this, but for some reason they do not do so.

Retail stores are numerous within the district, but none of them have a very large patronage. The distance from the downtown business district is so short that it does not prevent the people of this district from trading there. On market day scores of women may be seen going to the city market place. They can very conveniently go and come on the street cars, but many of them walk at least one direction. The report of one of the other districts investigated will show that its distance from the heart of the city has a marked influence upon the people and their finances. This is not the case in the district which we are now studying. Street car fare is an item of very slight importance to these people. When they wish to go to town they walk unless it is very bad weather. From one point of view this would appear to be a benefit, but when looked at from the other side it is evident that these people will go to town more often, and will thus probably be induced to spend both time and money which might be put to better use. The homes of the people in this district are nearly all in frame cottages, either single or double. Some are in rooms above, or in the rear of, stores and a few are in apartment houses. No real tenement blocks are found. As a rule the cottages are small. It was found that the average family has 3.9 rooms. Only a very few houses are of recent construction. Most of the others could be materially bettered in appearance and comfort by the work of painters and carpenters.

This district has few social features which can be said to be characteristic or of general interest. Social settlements, clubs, etc., are lacking. Many of the men belong to one or more lodges, but these orders are chiefly for insurance rather than for fraternal association. The children find in the school their greatest relief or change from the conditions surrounding their homes. Many things are done by the principals and teachers, or through their influence, for the enjoyment and social uplift of the children. Lack of both time and funds prevents them from doing many other things which would do much to influence for good the lives of the children of this district.

As this is primarily a residence district, it follows that it contains a number of churches. There are seven, all of them of some protestant denomination. One is a German and another a Swedish church. The Catholics of the district—there are a large number of them—belong in either the Saint John's or the Sacred Heart parishes. Both of these churches are outside of the district itself. The results of the investigation do not show to what extent the various churches do social as well as religious work. It is known that one of them conducts a free kindergarten, and another some children's clubs. The work of the others seems to be along old-fashioned religious lines rather than those followed by modern churches.

In opposition to the good which may be accomplished by the schools, churches, branch library, etc., we find some demoralizing forces hard at work. The district is full of saloons. At the intersections of all prominent streets there are from one to four saloons. Within the district the total number is thirty-four. Women as well as men are habitual beer drinkers. The statistics of expenses do not show that much money is spent for drink, but it is known beyond a doubt that on this point we were misinformed in most cases. Two or three times during the day many of the women of the district can be seen going to the saloon with a bucket for beer. While this may not in itself be wrong, it is safe to say that it has a demoralizing influence upon the life of the community.

The question of the recreation of adults in this district is an important one. As on the subject of drinking, definite information was hard to gain. Less than one-third of the people admitted that they had any form of recreation other than home life. Not one-tenth would say that they patronized theaters or five-cent shows as often as once a week. Yet people who have long been observers in this district declare that a great many of its inhabitants are regular patrons of the Park Theater, going two or three times a week, if the bill changes that often. Located within the district are two five-cent shows, both of which do a flourishing business every night. No one would think for a moment that their patrons come from other parts of the city. They live in this district. In spite, therefore, of the statements of these people that they do not spend their money for pleasures of this kind, we are forced to believe beyond a doubt that they do. This form of recreation, when indulged in only occasionally, may be harmless or even beneficial. But when continued night after night and week after week, it is demoralizing and harmful. Families in which every cent of the weekly income is needed to supply the necessities of life are known to spend from fifty cents to a dollar a week on five-cent shows. Women and children become fascinated by them and are willing to sacrifice clothing, or even food, in order to see a picture show. The overthrow of this pernicious influence is a task which can be accomplished only by the united efforts of all educational, social and charitable workers, who come into contact with these people. An educational campaign is necessary to overcome the evils resulting to working people from the cheap theater and five-cent show habit.

The Family. This investigation took us into the homes of 822 families[1] who were willing to give us at least a part of the

[1] A family may consist of one or more persons.

information which we desired. The following statistics were secured covering the general status of the family:

Total number of families		822
Normal families (78%)	640	
Families not normal (22%)	182	
		822
Cause of irregularity—		
Father dead		91
Mother dead		37
Father deserted		37
Mother deserted		7
Never married		10
Total not normal		182
Total number of people in 822 families		3,346
Average number per family		4.07
Total number of children in 822 families		1,881[2]
Average per family		2.29
Male children		937
Females		944

The nativity of the 822 families reported is as follows:

Indianapolis born	115	13.9%
Indiana born	263	32%
American born	230	28%
Foreign born	214	26.1%

The study of housing conditions, as shown by the schedule printed on pages 112-114, included the following points: kind of house; existence of cellar, sewerage and plumbing; the water supply; closets; kind of lighting; number of rooms; rent, property ownership by resident, and other items of minor importance.

Single houses	729	88.7%
Double houses	74	9.0%
Apartment houses	19	2.0%
Cellar—		
Yes	575	70%
No	187	30%
Sewerage—		
Yes	181	22%
No	641	78%

[2] Children as used here refers to the number of sons and daughters living at home as part of the family. We exclude all who are married, dead, or live away from home. Our figures therefore show present size of families, not birth rate.

Plumbing		
Yes	69	8.3%
No	753	91.7%
Water supply—		
City	148	18.3%
Well or cistern	678	81.7%
Closets—		
Inside	19	2.3%
Outside	803	97.7%
Lights—		
Oil	736	89.5%
Gas	67	8.2%
Electric	19	2.3%
Garbage taken away by city wagon	...	58%
Own their own property	214	26%+
Average number of rooms per family		3.97
Average weekly rent per family		$1.85
Average rent per room		$1.86

From these figures it is evident that the homes of a great majority of the people in this district are in small cheap houses, devoid of modern conveniences. Only 18.3% of the families enjoy the benefits of city water. The remainder are dependent on old-fashioned wells and cisterns. It is safe to assume that in many of these the water itself is impure. The close proximity of many of the wells to outside closets and stables is strong circumstantial evidence that the water cannot be pure. It is safe to assume that a careful examination of the water from each of the wells or cisterns in the district would result in the condemnation of a large number of them. For the sake of the health not only of the people of this district alone but of those of the entire city, this examination should be made.

The figures show that only 2.3% of the families use inside water-closets. All the rest use the old-fashioned out closets. A great many of these are old dilapidated structures and are a menace to public health and morals.

As a general rule the yards surrounding the homes are small. Most of them were full of ashes, tin cans and rubbish and presented anything but a cheerful, homelike appearance.[3] The home-decoration committee of any charitable society would find

[3] This investigation was made in the middle of winter. Perhaps the season had something to do with the appearance of the yards. In many cases, perhaps, the ashes and trash were hauled away in the spring, and the yards given a better appearance.

much room for work in this district. In most cases the only thing which would prevent the gardens being improved by grass, flowers, etc., is a lack of inclination on the part of the people. Sunlight and air are not scarce here, as they are in tenement districts.

Industrial Status. In the 822 families from which information was secured it was found that 44% of the breadwinners were skilled laborers. These men made an average weekly wage of $13.50. The unskilled breadwinners in the other families make an average weekly wage of $9.72. Definite information in regard to the amount of unemployment per year was very hard to obtain. But from the material at hand it appears that the skilled laborers were out of work about one month each year. The common unskilled workers find regular employment more uncertain. They average from six to ten weeks of idleness each year.

Income and Expenses. The following table shows the weekly income and expense of the average family in the district:

Earnings of breadwinners	$11 92
Other family income	4 38
Total weekly income	$16 30
Weekly expense—	
Rent	$1 85
Food	7 07
Heat and light	1 56
Insurance	44
Loans and installment	37
Car fare	10
Other regular items	46
Unaccounted for	4 45
Total	$16 30

The average of $4.45 "unaccounted for" appears large. Several things must be taken into consideration in regard to this point. In the families where the "unaccounted for" item runs above the average it is usually the case that the total family income is much larger than the wages of the breadwinner. Usually a grown son or daughter is at work making good wages. This wage has been counted in as part of the family income, although in reality only a small part of it is used to defray family expenses. The remainder is spent by the person who earns it in whatever way he sees fit.

Owing to the fact that it was found by the investigation that only a few families knew how much money was spent per week or month for clothing, that item does not appear separately under the head of weekly expense. All money spent for clothing, then, is included in the "unaccounted for" item.

Sickness occurs occasionally in every family. Unless some provision made for the payment of medicine and physicians' bills brings them under the head of "other regular items," they are included in "unaccounted for."

Numerous other things help to make this item large: money spent for beer and liquor, for recreation and amusement, for contributions to church and charity, for school books, for all articles used around the home not bought at grocery, or on installment. When all these things are taken into consideration one sees that the "unaccounted for" item is not abnormally large.

If I were asked what is the greatest need of this district, I should answer "Social Workers." If there could be established in this part of the city a settlement which should be the center for the social life of the district much good would result. I believe conditions here are ripe for social betterment work. If the scheme could be properly financed and competent managers put in charge of the work, there is no doubt of its success.

District Number Five.

The second district in which our investigation was made lies between Capitol Avenue and White River, from the railroad tracks on the south to New York Street on the north. That part of the district south of Washington Street will be considered by itself under the head of "Foreign District." We now turn our attention to the remainder of the district as outlined above.

Located as it is, very near the heart of the city, we should expect it to be a crowded district. Such is the case. The streets in the southern part of the territory are primarily business streets. Very few real dwelling houses are found on them. By this statement I do not mean to imply that no people live here. On the contrary several hundred of them do; but their homes are either in the rear of stores and places of business or above them. In some of the buildings along these streets we find real tenement house life with all its evils. The streets running north and south from New York Street to Market Street are primarily residence streets. The houses along them are either single or double cottages. They are crowded very close together, little or no space being available for yards. We found dark, gloomy rooms in every house in certain squares. This darkness was caused, not by a lack of windows in the houses themselves, but by the fact that the houses are crowded so closely together that not enough sunlight can get between them. The tables given later will show that over 55 per cent of the families of this district live in either double houses or apartment houses. These figures alone give one an idea of the cramped conditions.

This district has, for the purpose of our investigation, been selected as a territorial unit, but in no sense can it be said to be a social unit. No common interest in schools or churches, business or pleasure, seems to bind together the people with any kind of neighborhood feeling. One cause for this lack of common interests lies in the fact that within this small territory there lives a very heterogeneous mass of people. Twenty-five per cent of them are foreigners,[4] either Irish, German, Italian or Hungarian. Most of these speak English to some extent, but only a few of them can be said to be Americanized. Of the remainder of the people of the district 14 per cent are negroes. Their homes are mostly in the northeast corner of the district, near Indiana Avenue. Thirty-four per cent of the total number of families are classed as American born, i. e., they come from states of the Union other than Indiana. Consider this mass of people —foreigners of different nationalities, negroes, Americans from a dozen different states, and a handful of native citizens of Indianapolis. Could they be expected to mix well in any sort of social organization, or to have many common interests or aims?

It might have been stated at the beginning of this chapter that the territory which we chose to cover in this second part of our investigation, is set off by the City School Board as School District No. 5. But we cannot infer from this that all of the children within this territory go to the same school. The transfer system has been so worked out that School No. 5 has become primarily a foreign school. The native white children of the district and the negroes are sent to other schools not far away, and children living in adjacent districts, whose parents cannot speak English, are in most cases transferred to this school. This division of school interests breaks down one of the principal factors in the development of common social feeling.

[4] We have been forced to omit from this part of our study a number, not exceeding forty, of groups or families of non-English-speaking foreigners.

Within the district itself we find very little evidence of religious life or activity. Only one church is found within the boundaries given, but from this we must not conclude that no religious work is carried on. A number of churches of different denominations and for different nationalities are found near the district in different directions. These are all to some extent attended by the people whom we are studying.

Just as it is impossible to judge the religious life of the district by the number of churches within its boundaries, it is also impossible to judge definitely moral and social conditions in the entire district by the forces for evil which are found here. To be more explicit, let us consider the saloons. There are a large number of them in the district, especially along Washington Street and in its immediate vicinity. A certain portion of their patronage comes from the people of the district, the majority of whom are moderate if not habitual drinkers. But if all of these saloons had to depend upon the residents of the district for their patronage, many would be forced to go out of business. Their patronage comes from various parts of the city. People have business to transact with the cheap stores which are found here; with the colony of junk dealers who make West Washington Street their headquarters; with the packing houses and other large industrial concerns near here.

The city hay and grain market is located in the district. Each day scores of farmers are found here waiting to dispose of their produce. They too are usually patrons of the saloons. Thus we see that the residents of the district should not be charged with supporting the large number of saloons which are found in their midst. Another evil influence exists in the community for the presence of which the residents are not responsible. Along Washington Street, Senate Avenue, Maryland Street and Court Street are found many houses of ill-fame.[5] Over half of the red-light district of Indianapolis is found in this part of the city. On the whole these places are considered fairly orderly and well-regulated, but they nevertheless do a great deal to lower the moral tone of the surrounding community. If they are to be allowed to exist where they now are, steps should be taken to regulate family life near them. No children or young people should

[5] Our investigation was primarily one covering points of family life, income, etc. We consider that there can be no family life in a house of ill-fame, consequently our investigators did not call at any of these places, and we do not attempt to give any figures concerning them.

be permitted to live close to places of this kind, because their influence is undoubtedly demoralizing and injurious.[6]

In the discussion of social factors of the preceding district, we mentioned five-cent shows and their influence. Living as they do, so near the heart of the city, the people of this district come into close contact with places of this kind. I should estimate that there are more than twenty of these five or ten-cent shows within a mile of the center of this district. To just what extent these places are patronized by the people of the district it is impossible to estimate. However, it is known that many of them spend too much time and money on them. It is said that some of the shows in this part of town border close on the line of immorality. A censorship of all these places would certainly be a benefit to the community.

Notwithstanding the fact that several hundred families live in the district which we are now studying we cannot say that it is a residence part of the city. Its south and central portions are filled with various business establishments. The retail stores are all cheap firms handling only inferior goods at very low prices. Along Washington Street are located several junk yards. These establishments do considerable business, but as a rule the men with whom they deal are of a very inferior type. A few industrial establishments of higher rank are also located in various parts of the territory. Among them are Kingan & Company's packing house, the Acme Mills, the Kahn Tailoring Company's shops, the Merchants' Heat and Light Company's power plant, two lumber yards and planing mills, a cotton mill and a number of other firms.

These industries furnish employment to a large number of people, but only a part of them live within the district. The rest come from other parts of the city. Not all of the breadwinners of the families whose homes were investigated work near them. Many of them are common laborers who have no regular employment. Others have permanent positions outside of the district. It is difficult to say why this latter class choose to live under these surroundings when they might be in better parts of the city. Probably it is largely to be accounted for by an utter lack of ambition and desire to improve their life and surroundings.

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[6] I would say that children should not be allowed to live on Washington Street, between Capitol Avenue and West Street, on Senate Avenue from Market Street to Georgia Street, on Maryland Street from Capitol Avenue to Missouri Street or on Court Street from Senate Avenue to California Street.

It was found that 28 per cent of the women of the district are wage earners. The necessity for their labor is in some cases due to the fact that there are in the number a few widows or deserted women upon whom falls the duty of supporting young children. But I estimate that over 60 per cent. of the women employed are married women living with their husbands. They have become wage earners simply because the money which they earn is necessary for the maintenance of the family.

To this brief survey of general conditions we add the definite figures secured by the investigation.

THE FAMILY.

Total number of families	477	
Normal families	356	74.2%
Families not normal	121	25.8%
Father dead	61	50.7%
Mother dead	14	11.5%
Father deserted	26	21.4%
Mother deserted	14	11.5%
Never married	6	4.9%
Indianapolis born	38	8.1%
Indiana born	175	36.6%
American born	166	34.8%
Foreign born	98	20.5%
Number of children	798	
Average per family	1.6	

HOUSING CONDITIONS.

Single houses	214	44.8%
Double houses	172	36%
Apartment houses	91	19.2%
Cellar—		
Yes	286	60%
No	191	40%
Sewerage—		
Yes	227	47.6%
No	250	52.4%
Plumbing—		
Yes	133	27.9%
No	344	72.1%
Water supply—		
City	198	41.5%
Well or cistern	279	58.5%
Inside closets	99	20.8%

Lights—		
Oil	333	69.8%
Gas	119	22.8%
Electric	25	7.4%
Garbage taken away by city wagon	382	80%
Own their property	44	9.2%
Average number of rooms per family (including rooms used by lodgers)	4.17	

A comparison of these figures with those resulting from the investigation in District Number 12 gives some interesting results. These are, however, so self-evident that but little comment is needed. The large increase in the number of people living either in double houses or in apartment houses is a significant fact. Resulting from it we find an increase in the number of homes in which are found modern conveniences along the line of sewerage, plumbing, city water and inside closets. Upon their face these facts would seem to indicate better housing conditions. But such is not necessarily the case. Several of the tenements, although furnished with city water, etc., are worse places for homes than the small old-fashioned cottage. Dark rooms and bad air, to say nothing of bad social surroundings, are common in the tenements. In the cottages they are practically unknown. The number of people who own their own property is much smaller in the district now under discussion than in the preceding one. This is a natural result of higher property value. A poor man in this district cannot acquire property as easily as one in the other part of the city. The fact that the average weekly rent here is $2.43, as compared with $1.85 in District Number 12, is another indication of higher property values.

INCOME AND EXPENSE.

Average wage of chief breadwinner	$10 72
Average other incomes	3 62
Total average family weekly income	$14 34
Average weekly rent	$2 43
Average weekly food expense	6 58
Average weekly heat and light expense	1 60
Average weekly insurance expense	43
Average weekly installment and loan expense	52
Average weekly "other regular items"	50
Average amount not accounted for	2 28
	$14 34

Foreign District.

In the heart of Indianapolis, only a few squares from the principal business district, is located the foreign or "Hunyak" quarter. It is not over one-half of a square mile in area. But it contains the homes, stores and loafing places of several hundred foreigners, in addition to a packing house and other industrial concerns. It extends from Washington Street on the north to the railroad tracks on the south, and from Missouri Street on the east to the river on the west. A number of reasons may be assigned for its location and delimitation within the territory just described. The primary ones are:

(1) The Kingan & Co. packing house is located in the center of this district. Large numbers of these foreigners are employed in or around this establishment. They naturally desire to live near their work, hence they find homes in this quarter.

(2) Within the past two years the various railroads running through this part of the city have been engaged in the elevation of their tracks. This work has furnished employment to hundreds of laboring men, most of them foreigners. In addition to the track elevation in the city, two of the railroads which pass through this district have been doing an enormous amount of reconstruction work on their lines west of Indianapolis. Thousands of foreign laborers have been employed on this work. Naturally, on account of its convenient location, this district was made the headquarters or, if we may call it that, the permanent home of most of these men. When they quit work at any particular point they drift back here until they obtain new employment.

(3) The third cause of the existence of this foreign district is probably the most important one, since in many cities it is given as the primary and only reason. There seems to be a marked tendency on the part of these foreigners to live close together in a little district set off from the remainder of the city. This desire to live among one's own people, even when in a strange land, is a perfectly natural one. The American quarter in numerous cities of Europe is the result of the working of the same tendency.

This desire on the part of the "Hunyaks" to live close together does not meet with any discouragement from the people of Indianapolis, or in fact of any other of our American cities. The coming of a group of foreigners or even of a foreign family into any district populated by American laboring people is not heralded with pleasure. They prefer to keep them away from their homes and out of their sight. Only the very poorest class of American laborers are content to live by the side of the "Hunyaks."

In this small "Hunyak" district in Indianapolis are found representatives of many nationalities and people. The following table shows the results of the investigation:

Nationality.	*Men.*	*Women.*	*Children.*
Roumanians	284	33	19
Servians	187	1	2
Macedonians	104	1	..
Hungarians	50	6	4
Slavonians	35	3	5
Bulgarians	32	0	..
"Mohammedans"	30	0	..
	722	44	30

It is interesting to note the number of Roumanian women in comparison with the number of Servian women. All of these Roumanian women (with the exception of three) were, with the assistance of their husbands, managing boarding houses. In each of these from nine to fifteen other Roumanians lived. One rate seemed to be established for all boarding houses, no exceptions being made on account of quality of food or lodging. The boarders all pay $2 per week for board, and $3 per month, or 75 cents per week, for lodging and washing. On the latter item the proprietors make money, as twelve men paying $36 per month can easily be lodged in a house on which the monthly rent is about $14. But under prevailing high prices the cooks find it very difficult to furnish sufficient food for these men at $2 per week.

The Servians and most of the men of other nationalities seem to prefer to live in groups of from eight to twelve men. In some cases each man does his own buying and cooking, while in others one man cooks for all and the expense is divided pro rata. In these groups the rent is divided equally among the men occupying the house.

Only a very few of the men in the district had regular full time work.[7] Most of them were working part time, and many of them were out of work altogether. The average weekly wage of those who were working was $3.48. This of course is very

[7] This investigation was made during the winter and early spring, when very little outdoor work was going on.

nearly a mere subsistence wage, as in addition to the board and lodging expense of about $2.75 per week, they must buy clothing, tobacco, beer, etc. In the summer time when there is plenty of work for ten hours each day, these foreigners save a large per cent of their wages. The cost of living increases but little over what it is in the idle months and as wages are double or treble they can save a considerable part of their income. Other investigations have proved that much of the money thus saved is sent to relatives or friends in Europe.[8]

Housing. There are three types of buildings used as homes of foreigners in this section. These are cottages—either single or double—tenement blocks built for this purpose, and business blocks in which upstairs or back rooms are rented out as dwelling places.

All rental rates in the district are abnormally high.[9] This fact is due to more than one cause. Among them are:

(1) The greed of the landlords and desire for large profits on their investments.

(2) The demand for houses for the foreigners and the limited supply.

(3) Ignorance of foreigners as to what rental they should pay, and their inability to make bargains because they cannot speak English.

(4) The fact that nearly all the houses, especially the apartment houses, and the rooms in the business blocks are sub-rented once or twice before the inhabitant gets them. Each renter makes a profit, which is of course added to the rent.

(5) The fact that during the summer months a great number of these foreigners are out of the city engaged in railroad work. This leaves many of the houses empty. In way of compensation a higher rent is charged during the months they are occupied.

The houses in this district are nearly all dilapidated buildings. An inspection of any one of them would lead one to believe that not one cent had been expended upon it in the way of repairs for many years.

In many of the cottages the paper and plastering is off the walls. The floors are nearly all bad—many of them are damp

[8] An attempt was made to find out how many of these foreigners were married and had families in their mother country. We were unsuccessful in this, as they all showed great reluctance in giving the information about themselves, and absolutely refused to tell us about other members of the group who did not happen to be at home when we called.

[9] Our investigation revealed that the average rent per room in this foreign district is $3.27 per month; while in the district a few squares south, which is inhabited by a native white population, we found an average of $1.78 per room for much better houses.

the year round—and at least five houses visited showed water oozing up between the boards when stepped upon. Most of them had a sufficient number of windows to have made them reasonably light, but recent crowding in of new buildings, together with the breaking out of window glass and its replacement by boards, have made most of the houses very dark.

In a few instances the people living in these cottages still get their water from old wells. But through the efforts of the various health officials most of the wells have been condemned and abandoned, and the houses supplied with city water. One hydrant usually supplies three or four families or groups of men. None of the cottages are connected with the sewer. All of them have old-fashioned out-closets, some of them private and some of them semi-public affairs. All of them are filthy and unsanitary in the extreme. The yards surrounding the cottages are mostly full of rubbish.[10]

The real apartment houses in the district are of comparatively modern construction, but the hard usage to which they have been put has given them the appearance of old buildings. In many of the rooms the walls are in bad condition, but the floors are in most instances in fairly good shape. The suites as a rule contain two or three rooms, all of which have windows opening either on streets or on courts. These courts are very dirty, wet, ill-smelling places, half filled with garbage, tin cans, etc.

The numerous business blocks in which rear and upstairs rooms are rented to foreigners as dwelling places show the worst housing conditions in the district. In many of these buildings there are dark rooms—those having no windows or doors opening into streets or courts—which are inhabited by groups of men. Ventilation and sanitary conditions in nearly all of these buildings are very bad. A sickening, disagreeable odor is present, even in winter. In the summer months it is unbearable. Many of the rooms in business blocks are not occupied as permanent homes by these men, but are simply temporary lodging places or hotels. The guests sleep on the floor and every one feels free to have any amount of trash, food scraps, etc., upon the floor.

It can easily be inferred from what has already been said that the inhabitants of this district are crowded together. This is true, not only in regard to the number of families or groups of

[10] Within the last few weeks the City Sanitarian has ordered and enforced a cleaning up of the premises.

men which are housed in the district, but in regard to the number of individuals living in each room or suite of rooms. The average number of rooms in a house or suite is three. One of these serves as kitchen and dining-room, and, in most cases, as sleeping-room for the cook. In the other two rooms we find on the average 10 3/35 persons. In most of the houses visited we found from six to eight men sleeping in each room. (The average is lowered to 5 3/10 by a few cases of only two people occupying a room). The men usually sleep on single cots arranged around the walls in the most convenient way. The bedding consists usually of a miscellaneous assortment of blankets, comforts, pieces of old carpet, etc. Sheets and pillows are very rare. In only one or two houses did we find any effort at ventilation of sleeping rooms. Naturally the air in them is very heavy and foul from the odor of the cooking, tobacco smoke and the impurities thrown off from the lungs of the men.

A few examples of conditions actually discovered will help in the comprehension of the situation. Five men were found to be living, cooking, eating, sleeping and loafing in one room on the second floor of a block on Washington Street. This room had no window or door opening on a street or court. It was so dark that the men were forced to burn an oil lamp all day in order to see anything in the room. The air in this place was sickening.

In another room in the same building nine men live in two rooms, one of which is dark. Opening out of this latter room is an ordinary wardrobe or closet about six feet long and thirty inches wide. In this closet there is a cot, upon which a man sleeps. One of the Indianapolis health officers recently made a visit to this place at night and found a man sleeping in this closet with the door locked tight. In this same building there are many other dark rooms occupied by from four to eight men. The rent of these single dark rooms is from $3 to $6 per month. On South California Street in two upstairs (attic) rooms over a saloon twelve men cook, eat and sleep. Four of these men occupy the kitchen, and the other eight the remaining room. In the adjoining house seventeen men, one woman and two children live in two rooms. On West Pearl Street, in a small three-room shack, a Roumanian and his wife are keeping boarders and roomers. In the house next door fifteen Servians live in two rooms. Further examples are unnecessary, although many more could be given.

The question naturally arises, why do these men want to live in such large groups? The investigation brought out that in each little group of these men there was some common bond of union. They are not only of the same nationality, but they come from the same town, or were relatives or personal friends in their native land. Every week or month there are new arrivals. If a group of them come from the same district they remain together, occupying a common house in this country. Frequently also one or two men will come to America to join their friends or relatives. No matter how crowded are the conditions under which these people are living, they will always make room for the newcomers. The tie of friendship or blood is far stronger than any theories of healthful living which may be implanted in their minds.

People who are familiar with conditions among these foreigners, and I trust also even those who know nothing of the situation but what they gain from this brief sketch, are all impressed with the idea that there is great need of improvement. Considering the question from a purely selfish standpoint the people of Indianapolis cannot afford to allow such conditions to exist. The danger of contagious diseases or pestilence is too great. Any epidemic which gains a foothold here would spread like fire over the west end of the city.

Taking a broader social view of the question, it is evident that such conditions should not be suffered to exist. If immigration to America is to be open to all nationalities and classes of people without restriction, the people who come here will have a marked effect upon future generations of American people. Many of their habits and customs will stay with them for generations, changing a little under new conditions, but remaining fundamentally the same. Our customs and traditions will be likewise modified by theirs. These people by naturalization, and their descendants by birth, will be American citizens. Should American citizens live or be permitted to live under conditions such as these?

How are new conditions to be brought about? By education? Doubtless, to a certain extent. But the education of people like these to a point where they will desire to live hygienically, is a slow process, too slow for our present needs. We need stringent laws and strict law enforcement. These people cannot comprehend what they should do or why they should do it. Like young children they should have their actions regulated by authority until they reach a point of understanding. Nor should these laws apply solely to these ignorant foreigners. The property owners should be prevented from renting old dilapidated, unsanitary houses, and to a certain extent at least, it should be their duty to prevent overcrowding. Until some such radical steps are taken, living and housing conditions among the foreigners will continue to be a disgrace to the people of Indianapolis.

Christamore District.

The third and last district in which our investigation was carried on is called the Christamore district. Located in the northeast part of the city near the Atlas Engine Works, it is bounded on the north by the Belt Railroad near Twenty-first Street, on the east by Roosevelt and Hillside Avenues, on the south by the railroad tracks near Massachusetts Avenue, and on the west by the railroad tracks between Lewis and Cornell Streets. The district is not rectangular in shape, but in size it is approximately seven blocks long east and west and five blocks wide north and south.

The fact that we call this the Christamore district indicates that it differs from the others studied, in that it has a special characteristic which gives it a name. This special characteristic is a social settlement. It is now called Christamore or the College Settlement, but it was established as, and called for some time, "The Butler Settlement." Details of the management and results of the work at Christamore, interesting as they are, must be omitted from this study. By way of a general statement we may say that it is the desire of those in charge that the settlement become the social center for the white people of the neighborhood. A new settlement house, built for the purpose, promises much for the success of the enterprise. Here are found meeting places for the numerous social clubs, the majority of which are for young people, although some are for mothers and fathers. The work done by the various clubs differs in detail, but it all leads toward a common end, social uplift. In the children's clubs the fundamental object seems to be to inspire a spirit of real patriotism, a respect for and knowledge of, self-government, and cultivation of a spirit of usefulness. In the girls' clubs, cooking contests, sewing bees, etc., have a prominent part along with social enjoyment. The mother and father clubs have a more serious purpose, although much effort is put forth to prevent them from being dry and uninteresting.

Gradually, month by month, and year by year, the influence of the settlement is broadening; the good accomplished is becoming more far-reaching. At times reactions may set in, but in the long run the settlement will always be a great social power in the district.

We visited the homes of five hundred families in which we were given the information we desired. These people are divided into two classes not greatly differing in size, two hundred and ninety-one families being white, and two hundred and nine colored. All over the district it is a common thing to see negroes and whites living side by side in a very neighborly manner. On one or two streets in the eastern part of the district very few, if any, negroes are found. The converse is true of Yandes, Lewis and Alvord streets in the west part of the district. Here the white family is the rare exception. It is the belief of the managers of Christamore that the color line is not drawn closely enough in the district. Hence they, as part of their plan of action, have decided to exclude negroes. The settlement is open only to white people.

A few years ago this district was inhabited almost entirely by white people, most of whom worked in the Atlas Engine Works. At that time this company was employing large numbers of laborers, both skilled and unskilled. Most of their men had regular work and were fairly prosperous. Later there came a time when the Atlas works ran only part time. Then they decreased their capacity and materially cut down the number of men employed. As a result many laborers began to look for work elsewhere. They went either to other cities or to other parts of Indianapolis. Thus many houses were left empty and for rent. Negroes began moving into the district because they here found relief from the congested conditions of the Indiana Avenue district. This movement of negroes, which was at first very gradual, became quite rapid until at the present time we find that nearly half the population of the district consists of colored people. Their coming had an effect upon the other people of the district. Many of the better families who formerly lived here have moved away because they object to living in a colored district. While the statement itself is scarcely susceptible of proof, many people who are familiar with conditions in the district contend that the general moral tone and the standard of living of the whites of the district have been lowered by contact and association with the negroes.

It would be impossible to forecast the future of the district. Whether its population will eventually be mostly white or mostly negro depends to a large extent upon the policy of the Atlas Engine Works. If that establishment again begins production on a large scale, and furnishes employment for hundreds of men (they employ only white men), we may expect to see the negroes crowded out of the district. The houses will be remodeled and become the homes of white laboring men. But if a renewed activity of the engine works or some unexpected influence does not set in to counteract the tendency of the negroes to move into the district, we may expect to see the white people gradually move out, with the result that this section of the city will become a regular negro quarter.

It has already been intimated that the Atlas Engine Works is the most important industrial concern in the district. Among the other establishments which are located here are a large stove and range factory, two lumber yards and planing mills, and a bottling-works. A large number of men go outside of the district to find employment. Many of them, especially the negroes, are common laborers, teamsters, coachmen, etc., who work in various parts of the city.

All of the women who work outside of their own homes go out of the district for employment. Some of them work in down town stores or offices, or in factories in other parts of the city, but a large majority of them, especially the negroes, are engaged in housework. The best residence part of the city is located just a few squares west of this district, hence it is never difficult for the good domestic servants who live here to find work near their homes.

Child labor in factories is unknown in this part of the city. It is reported that a number of children who live here are illegally employed in down town stores, but our investigation did not establish definite proof of this statement.

Turning our attention for a moment to the subject of retail stores, we find somewhat the same conditions existing here as in District Number 12. There are numerous grocery, dry goods and notion stores in this part of the city, but all of them are small.

Their purpose seems to be to supply to the people of the district the little things which they have neglected to buy down town, or the big things which they do not wish to carry so far. In other words, the people of this district do much of their buying down town. They patronize the city market and the large stores. They are compelled by the distance to come and go on the street cars, but they declare that they save more than this item of expense by buying down town.

As has been said, this is primarily a residence district. A word in regard to the kind and condition of the houses occupied, is naturally in order. As will be shown later (p. 137) in the tables, 70 per cent of the homes are in single cottages, and 27 per cent in double cottages. About one-half of these buildings are old, that is, they have been in use for fifteen or twenty years. Nearly all of these older houses are set low on the ground with little or no foundation. In the early years this district was very marshy. During the winter and spring months water stood in ponds over the entire district. The modern system of surface drainage has done much to remedy this condition, but there is still much complaint. We were told that water stood for days in nearly two hundred yards last spring. In the cases where these low yards contain houses built with little foundation, conditions were far from good. A few women complained that surface water filled their cisterns and vaults causing them to overflow into the yards. In the last few years all new houses have been constructed with good foundations. As drainage is being gradually improved, we can safely prophesy that it will not be very long before the surface water troubles will be done away with.

Social Characteristics. The district has but few social characteristics of general influence. Among them the Christamore Settlement stands out most conspicuously. Its work has already been commented upon. The children living in the territory covered by the investigation attend school in four or five different districts. Owing to this fact the development in the community of any general feeling of school pride or school interest is impossible. This is a point to be regretted by those interested in the social welfare of the people of the district. The church comes next to the home and the school as a factor in social betterment. In the Christamore district we have four churches. In addition to these there are two on College Avenue which are attended by a number of people whose homes we visited.

Here, as in the other districts, we find forces for evil working in opposition to the better elements of society. There are about twenty saloons in the immediate district around Christamore. Although many of them are very dirty places, they are the loafing places of the men of their neighborhood. Owing to the distance down town, the men who desire to leave home of an evening find it impossible to go there. Consequently they loaf in the corner saloons in their own neighborhood and become poisoned by cheap whiskey, bad beer and impure atmosphere. In the other districts we have mentioned five-cent shows are a factor in the social life of the community. We find only one place of this kind near Christamore. My opinion concerning places of this kind was advanced in the discussion of their presence in District Number 12. It is not necessary to repeat it here, but it is to be hoped that no more "nickel shows" will secure a foothold in this part of the city.

HOUSING CONDITIONS.

Single houses	350	70 %
Double houses	138	27.6%
Apartment houses	12	2.4%
Total number of homes	500	
Cellar—		
Yes	212	42.4%
No	288	57.6%
Sewerage—		
Yes	98	19.6%
No	402	80.4%
Plumbing—		
Yes	26	5.2%
No	402	94.8%
Water—		
City	98	19.6%
Well	402	80.4%
Inside closets	6	1+ %
Lights—		
Oil	429	85.9%
Gas	65	12.9%
Electric	6	1.2%
Garbage taken away by city wagon	361	72.2%
Own their property	75	15 %
Rented houses	425	
Average rent per month	$8.14	
Average rent per room	$1.73	

A comparison of these figures with those secured in District Number 12 shows that housing conditions are very similar in the two districts. A large majority of the people live without the benefits of modern conveniences. Not only do they lack the comforts of modern homes, but they live under the unhealthful surroundings of primitive cities. Water from wells or cisterns is used by 80.4 per cent of the families. The fact that the land in this part of the city is low and that water stands in the yards has already been mentioned. The danger which comes from drinking water which may have been polluted by impurities in the surface water is very great. This danger could be eliminated by the extension of city water mains and careful inspection of wells.

At the present time it would probably not be expedient for the city to attempt to enforce sanitary sewage in this district. But from the standpoint of public health it would at least be proper to enforce stringent regulations in regard to outside closets and garbage disposal. It will be noted that 72 per cent of the families have their garbage hauled away in the city wagons. About one-half of the remaining 28 per cent feed all their garbage to chickens. The other 14 per cent throw it out into the streets, alleys or their own yards. This last practice should be stopped by regulation and inspection.

THE FAMILY.

Number of families investigated—		
White	291	
Negroes	209	
Total	500	
Number of people	1,700	
Average per family	3.4	
Normal families	376	75 %
Families not normal	124	25 %
Father dead	56	45.2%
Mother dead	11	8.8%
Father deserted	37	29.8%
Mother deserted	14	11.3%
Never married	6	4.9%
Number of children in 500 families	896	
Average per family	1.7	
Number of childless families	164	
Indianapolis born	27	5.4%
Indiana born	150	30 %
American born	294	58.8%
Foreign born	29	5.8%

Negroes of the Christamore District.[11] The fact was mentioned in the general discussion of the Christamore district, that two streets in the western part of the district are populated almost entirely by negroes. A special study of the cards obtained in their homes brings out some interesting facts:

Total number of families	139	
Normal families	84	60%
Families not normal	55	40%
Father dead	25	45.5%
Mother dead	5	9%
Father deserted	15	26%
Mother deserted	6	12%
Number of children in 139 families	248	
Average per family	1.7	

In a total of 139 families only two were found where both the man and wife were born in Indianapolis. In 14 families both parents were born in the State of Indiana. One family had come to the city from Cuba and was classified as foreign. In the other 122 families either one or both parents were natives of some other states of the Union.

The question is frequently asked "from where do the negroes come to Indianapolis?" The following table shows the native state of the 223 adults who are part of the 139 families under consideration:

Kentucky	123	North Carolina	4
Tennessee	44	Georgia	2
Indiana	32	Mississippi	2
Virginia	9	Pennsylvania	1
Alabama	5	Illinois	1

The average length of residence in Indianapolis of the adults is fourteen years. This average is high because a few people were found who had been among the first colored residents of the city. The great majority of the people had been in Indianapolis only five or six years.

The following table shows the average weekly income and expense of the 139 families:

[11] In order to make a comparison of conditions as we found them among the negroes and whites, we are giving here the figures secured in the homes of 112 negro families on Yandes and Lewis Streets. These negroes have already been counted among the other residents of the district, and the figures secured in their homes make up a part of the general average for the district.

NEGROES.

Average wages of chief breadwinner	$10 13
Average other earnings	2 73
Average other income	39
Average family income	13 18
Weekly rent	$1 84
Food	4 72
Heat and light	82
Insurance	48
Loans and interest	34
Street car fare	38
Recreation	11
Other regular items	28
	$8 97
Not accounted for	4 21
	$13 18
Married women employed, 102	74%

Comparison of the Three Districts.

HOUSING CONDITIONS.

	District No. 12.	*District No. 5.*	*Christamore District.*
Number of houses	822	477	500
Single houses	88.7%	44.8%	70.0%
Double houses	9.0%	36.0%	27.6%
Apartment houses	2.2%	19.2%	2.4%
Houses with cellars	70.0%	60.0%	42.4%
Houses with sewer connections	22.0%	47.6%	19.6%
Houses with inside plumbing	8.3%	27.9%	5.2%
Houses with city water	18.3%	41.5%	19.6%
Houses with electric lights	2.3%	7.4%	1.2%
Houses with gas lights	8.2%	22.8%	12.9%
Houses from which garbage is taken by city wagon	58.0%	80.0%	72.2%
Houses with inside closets	2.3%	20.8%	11.0%
Houses owned by inhabitants	26.0%	9.2%	15.0%
Average number of rooms per family	3.97	4.17	4.69
Average rent per room	$1.86	$2.36	$1.73

THE FAMILY.

	District No. 12.		*District No. 5.*		*Christamore District.*	
Number of families	822		477		500	
Normal families	640	78 %	356	74 %	376	75 %
Families not normal	182	22 %	121	26 %	124	25 %
Father dead	91		61		58	
Mother dead	37		14		11	
Father deserted	37		26		39	
Mother deserted	7		14		14	
Never married	10		6		7	
Indianapolis born	115	14 %	38	8.1%	27	5.4%
Indiana born	263	32 %	175	36.6%	150	30 %
American born	230	28 %	166	34.8%	294	58.8%
Foreign born	214	26 %	98	20.5%	29	5.8%
Negroes	37	4.5%	57	14 %	209	41.8%
Average number of children	2.29		1.6		1.79	

WEEKLY FINANCES.

	District No. 12.	*District No. 5.*	*Christamore District.*
Average weekly wage of breadwinner	$11 92	$10 72	$11 43
Average weekly other family income	4 38	3 62	3 33
Average weekly total income	$16 30	$14 34	$14 76
Average weekly rent	$1 85	$2 43	$2 03
Average weekly cost of food	7 07	6 58	5 55
Average weekly cost of fuel and light	1 56	1 60	1 04
Average weekly cost of insurance	44	43	45
Average weekly cost of loan and installment	37	52	33
Average weekly cost of street car fare	10	....	44
Average weekly cost of other regular items	46	50	52
Average weekly cost not accounted for	4 45	2 28	4 40

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INDIANA UNIVERSITY STUDIES

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LUX ET VERITAS

AN EXAMPLE OF PLAGIARISM AMONG ELIZABETHAN PAMPHLETEERS: Samuel Rowlands' "Greenes Ghost Haunting Conie-Catchers." By Edward D. McDonald

The 'University Studies' constitute a sub-series of the Indiana University Bulletin *in which from time to time are published some of the contributions to knowledge made by instructors and advanced students of the University. At present not more than two or three such numbers are issued a year. The 'Studies' are continuously numbered, and, as needed, a title-page and table of contents will be issued, for binding them up in volumes.*

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INDIANA UNIVERSITY STUDIES

No. 11 BLOOMINGTON, INDIANA SEPTEMBER, 1911

Prefatory Note

THIS study is based upon a paper written by Mr. McDonald for the seminary in Elizabethan non-dramatic literature two years ago. His purpose was to give a connected account of the plagiarisms in the pamphlet called *Greenes Ghost Haunting Conie-catchers,* by S. R., ordinarily attributed to Samuel Rowlands, as an illustration of the methods of one kind of Elizabethan hack writer. The pamphlet is made up of bits stolen from ten contemporary works, some of which thefts are deftly concealed. About half of these plagiarisms have been noticed by various scholars; Mr. McDonald's purpose is to present as complete a view as possible of the debt of the pamphlet to its various sources, verified in detail and illustrated by quotations.

Such studies of separate pamphlets are important as throwing some light on the shadowy figures of minor Elizabethans, and as a basis for generalizations about their methods and standards. The pamphlets have great interest and value for the social and literary historian. The best of them portray vividly and accurately the complex and many-sided Elizabethan life, furnishing a necessary background for any real understanding of Elizabethan thought. But they demand wary handling, they represent all stages of reliability, and there is need for much careful editing before this mass of material as a whole can be safely used. To do a small part of this important work is the aim of Mr. McDonald's essay.

FRANK AYDELOTTE,
Associate Professor of English.

An Example of Plagiarism among Elizabethan Pamphleteers: Samuel Rowlands' *Greenes Ghost Haunting Conie-catchers.*

"And some . . . . think to divert the sagacity of their readers from themselves and cool the scent of their own fox-like thefts, when yet they are so rank as a man may find whole pages together usurped from one author."—BEN JONSON, *Discoveries.*

Plagiarism is a breach of literary ethics. Today we look upon it as a very serious breach. Failure to use quotation marks where present day standards demand them is the one unpardonable sin a writer can commit. Such an offender is at once branded as an atrocious, thieving pirate. Moreover, very tangible methods have been devised for punishing him who maliciously or even innocently lifts another man's copy. Aside from flying in the face of public disfavor, the plagiarist is now accountable to copyright laws, national and international. This has not, however, always been the case. There have been periods in the history of English letters—the Elizabethan is especially in point—when professional writers, like a certain number of college freshmen, believed very thoroughly in the saying, "There is nothing new under the sun." Therefore why scruple to use the scissors and paste method? Why not clip a little here and a little there? Legion is the number of college themes, and numerous the Elizabethan pamphlets—not to mention other productions—thus patched up, and afterwards brought out with a great flourish.

All Elizabethans, from Shakespere down to the veriest ballad-monger, were much freer in regard to borrowing than present day standards would allow. The whole question of Elizabethan plagiarism might seem, therefore, to be very unified and simple: every writer stole from every other writer without leave or license. Unfortunately, the truth about even so simple a question objects to being pigeon-holed; it baffles aphoristic and dogmatic statement. In making a few distinctions I hope not injudiciously to "straine Gnats and passe over Elephants;" I want no pang of conscience upon hearing Samuel Rowlands say to the Bellman, "But you good sir, like a Spider to entrappe onely the smallest flies, suffer the great ones to flie through, you scowre the ditch of a company of croaking frogs, when you leave behinde you an infinite number of venomous Toades."[1]

It is well known that Shakespere, according to present day standards, was an out and out plagiarist. It is also a matter of

[1] *Martin Mark-all* (Hunterian Club edition, 1880.) II, 14.

general information that his methods were called into question even in his own day. There is no good reason to doubt that Greene had Shakespere in mind when he gave expression to his remarkable and oft quoted indictment of the great dramatist's embryonic efforts at playwriting: "There is an upstart Crow, beautified with our feathers, that with his Tygers heart wrapt in a Players hide, supposes he is as well able to bumbast out a blanke verse as the best of you: and being an absolute *Johannes fac totum,* is in his own conceit the onely Shake-scene in a countrie."[2]

In 1592 when Shakespere was yet a novice and Greene, according to one competent judge, "the only comedian, of a vulgar writer" in England,[3] the above accusation contained an element of truth. But then how quickly this truth was dissipated! How thoroughly the *upstart crow's* brilliant achievements gave this indictment the lie! I fancy it has had a rather hollow ring for a goodly number of years—in round numbers three hundred, and more. What if in 1598 or thereabout this *Shake-scene,* according to a habit contracted early in life, took certain liberties with a delightful novel by one Thomas Lodge called "Rosalynde"? What if "As You Like It" does actually owe this novel a good deal—and it actually does? It ought to owe it one thing more, its name. Be that as it may, Jacques, Touchstone, and Audrey are net gain. And this trio is certainly worth while. Intelligence tells us that Shakespere's method has more than justified itself. One could, of course, go through the entire list of plays and sources and still find oneself unwilling to be anything but chary in the handling of the man's name and fame. Here is one case where we make distinctions gladly.

If, therefore, Shakespere's immorality were all that a treatise on Elizabethan plagiarism had to prate about it would be dreary stuff at best. There was, however, in his day a form of pilfering that remained untouched by the hand of genius; this was pernicious appropriation of other men's thought, downright theft and slavish copying of their work. Of this sort of gross immorality Samuel Rowlands in "Greenes Ghost Haunting Conie-catchers" is guilty. For his conduct there is not now, nor ever was, any excuse. That conduct is an excellent commentary on the degraded state of the hack writer. That such catchpenny tracts as "Greenes Ghost" should sell, that the laws, such as they were, protected the pub-

[2] Greene, *Works* (ed. Grosart.) XII, 144.
[3] Chettle: *Kind-Harts Dreame* (Percy Society.) IV, 11.

lisher rather than the writer, is not exactly complimentary to the Elizabethan reading public. But whatever their moral code, nothing can justify Samuel Rowlands' methods. It must be admitted that the author of "Greenes Ghost" is a small man, that the interest in him is mainly of an antiquarian or historical nature, that his chief claim to remembrance is that he lived and wrote when the Elizabethan drama was in flower, that his prose is only fair and his verse for the most part doggerel, even if there are some lines "which Pope would not have disdained to use," and lastly, that he is one of the most arrant pilfering book-makers among Elizabethan men-of-letters.[4] It is principally with this last accusation that we have here to deal. That it is not a false one, will be manifest if we begin at the beginning of "Greenes Ghost," and point out the borrowings as we go along.

This paper will attempt not only to record the results of the writer's study of Rowlands, but also to acknowledge and to register, wherever feasible, the work of others bearing on the particular piece of writing now under consideration. The hope is that this study will have interest not only for the student of Rowlands but for the students of Lodge, Nashe, Dekker, and especially Greene. However, that it may have meaning for readers who are not strictly students of these pamphleteers but who have more than a casual interest in Elizabethan literary matters, the important borrowings together with the original passages will be given entire. When the verbal likenesses between the two are not striking, merely the references will be designated. In this essay will be recorded all the borrowings in "Greenes Ghost" that have, so far as is known, been noticed by those who have written about Rowlands, in addition to what the present writer has discovered.

In 1860, J. O. Halliwell-Phillipps reprinted the 1626 (second) edition of the pamphlet. His reprint had the following preface:

"This tract has been attributed, but apparently on uncertain grounds, to Samuel Rowlands. It was first printed in 1602, and Lowndes also records an edition of the date 1606, but I can find no other notice of the latter. The edition of 1602 is of singular rarity, and has not been accessible to me. If we may believe the editor, S. R., 'this little pamphlet came by chance to my hands, adding somewhat of mine owne knowledge, and upon very credible information'; but statements of this kind are received with hesitation by those acquainted with the literature of the period. That any

[4] Rowlands' right to be called, with more or less reservation, a man-of-letters is quite clear. While he may not have made his entire way with his pen, he was, at least, a free lance. There is a certain independence in him that would have graced many of his abler fellows.

portion of it was written by Greene himself may well be questioned, but it may have been intended as a kind of supplement to his first and second parts of Coneycatching, originally published in 1591."[5]

There is no suggestion of Rowlands' indebtedness to Greene here. I have not seen this reprint, the impression being a very limited one (twenty-six copies), but certainly nothing was made of S. R.'s borrowings. Had there been, the Hunterian Club edition (1880) would have noted the fact. The truth is that this edition also takes practically no account of Rowlands' plagiarism. Certainly it has served a more useful purpose. Almost as though it were intentional, however, the Memoir, the Biographical Index,[6] and the Notes are singularly silent on the matter. Mr. Edmund Gosse, the writer of the Memoir, does point out that Rowlands was quick in adopting new ideas, that he kept his ear close to the ground. Then too Mr. Gosse makes a direct indictment (though not necessarily of plagiarism) against Rowlands when he says: "Martin Mark-all, his contribution to 1610, is an arrant piece of book-making," and argues that the catch-penny nature of this tract and of "The Whole Crew of Kind Gossips" (1609) indicates that "our poet had fallen on troublous days."[7]

The writer is inclined to disagree with this for several reasons. In the first place, "Martin Mark-all" is by no means the first nor the worst example of book-making in Rowlands, as will be shown conclusively. In the second place, although this tract contains lengthy paraphrases and even verbatim excerpts from another source, it is one of the most brilliant—this is none too strong a word—things Rowlands ever did. And lastly the broad humour of "Martin Mark-all" emphasizes a certain sureness of self and an evident smugness in its author. I cannot believe that the days in which Rowlands was having a good deal of fun at Dekker's expense were troublous ones. If so, Martin Mark-all was more than a silent sufferer. Unfortunately all this must remain for the present a part of the great open question, the question of the every day life and habits of the most mystifying of the Elizabethans.

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[5] This preface is given in the Bibliographical Index of the Hunterian Club. ed. I, 16.

[6] This index contains Sir Walter Scott's very interesting advertisement of James Ballantyne & Co.'s reprint in 1815 of Rowlands' *The Letting of Humours Blood in the Head Vaine etc.* (1611) Mr. Sidney Lee in *D. N. B.* dates this reprint 1814.

Mr. R. B. McKerrow was, I think, the first man to point out this poem's dependence upon Nashe and Lodge. See *Works of Thomas Nashe,* notes on Vol. I, 162, 34-5; 208, 23.

[7] *Memoir on Samuel Rowlands.* I, 18.

As to the other writers whose opinions of Rowlands have been collected and set down in the Hunterian Club edition, it would seem that none of them had noticed his high-handed and immoral methods. At any rate they were willing to give him a fair name and to forward his reputation by praise, which if not extravagant, is, at least, more than faint. In the goodly number of extracts given from J. Payne Collier no question is raised as to Rowlands' originality. Mr. Sidney Lee in his article in the Dictionary of National Biography has nothing or almost nothing to say about plagiarism.[8] In speaking of Rowlands' usual subject matter, low London life, he says: "He [Rowlands] owed something to Greene's writings on like topics and is said to have vamped up some unpublished manuscripts by Nashe."[9] All in all, it is only very lately that attention has been called to S. R.'s piracies. Apparently Rowlands designed better than he knew when he schemed to divert the sagacity of his contemporary readers from himself and cool the scent of his own fox-like thefts. I cannot help believing that Jonson struck the compiler of "Greenes Ghost" exactly and that he never described a man's humour better. It only remains now to present the proof upon which this belief is based.

The "Greenes Ghost" pamphlet has the following title-page: "Greenes Ghost Haunting Conie-catchers. Wherein is set downe, The Arte of Humouring. The Arte of carrying Stones. Will. St. Lift. Ia Fost. Law. Ned Bro. Catch. and Blacke Robins Kindnesse. With the conceits of Doctor Pinch-backe a notable Makeshift. Ten times more pleasant than any thing yet published of this matter. *Non ad imitandum, sed ad evitandum.* London, Printed for R. Iackson, and I. North, and are to be sold in Fleetstreete, a little above the Conduit. 1602."

This title-page has the usual catch-penny features, of which a little explanation may be necessary for those unacquainted with the doubtful methods used by the pamphleteers in advertising their wares.

After Greene's death, September 3, 1592, his name was one to conjure with. Writers with a taste for the morbid did not scruple to make stock out of the man's wretched end. Gabriel Harvey was not the only one to feed upon the rubbish pile, though he alone sur-

[8] This article misplaces Rowlands' best known declaration of independence, 'my Penne never was, nor never shalbe, (God saying Amen,) Mercenarie.' This occurs in the dedicatory letter addressed to George Gaywood, a friend to a 'beloved friend' of S. R. (*A Terrible Battle betweene the two consumers of the whole World.* 1606?)

[9] For a discussion of this second accusation, *cf. Works of Thomas Nashe,* ed. R. B. McKerrow, Vol. V, 151, n. 1.

feited. One may be sure that only a partial report of this ghastly post-mortem has come down to us, and we are all the better off for that. Shortly after Greene's death, Nashe in a 'private Epistle' to the printer of "Pierce Penilesse" wrote: "Had you not beene so forward in the republishing of it ["Pierce Penilesse"], you shold have had certayne Epistles to Orators and Poets, to insert to the later end; As namely, to the Ghost of Machevill, . . . ; and lastly, to the Ghost of Robert Greene, telling him, what a coyle there is with pamphleting on him after his death."[10] Here is direct evidence that the catch-pennies were very busy vilifying or extolling the dead writer. How long this continued we do not know with certainty. We may, however, be reasonably sure that this 'coyle' had partially spent itself by the time "Greenes Funeralls" appeared in 1594, and had completely died down before the entirely well-intentioned but perfectly pointless "Greene in Conceipt" raised its silly voice six long years after Greene's death. However, Dickenson paid his belated tribute (he probably looked upon it as such) and deserves some credit.

Now is Samuel Rowlands too a belated tribute payer? Is his use of Greene's name on a title page well-intentioned? It is to be feared that so much good cannot truthfully be said of him. It would seem that he had read "Every Man Out of His Humour" and had taken a hint from one of Carlo's speeches to the effect that one might steal from Greene's works with no little security. Then too exactly one month and one day before "Greenes Ghost" was entered in the Stationers' Register a new edition of Harman's "Caveat" was recorded there. This would indicate, if such indication were necessary, that the interest in rogues and vagabonds had not died with their great discoverer, 'maister R. G.' The truth is that this interest in low London life had abated little, if any: witness Dekker's success—and that notwithstanding all his cribbings. It is natural, therefore, that Rowlands, who had no little aptitude for the work, should enter this field. He had succeeded

[10] *Works of Thomas Nashe,* ed. McKerrow, Vol. I, 153. It would be interesting to know what pamphlets Nashe had in mind. Close upon Greene's death were published: *Greenes Groats-worth of Wit.* (Stat. Reg. Sept. 20); *The Repentance of Robert Greene.* (Stat. Reg. Oct. 6); *Greenes Vision.* (No date; late in 1592?) All of these are attributed to Greene; the first two certainly rightly so. Other tracts which have to do directly with Greene's last days and death are: Gabriel Harvey's *Foure Letters and Certaine Sonnets: especially touching Robert Greene and other parties by him abused.* (Stat. Reg. Dec. 4); *Greenes News both from Heaven and Hell.* (Stat. Reg. Feb. 3, 1593.) Later three other pamphlets attempted to attract attention by parading Greene's name. These are: *Greenes Funeralls,* (Stat. Reg. Feb. 1, 1594); *Greene in Conceipt,* (Stat. Reg. May 3, 1598); *Greenes Ghost Haunting Conie-catchers,* (Stat. Reg. Sept. 3, 1602).

with muck-raking verse, succeeded to the degree that his second verse tract (his first was religious) was forbidden and burned, first in public and then in the kitchen of the Stationers' Company.[11] Why then not succeed with muck-raking prose? If this cause could be helped by conjuring up the ghost of poor Robert Greene, what harm in that? All in all, Rowlands' title-page is a piece of catch-penny claptrap, and in the light of the contents of his pamphlet anything but unpretentious; although it must be remembered that no Elizabethan pamphlet was ever over modest in its title promises.

"The Epistle Dedicatorie," which seems to be largely Rowlands' own, has the following address: "To All Gentlemen, Merchants, Apprentises, Farmers, and plaine countrimen, health."[12] It is in this letter that Rowlands tells us that he has "as one inforced (*amore patriae*) taken in hand to publish this little pamphlet (which by a very friend came by a chance to my hands, . . " Ordinarily such a statement as this in a pamphlet would amount to very little and Halliwell-Phillipps was entirely justified in giving it little credence. And yet it cannot be ignored; it was put in originally for a purpose. The statement was doubtless designed to protect Rowlands against a charge of plagiarism, by dropping the suggestion that at least a portion of the work was by Greene—which is true indirectly—thereby arousing an added interest in the tract. That a pamphlet actually came to S. R. through a friend and that he simply edited and added to it, may with the best of reason be denied.

The remainder of the letter, which in spots borrows from Greene, is a serious but commonplace indictment of the conny-catching abuses, and ends much as does that in "The Second Part of Conny-catching," with the prayer: "God either convert or confound such base companions."[13] This letter is signed S. R.

With the pamphlet proper, cribbing begins in earnest. After a frank reference to "two merrie and pithie Pamphlets of the arte

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[11] *Arber's Transcript*, II, pp. 832-33.

[12] This form of address is not usual but Greene's *A Notable Discovery of Coosnage* has "To the Yong Gentlemen, Marchants, Apprentises, Farmers, and plain Countreymen Health."

The Second part of Conny-catching and *A Disputation betweene a Hee Conny-catcher and a Shee Conny-catcher* have very similar forms.

[13] Seemingly less charitable but perhaps only less logical, Greene has: "God ether confound, or convert such base minded Cooseners." In his General Introduction to Greene's plays (pg. 10, n. 1) Professor Churton Collins misquotes (according to the Grosart text to which he refers) a strikingly illogical wording in *The Repentance*, which is: "in the Cittie of Norwitch, where I was bred and borne." At various places in this introduction Professor Collins must have been quoting from memory.

of Conicatching.'' Rowlands says he has heard ''that there were no such names as he [Greene] hath set downe,[14] nor anie cheating Arte so christened as Conicatching.'' However we are now told that in the suburbs of London a 'like underhanded traffique' is being carried on daily. In enumerating and describing the cant terms of these traffickers Rowlands steals from Greene's ''The Blacke Bookes Messenger.'' The directness of the theft will appear from the quotations subjoined. Rowland's change of Greene's arrangement may have some significance:

Greenes Ghost.

Marie, in effect there is the like underhand traffique daylie used and experienced among some fewe start up Gallants disperst about the suburbs of London, who termes him that draws the fish to the bait, the Beater, and not the Setter: the Taverne where they go, the Bush, and the foole so caught, the Bird. As for Conicatching, they cleape it Batfowling, the wine the Strap, and the cards the Limetwigs. Now for the compassing of a woodcocke to worke on, and the fetching him into the wine bench of his wracke, is right beating the bush. The good asse if he will be dealt upon, stouping to the lure: if he be so wise as to keep aloofe, a Haggard. And he whom he makes Verser the Retriever, and the Barnacle the Pot-hunter.[15]

The Blacke Bookes Messenger.

A Table of the words of Art lately devised by *Ned Browne* and his associates, to *Crosbite the old Phrases used in the manner of Conny-catching.*

He that drawes the fish to the bait,	*the Beater.*
The Taverne where they goe,	*the Bush.*
The foole that is caught,	*the Bird.*
Conny catching to be called,	*Bat fowling.*
The wine to be called,	*the Shrap.*
The cards to be called,	*the Lime twigs.*
The fetching in a Conny,	*beating the Bush:*
The good Asse if he be woone,	*stooping to the Lure.*
If he keepe a loofe,	*a Haggard.*
The verser in conny-catching is called	*the Retriever.*
And the Barnacle,	*the pot hunter.*[17]

It does not admit of any doubt that Rowlands took these terms directly from Greene. His failure to connect them with ''The

[14] "There be requisit effectually to act the Art of Cony-catching, three several parties: the Setter, the Verser, and the Barnackle." *A Notable Discovery of Coosnage. Works,* X, 15.

[15] Page 7.

[17] *Works*, XI, 7.

Blacke Bookes Messenger" is not difficult to explain. It would have been very ill-advised, for a little further on he lifts about two hundred lines verbatim—except for occasional changes or corrections—from the same work. Nor is this remarkable pilfering all he owes to "The Blacke Booke." To have called attention to so important a source would have been incompatible with the method used in yarking up "Greenes Ghost."

In one or two subsequent paragraphs Rowlands undertakes to suggest abuses and "grosse sinnes" with which the writer of the conny catching pamphlets might with more profit have concerned himself. These suggestions are interesting, interesting because they constitute a boiled down version of "The Defence of Conny catching" (1592), a pamphlet attributed to Greene but probably not of his authorship. Dr. Grosart's opinion that "it is against, not by Greene" has point.[18] Besides the tract has little beyond its cleverness to indicate his able workmanship. To show the similarity in subject matter, I shall give the topics suggested by both Rowlands and "The Defence." It must be remembered that in the latter these subjects are treated in detail and often illustrated by stories.

Greenes Ghost:

(1) extortion, (2) usurers, (3) bakers' use of short weights, (4) adulteration of wines and beer, (5) ale-wives' use of short pots and cans, (6) false oaths, (7) pride, (8) swearing, (9) folly of young people, (10) advice to house-holders, (11) putting of powder into ale to give it strength, (12) extravagance in dress.

The Defence:

(1) extorting of pelf, (2) usurers, (3) millers' use of short weights and false hoppers, (4) ale-wives' use of short pots and cans; their false scoring, (5) chandlers' use of short weights, (6) tricks of hostlers and costermongers, (7) adulteration of wine, (8) tricks of butchers and drapers, (9) lawyers, (10) cosening braggarts, (11) Greene's sale of *Orlando Furioso* to two companies, (12) evading payment of ale house scores.

When reading these lists of proposed subjects one can almost hear Corporal Fize of "Martin Mark-all" giving his fatherly advice to the Bellman of London: "Mee thinkes it should have beene your part rather to have tolde of domesticall affaires and household

[18] Of course Grosart afterwards changed his mind and admitted, as everyone else must, the possibility of Greene's having had a part in the production of *The Defence*. Storojenko seemed sure that it was not Greene's. Incidentally Storojenko overstates the truth in saying that *The Defence* "is full of furious abuse of the exposer" of conny catching. His statement early in the essay (I, 30) that it is "a naively-sly pamphlet" hits the truth exactly.

matters, . . . If then it be all one in City as in Countrey, among the rich as amongst us poore, and generally in all Trades and Occupations deceit and abuses, sith it is so that he that cannot dissemble cannot live: why then should you bee so spitefull goodman Saunsbell to inueigh against us poore soules above the rest, who of all others, in shifting are the most simplest soules in this over wise world.''[19]

It would seem then that we really have three defences of conny catchers, parts of "Greenes Ghost" and "Martin Mark-all" reflecting the very spirit of "The Defence." Of course the author of "Greenes Ghost" doesn't practice what he preaches; his is a conny catching pamphlet. Nevertheless it, like the other two tracts, does call attention to the tricks and skin-games of tradesmen.[20] This, as Professor F. W. Chandler points out, is the real significance of "The Defence." Several interesting questions grow out of this similarity in the three works. Did Rowlands merely borrow the idea from the earlier works?[21] Or is it possible that he wrote "The Defence?" It seems to me to be about his level. Moreover it shows that rather accurate knowledge of the conny catching stuff that is shown in "Greenes Ghost." Moreover, though here I may be foisting a theory upon my reading, the half-serious, half-humorous attitude which these pmphlets take toward the problem of defence and which in "Martin Mark-all" breaks out into broad burlesque indicates, to put it mildly, the work of kindred spirits. Of course, this is at best mere speculation—speculation, the joy of the litterateur, the fear of the historian. Manifestly the student of pamphlet literature, a sort of mongrel criss-cross, is in a delicate position when tempted to use his imagination; therefore, on to surer ground.

"Greenes Ghost" does scarcely more than enumerate a number of tricks practiced by tradesmen when it turns its attention to

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[19] *Works*, II, 12-13. The spirit of *The Defence* is well shown by an extract from the closing paragraph. "Thus have I proved to your maships, how there is no estate, trade, occupation, nor mistery, but lives by *Conny-catching*, and that our shift at cards compared to the rest, is the simplest of al, & yet forsooth, you could bestow the paines to write two whole Pamphlets against us poore cony-catchers: Think M. R. G. it shal not be put up except you grant us our request." Greene, *Works*, XI, 103.

[20] *A Notable Discovery of Coosnage* has inimitable stories about cosening colliers (*Works*, X, 51-61) and *A Quip for an Upstart Courtier* (1592) is a real mine of information about the tricks of the trades: in it indeed "is plainly set downe the disorders in all Estates and Trades." (*Works*, XI, 207.)

[21] He might, I suppose, have gotten the idea from *Greenes News both from Heaven and Hell*, a pamphlet which I have not had opportunity to examine. This seems hardly likely, however, inasmuch as *Martin Mark-all* copies from *The Defence*.

rogues and criminals, and from this point on is purely a conny catching pamphlet. The first game described corresponds to modern blackmail in method. Rowlands advertises it as "a new tricke to fetch in the pence." In reality it was treated ten years before in "A Notable Discovery of Coosnage" from which Rowlands calmly stole it. The game is simply this. Certain rogues after disguising themselves as official summoners or apparitors go to citizens, gentlemen, or wealthy farmers who have not conducted themselves in all ways as they should and threaten them with process or citation, at the same time offering to remain quiet provided their silence is properly rewarded.[22] The individuals so approached are always of some standing and have everything to lose by exposure. As a result they are willing to pay a liberal amount of hush-money. Rowlands designates the practice as "A monstrous abuse of authoritie, and hindrance to the courts of Justice, that have the oversight of such offences." Greene concludes that these conny catchers "discredite, hinder, and prejudice the court of the Arches, and the Officers belonging to the same."[23]

The next example of plagiarism in "Greenes Ghost" deserves little attention, being at most but the theft of an idea. Rowlands devotes a short paragraph to bigamists, who "ride up and downe the countrie, like yong merchants a wooing, and they will marie everie moneth a new wife, & then fleece her of all she hath, that done run away, and learne where another rich widow dwelleth and serve her after the same sort: so rounding England, till they have pickt up their crummes, and got enough to maintaine them all their life after."[24] This idea is a direct borrowing from "The Defence"

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[22] In *A Quip for an Upstart Courtier* Greene accuses the official summoners of this breach of duty, citing Chaucer as authority. *Works*, XI, 255.

[23] The extracts are not given in full because of the subject matter. *Greenes Ghost*, I, 9-10. *A Notable Discovery of Coosnage*, X, 44-46.

[24] This is one of the cribbings in *Greenes Ghost* which Professor F. W. Chandler points out in his *The Literature of Roguery.* (Boston and New York, 1907). The following paragraph from the work (Vol. I, 103-104) includes, I think, all but one of the pilferings in *Greenes Ghost* to which Professor Chandler calls attention: "Samuel Rowlands in "Greenes Ghost Haunting Conie-catchers" (1602) pretended to edit what is really a theft from previous conny-catching pamphlets, those of Greene especially. . . . Among his fifteen stories appear the tricks of colliers, as detailed in the "Blacke Bookes Messenger;" the trick of reclaiming other's property at inns and fairs, from the Groundworke of Conny-catching;" the story of a false cry of justice, from the "Disputation Between a Hee Conny-catcher and a Shee Conny-catcher;" the fraud of blindfolding a victim in Paul's as if by mistake, from the "Thirde Part of Connycatching;" and an abridgement of the bigamist story, from the "Defence of Conny catching." Rowlands' theft of the story of the hooker is also pointed out. (Vol. I, 100, n. 2.)

This would seem to be a formidable list of borrowings in one small pamphlet. And yet it tells considerably less than half the story.

which devotes no little space to the exposure of bigamy. Rowlands' very brief treatment of the subject is distinctly to his credit. Brevity doesn't always make for wit; it sometimes makes for cleanliness.

And now comes the most notorious of all the cribbings in Rowlands: without a blush something less than two hundred lines are taken practically verbatim from "The Blacke Bookes Messenger." In a certain way this lengthy borrowing represents a peculiar form of theft, a form that is also used by Dekker, but never quite so brazenly. It does not consist in taking a story and making it over, with additions or omissions, a common practice with the Elizabethans and one about which they had no qualms, but of dipping down into the heart of a pamphlet and taking out a number of descriptive passages one after the other. For this reason, perhaps, the borrowing is, so far as I know, unrecorded. Professor Chandler points out merely the tag end of it which has to do with a trick played on unsuspecting merchants by fake colliers. The excerpts follow:

Greenes Ghost.	*The Blacke Bookes Messenger.*
But exceeding all these are the fine sleights of our Italian humourists, who being men for all companies, will by once conuersing with a man so draw him to them, that he shall thinke nothing in the world too deare for them, nor once be able to part them, vntill they haue spent all they haue on them.	There are a number of my companions yet liuing in *England,* who beeing men for all companies, will by once conuersing with a man, so draw him to them, that he shall thinke nothing in the world too deare for them, and neuer bee able to parte from them, vntill hee hath spent all he hath.
If he be lasciuiously addicted they haue Aretines Tables at his fingers ends, to feede him on with new kinde of filthinesse: they will come in with Rowse the French painter, and shew what an vnlawfull vaine he had in baudrie: . . . .[Several lines of vulgarity.]	If he bee lasciuiously addicted, they haue *Aretines Tables* at their fingers endes, to feed him on with new kind of filthiness: they wil come in with *Rous* the french Painter, and what vnusuall vaine in bawdery hee had . . . . [Several lines of vulgarity.]
If they see you couetously bent, they will discourse wonders of the Philosophers stone, and make you beleeue that they can make gold of goose-grease, only you must be at some two or three hundred pound charge, or such a small trifle, to helpe to set vp their stilles, and	If they see you couetously bent, they wil tel you wonders of the Philosophers stone, and make you beleeue they can make golde of Goose-greace: onely you must bee at some two or three hundred pounds cost, or such a trifling matter, to helpe to set vp their Stylles,

then you neede not care where you beg your bread: for they will make you do little better, if you follow their prescriptions.

Discourse with them of countries, they will set you on fire with trauelling: yea what place is it they will not sweare they haue beene in, and I warrant you tell such a sound tale, as if it were all Gospell they spake. Not a corner in Fraunce but they can describe. Venice, why? It is nothing, for they haue intelligence of it euerie houre, and at euerie word will come in with Siado Curtizano, tell you such miracles of Madam Padilia and Romana Impia, that you will be mad till you be out of England: & if he see you are caught with this baite he will make as though he will leaue you, and faine businesse about the Court, or that such a Noble man sent for him, when you will rather consent to robbe all your friends then bee seuered from him one houre. If you request his companie to traueile, he will say, In faith I cannot tell, I would sooner spend my life in your companie, then in anie mans in England. But at this time I am not so prouided of monie as I would: therefore I can make no promise: and if a man should aduenture vpon such a iourney without money, it were miserable and base, and no man will care for vs. Tut monie say you (like a liberall young maister) take no care for that, for I haue so much land and I will sell it, my credit is worth so much, and I will vse it. I haue the keeping of a Cosens chamber of mine, which is an old counsellour, and he this vacation time is gone downe into the countrie, we will breake vp his studie, rifle his chestes, diue into the bottome of his bagges, but we will haue to serue our turne, rather then faile we will sell his bookes,

and then you need not care where you begge your bread, for they will make you doo little better if you followe their prescriptions.

Discourse with them of Countries, they will set you on fire with trauailing, yea what place is it they will not sweare they haue beene in, and I warrant you tell such a sound tale, as if it were all Gospell they spake: not a corner in *Fraunce* but they can describe. *Venice*, why it is nothing, for they haue intelligence from it euery houre, & at euery worde will come in with *Strado Curtizano*, and tell you such miracles of Madam *Padilia* and *Romana Imperia*, that you will bee mad tyll you bee out of *England*. And if hee see you are caught with that bait, he will make as though hee would leaue you, and faine businesse about the Court, or that such a Noble man sent for him, when you wil rather consent to robbe all your freends, than be seuered from him one hower. If you request his company to trauel, he will say In faith I cannot tell: I would sooner spend my life in your company than in any mans in *England*, but at this time, I am not so prouided of money as I would, therefore I can make you no promise: and if a man should aduenture vpon such a iourney without money, it were miserable and base, and no man will care for vs. Tut, money say you (like a liberall young maister) take no care for that, for I haue so much land and I wil sell it, my credite is so much, and I will vse it: I have the keeping of a Coosens chamber of mine, which is an old Counsellor, & he this vacation time is gone downe into the Country, we wil breake vp his studie, rifle his chests, diue in to the bottome of his bags, but wee will haue to serue our turne; rather pawne his bedding & hangings, and make riddance of all his household stuffe to set vs packing. To this he listens a little, and saith, These are some hopes yet, but if he should goe with you, and you haue monie. and he none, you will domineere ouer him at your pleasure, & then he were wel set up to leave such possibilities in England, & be made a slaue in another countrie. With that you offer to part halfes with him, or put al into his custody, before he should think you meant otherwise than wel with him. He takes you at your offer, and promiseth to husband it so for you, that you shall spend with the best, and yet not wast halfe so much as you do. Which makes you (meaning simplie) to put him in trust, and giue him the purse. Then all a boone voyage into the lowe Countries you trudge, and so traueile vp into Italy, but *per varios casus, et tot discrimina rerum*, in a towne of garrison he leaues you, runnes awaie with your monie, and makes you glad to betake your selfe to prouant and become a Gentleman of a companie. If he feare you will make him after him he will change his name: and if there be anie Gentleman or other in the countrie, he will borrow his name and creepe into his kinred, or it shall cost him a fall, and make him paie sweetly for it in the end, if he take not the better heed. Thus will he be sure to haue one Asse or other a foote to keepe himselfe in pleasing.[25]

There is no Arte but he will haue a superficiall sight into, and put downe euerie man with talke: and when he hath vttred the most he can, make men beleeue he knowes ten times more then he will put into

than faile, we wil sel his books, pawne his bedding and hangings, & make riddance of all his household stuffe to set vs packing. To this he listens a little, & sayes: These are some hopes yet, but if he should go with you, and you haue money & he none, you will domineere ouer him at your pleasure and then he were well set vp, to leaue such possibilities in *England*, and be made a slave in another Countrey: With that you offer to part halfes with him, or put all you haue into his custodie, before hee should thinke you meant otherwise then well with him. Hee takes you at your offer, and promiseth to husband it so for you, that you shall spend with the best and yet not wast so much as you doe: which makes you (meaning simply) put him in trust and giue him the purse: Then all a boone voyage into the low Countries you trudge, so to trauel vp into *Italie*, but *per varios casus et tot discrimina rerum*, in a Towne of Garrison he leaues you, runnes away with your money, and makes you glad to betake yourself to prouant, and to be a Gentleman of a Company. If hee feare you will make after him, hee will change his name, and if there be any better Gentleman than other in the Country where he soiournes, his name hee will borrowe, and creepe into his kindred, or it shall cost him a fall, and make him pay sweetely for it in the end, if he take not the better heede. Thus will he bee sure to haue one Asse or other a foote, on whom hee may pray, and euer to haue newe inuentions to keepe him selfe in pleasing.

There is no Art but he will haue a superficial sight into, and put

[25] *The Defence* also has a good description of this cosening globe-trotter. Greene's *Works*, XI, 72-75.

their heads, which are secrets not to be made common to euerie one.

He will perswade you he hath twentie receits of loue powders, that he can frame a ring with such a deuise, that if a wench put it on her finger she shall not choose but follow you vp and downe the streetes.

If you haue an enemy that you would faine be rid of, he will teach you to poison him with your verie lookes: to stand on the top of Poules with a burning glasse in your hand, and cast the same with such a force on a mans face that walkes vnder, that it shall strike him stark dead, more violently then lightning.

To fill a letter full of needles, which shall be laid after such a mathematical order, that when he opens it, to whom it is sent, they shall spring vp and flie into his bodie forcibly, as if they had beene blowne vp with gunpowder, or sent from a Caliuers mouth like small shot.

To conclude, he will haue such probable reasons to procure beleefe to his lies, such a smooth tongue to deliuer them, and set them forth with such a grace, that he should be a verie wise man did not swallowe the Gudgin at his hands.

In this sort haue I knowne sundrie young Gentlemen of England trained forth to their owne destruction, which makes me the more willing to publish this discourse, the better to forewarne other of such Batfowling companions; as also for the rooting out of these insinuating moth-wormes that eate men out of their substance vnseene, and are the decaie of the forwardest Gentlemen and best wits.

How manie haue we about London, that to the disgrace of Gentlemen liue gentlemanlike of themselues hauing neither mony nor

downe euery man with talke, and when he hath vttered the most he can, he makes men beleue that hee knowes tenne times more than he will put into their heads, which are secrets not to be made common to euerie one.

He will perswade you hee hath twentie receiptes of Loue powders: that hee can frame a Ring with such a quaint deuise, that if a Wench put it on her finger, shee shall not choose but followe you vp and downe the streetes.

If you haue an enemie that you would faine be ryd of, heele teach you to poyson him with your very lookes. To stand on the top of Paules with a burning glasse in your hande, and cast the Sunne with such a force on a mans face that walkes vnder, that it shall strike him starke dead more violently than lightning.

To fill a Letter full of Needles, which shall bee laide after such a Mathematicall order, that when hee opens it to whome it is sent, they shall all spring vp and flye into his body as forceably as if they had beene blowne vp with gunpowder or sent from a Calleeuers mouth like small shotte.

To conclude, he will haue such probable reasons to produce beleefe to his lyes, such a smooth tongue to deliuer them, and set them foorth with such a grace, that a very wise man he should be that did not swallowe the Gudgin at his hands.

In this sorte haue I knowne sundry yoong Gentlemen of *England* trayned foorth to their own destruction, which makes mee the more willing to forewarne other of such base companions.

Wherefore, for the rooting out of these slye insinuating Mothworms that eate men out of their substance vnseene, and are the decay of the land, nor any lawful means to maintain them, some by play, and then they go a mumming into the countrie all the Christmas time with false dice, or if there be anie place where Gentlemen or merchants frequent in the Citie, or anie towne corporate, thither will they, either disguised like to yong merchants, or substantiall Citizens, and draw them all drie that euer dealt with them.

There are some that doe nothing but walke vp and downe Paules, or come to shops to buy wares, with budgets of writings vnder their armes: and these will vrge talke with anie man about their sutes in law, and discourse vnto them how these and these mens bands they haue for money, that are the chiefest dealers in London, Norwich, Bristow, and such like places, and complaine that they cannot get one pennie. Why, if such a one doth owe it you (saith some man that knowes him) I durst buy the debt of you, let me get it of him as I can. O saith my budgetman, I haue his hand and seale to shewe, looke heere els: and with that pluckes out a counterfiet band (as all other his writings are) and reades it to him. Whereupon for halfe in halfe they presently compound, and after that hee that ten pounds paid him for his band of twentie besides the forfeiture, or so forth, he sayes, Faith these Lawyers drinke as drie as a sieue, and I haue mony to pay at such a daie, and I doubt I shall not be able to compasse it: here are all the leases and euidences of my land lying in such a shire, I would you would lend me fortie pounds on them till the next tearme, or for some sixe moneths, and then either it shall be repayd with interest, or I will forfeit my whole inheritance,

forwardest Gentlemen and best wittes: it were to bee wished that *Amasis* Law were reuiued, who ordayned that euery man at the yeares ende should giue account to the magistrate how he lived, and he that did not so, or could not make an account of an honest life, to be put to death, as a Fellon without fauour or pardon.

Ye haue about *London,* that (to the disgrace of Gentleman) liue gentleman-like of themselues, hauing neythere money nor Lande, nor any lawfull meanes to maintain them: some by play, and they go amumming into the Country all Christmas time with false dice, or if there be any place where gentlemen or Marchants frequent in the Citty or Towne corporat, thyther will they, either disguised like yonge Marchants, or substantiall Cittizens, and drawe them all dry that euer deale with them.

There are some doe nothing but walke vp & downe Paules, or come to mens shops to buy wares, with budgets of writings vnder their armes, & these will talke with any man about their sutes in Lawe, and discourse vnto them how these and these mens bonds they haue for money, that are the chiefest dealers in *London, Norwich, Bristowe,* and such like places, & complaine that they cannot get one penny. Why if such a man doth owe it you, (will some man say that knowes him) I durst buy the debt of you, let me gette it of him as I can: O saith my budget man, I haue his hand and seale to shewe, looke here els, and with that pluckes out a counterfaite band, (as all his other writings are,) and reades it to him: whereupon, for halfe in halfe they presently compound, and after he hath that tenne pound payd him for which is better worth then a hundred marks a yeare.

The wealthie retailer, citizen, merchant, Gentleman or young nouice that hath store of crownes lying by him, greedy of such a bargaine, thinking perhaps by one clause or other to defeat him of all he hath, lends him the mony and takes a faire statute merchant of his lands before a Iudge, but when all comes to all, he hath no more land in England then seuen foote in the Church yard, neither is his inheritance either in *Posse* or *Esse*, then a paire of gallowes in a greene field, nor do anie such occupiers knowe him, much lesse owe him anie money, whereby the couetous person is cheated fortie or fiftie pounds thick at one clap.

Not unlike to these are they, that coming to Ordinaries about the Exchange where Merchants do table for the most part, will saie they haue two or three ships of coales late come from Newcastle, and wish they could light on a good chapman that would deale for them altogether. What is your price, saith one? What's your price, saith another? He holds them at the first at a very high rate, and sets a good face on it, as though he had such traffique indeed, but afterward comes downe so low, that euery man striues who shall giue him earnest first: and ere he be aware, he hath fortie shillings clapt into his hand, to assure the bargaine to some one of them. He puts it vp quietly, and bids them enquire for him at such a signe and place, where he neuer came, signifying also his name, when in troth he is but a cosoning companion, and no such man to be found. Thus goes he cleare awaie with fortie shillings

his band of twentie, besides the forfieture, or so forth, he saies faith these Lawyers drinke me as drie as a sieue, and I haue money to pay at such a day, and I doubt I shall not be able to compasse it. Here are all the Leases and Euidences of my Lande ly- in such shyre, could you lend me fortie pound on them till the next Tearme, or for some sixe Monthes? and it shall then be repayd with interest, or Ile forfeit my whole inheritance, which is better worth then a hundred markes a yeare.

The welthy Gentleman or yong Nouice, that hath store of Crownes lying by him, greedy of such a bargaine, thinking (perhaps) by one clause or other to defeate him of all he hath, lends him money, and takes a faire Statute marchant of his Lands before a Iudge; but when all comes to al, he hath no more land in *England* then a younger brothers inheritance, nor doth any such great Occupier as he faineth, know him: much lesse owe him any money: whereby my couetious maister is cheated fortie or fiftie pound thick at one clap.

Not vnlike to these are they, that comming to Ordinaries about the Exchange, where marchants do table for the most part, will say they haue two or three shippes of Coles new come from *Newcastle*, and wish they could light on a good chapman, that would deale for them altogether? Whats your price? saith one. Whats your price? saith another. He holds them at the first at a very high rate, and sets a good face on it, as though he had such traffique indeede, but afterward comes downe so lowe that euery man striues who shall giue him earnest first, and ere he be aware, in his purse for nothing, and they vnlike euer to see him againe.[26]

he hath fortie shillings clapt in his hand, to assure the bargaine to some one of them: he puts it vp quietly, and bids them enquire for him at such a signe and place, where he never came, signifying also his name: when in troth hee is but a coozening companion, and no such man to bee found. Thus goes he cleere away with fortie shillings in his pursse for nothing, and they vnlike to see him any more.[27]

The pages following this lengthy borrowing are also indebted to Greene; up to the point where Rowlands begins to tell, or better, to re-tell specific stories, almost everything is early conny-catching material made over. However, inasmuch as the verbal likenesses are not great, parallel passages will not be given. The trick of stealing a horse and then eating him out ''lim by lim in wine and capons'' at some out of the way tavern is, I think, original with Rowlands.[28] It may be worth while to note that ''fawnguests'' are treated in ''The Thirde Part of Conny-catching;'' that nips and foists are treated fully in the first two conny catching pamphlets, and also that the practices of the snaps and cloyers were well known to Greene,[29] as was also the rivalry existing between the city and country nips and foists. This last can be well shown by quotations which will, incidentally, again illustrate Rowlands' careless handling of the truth:

Greenes Ghost.

There be divers sorts of Nips and Foysts both of the citie and countrie: these cannot one abide the other, but are at deadly hatred, and will boyle and discover one another by reason one is hindrance to the other. And these the former bookes have omitted.[30]

[26] *Works*, I, 10-14.

[27] Greene, *Works*, XI, 24-31.

[28] Dekker in *The Bel-man of London* steals this and several other tricks from *Greenes Ghost,* copying them much more slavishly than his ability necessitated. About these pilferings Professor Frank Aydelotte of Indiana University raises the interesting question: "Can the same S. R. have written both *Greenes Ghost* and *Martin Mark-all?*"

[29] Greene, I think, does not use the noun, "cloyer." He uses "snap" instead. That he knew the cloyer's game cannot be doubted. "Truth, if fortune so favor thy husband that hee be neither smoakt nor *cloyed,* for I am sure all thy bravery comes by his nipping, Foysting, and lifting." *Disputation between a Hee Conny-catcher and a Shee Conny-catcher.* X, 204.

[30] *Greenes Ghost.* I, 18. Exactly what Rowlands means by "former bookes" is uncertain, the more so because just before the above quotation (pg. 16) he says that "the first part of Conicatching" treats of nips and foists. He probably means that his book is the first to distinguish between the "Gentlemen Batfowlers" and "the common rablement of Cut-purses."

Is it possible that poor Samuel had never seen Greene's excellent description of nips and foists? If so he must have borrowed "on instinct."

The Second Part of Conny-catching.

. . . : therefore an exquisite Foist must have three properties that a good Surgion should have, and that is an Eagles eie, a Ladies hand, and a Lyons heart: an Eagles eie to spie a purchase, to have a quicke insight where the boong lies, and then a Lyons heart not to feare what the end will bee, and then a Ladies hand to be little and nimble, the better to dive into the pocket. These are the perfect properties of a Foist: but you must note that there be diversities of this kind of people, for there be cittie Nips & countrey Nips, which haunt from faire to faire, and never come in *London*, unlesse it be at Bartholomewe faire, or some other great and extraordinarie assemblies: Nowe there is a mortall hate betweene the Countrey Foist, and the Cittie Foist, for if the Cittie Foist spie one of the connies in *London*, straight he seekes by some meanes to smoake him, and so the Countrey Nip if he spie a Cittie Nip in any faire, then hee smoakes him straight, and brings him in danger.[31]

The story of how a cut-purse nipped the pocket out of a cheesemonger's apron is now given. This is simply another version of Greene's "A merry tale how a Miller had his purse cut in New gate market."[32] In the first case the pocket is nipped while the merchant is stuffing pieces of a large cheese into the conny catcher's cape; in the second the bung is cut while the miller is kindly wiping from the nip's face flour that had been thrown upon him by an accomplice.

In exposing the tricks of the "lift" Rowlands steals from "The Second Part of Conny-catching" and also from "The Groundworke of Conny-catching." Here again he makes the material over slightly, adding the trick of pretending to drop a ring after dark before a shop. The rogue thereupon asks the shop-keeper for a candle. This is actually dropped and before another can be supplied, the "lift" is off with whatever booty he is able to grab up. This trick is, I think, original with Rowlands, as are the next two detailed, so far as I know. The first of these is called chopchain; the second, spoonselling. Dekker steals the latter, calling it spoonmeat but otherwise making very few changes from Rowlands' version.

Rowlands now continues: "Gentlemen I will acquaint you with a strange newe devised arte of stone-carrying." It would indeed

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[31] Greene, *Works*, X, 107-108.

[32] *The Second Part of Conny-catching*, X, 110.

be strange if it were new; but it isn't. Both the name and the game are cribbed: the name from the "Groats-worth of Wit;" the game in detail from "The Defence." The three definitions of this "newe devised arte" will be given.

Greenes Ghost:

First and foremost you must note, that leaving an Ale-wife in the lurch, is termed making her carie stones, which stones be those great Oes in chalke that stand behind the doore: the weight of everie one of which is so great that as many shillings as there be, so many times shee cries O, as groaning under the waight thereof. Now sir, of these Oes twenty shillings make a just loade, and tenne pound a bargeful.[33]

Groats-worth of Wit:

If he [Roberto] could any way get credit on scores, he would then brag his creditors carried stones, comparing everie round circle to a groning O, procured by a painful burden.[34]

The Defence:

These *Souldados*, for under that profession most of them wander, have a pollicie to scourge Alehouses, for where they light in, they never leape out, till they have shewed theyr Arithmatike with chalke on every post in the house, figured in Cyphers like round Os, till they make the goodman cry O, O, O, as if hee should cal an O yes at the Size or Sessions.[35]

It will be noticed that Rowlands gives these O's what might be called a spatial value. This, aside from his explanation of the origin of the expression "carrying stones"[36] is practically his only original contribution. His dependence upon "The Defence" for the details of the game is worth noting.

Greenes Ghost:

First this is a generall precept amongst them, that he must be some odde drunken companion that they deale upon, and his wife a good wench that so she may bee fallen in with, and wipe off her guests scores, if so he have no monie to discharge it: . . . Yet if this cannot conveniently be brought to passe, . . . , then will they be sure their goodman hoast must be a certaine kind of bawd, or a receiver of cutpurses, pickpockets, or such

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[33] *Works*, I, 22-24.

[34] *Works*, XII, 135.

[35] *Works*, XI, 76-77.

[36] Professor Chandler points out that the trick upon which his explanation is based harks back to the *Cid*.

like, ... Nay further, they will observe if he at anie time raile against anie severe Justice that hath the punishment of such notorious persons, and if he do (as in some drunken humour or other he will over-shoote himself in that kind) then will they conceale it, never discover it, but domineere over them, throwe the pots against the wall, for he and his house is forfeit unto them.

The Defence:

Now sir they have sundry shifts to maintaine them in this versing, for eyther they creepe in with the goodwife and so undoo the goodman, or els they beare it out with great brags if the Host be simple, or els they trip him in some wordes when he is tipsy, that he hath spoken against some Justice of peace or other, or some other great man: and then they hold him at a bay with that, til his backe almost breake."

Now follows the story of the spurious justice who crossbites "a Gentleman of the Innes of Court."[37] This may well be discussed in connection with two other stories, "How a Curbar was drest with an unsavourie perfume &c" and a recounting of the clever "Who am I?" trick. All three are taken brazenly out of Greene: the first, from "A Disputation between a Hee and a Shee Conny-catcher;" the second, from "The Blacke Bookes Messenger;" the third, from "The Thirde Part of Conny-catching." Not much need be said about these cribbings; if space permitted, their verbal dependence upon the earlier versions could be pointed out. According to his habit Rowlands advertises the "Who am I?" trick as "a new kind of conveyance."

The statement made above to the effect that "Martin Mark-all" is neither the first nor the worst example of book-making in Rowlands, if not already substantiated, will now be given additional proof. Toward the end of "Greenes Ghost" without rhyme or reason—except, perhaps, to make "a coyle about dogges without wit"—is dragged in "A notable Scholer-like discourse upon the nature of Dogges." Inasmuch as a part of this discourse appears also in "Sumners Last Will and Testament," one is led to expect an authoritative discussion of the possibilities of Rowlands' indebtedness to Nashe in the McKerrow edition. Nor is one disappointed. For a more thorough treatment of this particular matter the reader is, therefore, referred to what is now, and is destined long to remain, the final edition of Nashe.

Only such extracts will be given here, as will indicate the close-

[37] Beyond the game Greene's story has an added point of interest—a country foist is crossbit by the trick after the city foists have failed to get a "snap" from him.

ness with which Rowlands in places follows Nashe, or perhaps the translation which Nashe too copied closely in spots.[38]

Greenes Ghost:

For first and foremost, there is no man of experience that will denie but dogs do excell in outward sence, for they will smell better then we, and thereby hunt the game when they see it not. Besides, they get the sight of it better then we, and are wonderfull quicke of hearing. But let us come to speech, which is either inward or outward. Now that they have outward speech I make no question, although we cannot understand them, for they bark as good old Saxon as may be; yea they have it in more daintie maner than we, for they have one kind of voice in the chase, and another when they are beaten, and another when they fight. . . . he chooseth those things that are commodious unto him, and shunneth the contrarie: He knoweth what is good for his diet, and seeketh about for it. At the sight of a whip he runneth away like a theef from a hue and crie. Neither is he an idle fellow that lives like a trencher Flie upon the sweat of other mens browes, but hath naturallie a trade to get his living by, as namely the arte of hunting and Conicatching, which these late bookes go about to discredit. Yea, there be of them as of men of all occupations, some Cariers, and they will fetch; some watermen and they will dive and swim when you bid them; some butchers, and they will kill sheepe; some cookes, and they turne the spit.

Summers Last Will:

That creature's best that comes most neere to men;
That dogs of all come neerest, thus I prove:
First, they excell us in all outward sence,
Which no one of experience will deny;
They heare, they smell, they see better then we.
To come to speech, they have it questionlesse,
Although we understand them not so well:
They barke as good old Saxon as may be,
And that in more varietie then we:
For they have one voice when they are in chase,
Another, when they wrangle for their meate,
Another, when we beate them out of dores.
That they have reason, this I will alleadge,
They choose those things that are most fit for them,
And shunne the contrarie all that they may;
They know what is for their owne diet best,
And seeke abot for't very carefully;
At sight of any whip they runne away,

[38] Although these parallel passages—like every borrowing recorded in this paper—were noticed independently, the source of the discourse on dogs was unknown. Cf. notes on *Summers Last Will*, III, 254, 670-735, where is given the ultimate source of these passages, the *Pyrrhoniae Hypotyposes* of Sextus Empiricus in the Latin translation of Henri Etienne.

As runs a thiefe from noise of hue and crie:
Nor live they on the sweat of others browes,
But have their trades to get their living with,
Hunting and conie-catching, two fine artes:
Yea, there be of them, as there be of men,
Of everie occupation more or lesse:
Some cariers, and they fetch: some watermen,
And they will dive and swimme when you bid them:
Some butchers, and they worrie sheep by night:
Some cookes, and they do nothing but turne spits."

Before proceeding to the very last sections of "Greenes Ghost," about which this paper has little to say, two instances of Rowlands' plagiarism outside of this pamphlet will be given. The first of these is a borrowing in "Martin Mark-all;" the second is taken from "The Letting of Humours Blood." Both examples are of intrinsic interest.

That Rowlands in "Martin Mark-all" borrows from "The Defence" has not, I think, been pointed out before. To a sympathetic reader it is a real disappointment to know that "Martin Mark-all" is not entirely Rowlands' own. Besides, it is almost unbelievable that he should crib in a pamphlet designed to advertise Dekker's pilferings. That he takes such a strange risk will be shown by the following extracts.

Martin Mark-all:	*The Defence:*
Corporal Fize to the Bel-man: But you good sir, like a Spider to entrappe onely the smallest flies, suffer the great ones to flie through, you scowre the ditch of a company of croaking frogs, when you leave behinde you an infinite number of venomous Toades, you decypher and paint out a poore Rogue, or a Doxie that steale and rob hedges of a few ragged clothes (which you can make but petit larciney.) And never speake of those Vultures that ruine whole Lordships, and infect the common wealth, by their villainous living to the discredit of some, and the ill example to all. Sir reverence on your Mastership, good Mas Bel-man, had you such a moate in your eie, that you could not see those Fox-furd gentlemen, that	*Cuthbert Cunny-catcher to maister R. G.:* But you play like the Spider that makes her webbe to intrap and snare litle Flyes, but weaves it so slenderly, that the great ones breake through without any dammage. You straine Gnats and passe over Elephants; you scoure the ponde of a fewe croakyng Frogges, and leave behinde an infinite number of most venemous Scorpions. You decyper poore Conny-catchers, that perhaps with a tricke at cardes, winne fortie shillings from a churle that can spare it, and never talke of those Caterpillers that undoo the poore, ruine whole Lordships, infect the common-wealth, and delight in nothing but wrongfull extorting and purloyning of pelfe, whenas such be the

harbour more deceit under their dammaske cassockes, then is in all the poore Rogues in a countrey, Brokers I meane and Usurers, that like vultures prey upon the simple, those that are moaths in a common-wealth, living upon the spoile of young gentlemen, as thriftie as a horse-leech, that will never leave drinking untill he burst.[39]

greatest Connycatchers of all, as by your leave maister R. G. I wil make manifest.

Sir reverence on your lordship, had you such a moate in your eye, that you could not see those Fox-furd Gentlemen that hyde under their gownes faced with foynes, more falshood than all the Conny-catchers in *England* beside, those miserable Usurers (I meane) that like Vultures pray uppon the spoyle of the poore?[40]

The borrowing in "The Letting of Humours Blood" is from Lodge's excellent description of a usurer in "Wits Miserie and the Worlds Madnesse" [41] (1596). This description is not far from being the best thing in Lodge, and, in my opinion, represents the Elizabethan prose satire near its high-water mark. The usurer has had many rough handlings from the pamphleteers, but Lodge's stands out above them all. Rowlands' cribbing here is a distinct indication of judgment if not of fine moral sense. On account of its length the description will not be given in full.

The Letting of Humours Blood.

[The broker is] in manners and complexion,
Jumpe like to *Userie*, his nearest kinne;
That wears a money bagge under his chinne:
A bunch that doth resemble such a shape,
And hayred like to Paris garden Ape,
Foaming about the chaps like some wilde Boore,
As swart and tawnie as an *India* Moore:
With narrow brow, and Squirrell eyes, he showes,
His faces chiefest ornament, is nose,
Full furnished with many a Clarret staine,
As large as any Codpiece of a *Dane*,
Embossed curious; every eye doth judge,
His Jacket faced with motheaten Budge:
To which a paire of Satten sleeves he weares,
Wherein two pound of greace about he beares.[42]

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[39] *Martin Mark-all, Beadle of Bridewell*, II, 14.
[40] *The Defence*, XI, 51-52.
[41] *Cf.* note 6.
[42] *Works*, I, 53-54

Wits Miserie.

This usury is jumpe of the complexion of the Baboun his father, he is haired like a great Ape, & swart like a tawny Indian, his hornes are sometime hidden in a button cap (as Th. N. described him) but now he is fallen to his flat cap because he is chiefe warden of his company: he is narrow browd, & Squirril eied, and the chiefest ornament of his face is, that his nose sticks in the midst like an embosment in Tarrace work, here and there embelished and decked with *verucae* for want of purging with Agarick; . . . . double chinned hee is, and over his throat hangs a bunch of skin like a mony bag:[43] band weares hee none, but a welt of course Holland, & if you see it stitcht with blew thred, it is no workiday wearing: his trusse is the piece of an old packcloth, the marke washt out; and if you spie a paire of Bridges satten sleeves to it, you may be assured it is a holy day: . . . . : his jacket forsooth is faced with moth-eaten budge, and it is no lesse then Lisle Grogeram of the worst: it is bound to his body with a Cordeliers girdle, died black for comelines sake: & in his bosom he beares his handkerchiefe made of the reversion of his old tablecloth: his spectacles hang beating over his codpiece like the flag in the top of a maypole &c.[44]

The latter portion of "Greenes Ghost" seems more or less original. However, neither "A notable Exploit performed by a Lift"[45] nor "How a Citizen was served by a Curtizan" have much to recommend them. They are weak, if not altogether pointless. On the other hand, this portion of the pamphlet has something to say about prentises, draymen and watermen that is not without value. In "Doctor Pinchbacke," the last story in the tract, Rowlands is simply working over old material. The trick of recovering stolen property by magic is an old one. But the author of "Greenes Ghost" did not have to go far for a suggestion. The trick is turned by the "Visiter" in the "Groundworke of Conny-catching." Chettle's "cunning man" in "Kind Harts Dreame" about whose skill "the whole town talks" but who "onely conny-catcht his host" is another "Pinchbacke," playing indeed the same game. Then too in

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[43] AUARICIA.

He was bitelbrowed || and baberlipped also,
With two blered eyghen || as a blynde hagge;
And as a letheren purs || lolled his chekes,
Wel sydder than his chyn || thei chiueled for elde;
And as a bondman of his bacoun || his berde was bidraueled.
With an hode on his hed || a lousi hatte aboue,
And in a tauny tabarde || of twelue wynter age,
Al totorne and baudy || and ful of lys crepgyne;
But if that a lous couthe || haue lopen the bettre,
She sholde noughte haue walked on that welche || so was it thredebare.

Piers the Plowman.

[44] *Wits Miserie* (Hunterian Club ed. 1875), 26-31.

[45] *Cf. The Literature of Roguery,* I, 247 n.

"The Thirde Parte of Conny-catching" and in "The Defence" garments are recovered by a pretense of magical powers. However, Rowlands adds one or two good tricks of his own, thereby removing grounds for any serious charge against his work here.

The material in this paper requires little synthesizing; it makes its own comments which, it is hoped, throw some light on the methods of the Elizabethan pamphleteers. That these methods were not only loose but often downright immoral is proved beyond question by the study of "Greenes Ghost," a pamphlet that must have enjoyed some reputation in its day, even though its production was made possible only by the most overt piracy. It is clear that nothing can be urged in Rowlands' defence. The question of Elizabethan plagiarism is not always so simple: intelligent distinctions must be made, and to make this possible, certain standards must be set. Samuel Rowlands' work on the "Greenes Ghost" pamphlet may safely be taken as an example of the sort of plagiarism which the Elizabethans themselves felt to be clearly immoral.

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INDIANA UNIVERSITY STUDIES

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CONTENTS

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INDIANA UNIVERSITY STUDIES

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Prefatory Note

The first of the articles in this issue of the University Studies (No. 12) is a continuation of the studies on perchloric acid, to which three articles were devoted in the issue dated July, 1910. The second article (No. 13) is a collateral study to the preceding. The third article (No. 14) is a condensation of a thesis for the degree Doctor of Philosophy, for which the observations were made in the Kirkwood Observatory of Indiana University.

12. STUDIES ON PERCHLORIC ACID (IV)—DISTILLATION OF POTASSIUM PERCHLORATE WITH SULPHURIC ACID.

By FRANK C. MATHERS, Ph.D., Assistant Professor of Chemistry.

Introduction. The difficulties in obtaining a satisfactory supply of perchloric acid for experiments in the Indiana University chemical laboratory led to the research which is described in this paper. At the present time, the use of perchloric acid in laboratory methods is seriously restricted by high cost, and its use in any commercial process is impossible. The success of the methods for the electrolytic deposition of metals from perchlorate baths [1] really depends upon the economical preparation of perchloric acid.

Perchloric acid may be made very easily by the treatment of sodium perchlorate with concentrated hydrochloric acid. The conditions for obtaining maximum yields were published in a previous paper.[2] The only objection to this method is that the sodium perchlorate is an expensive starting material. Potassium perchlorate, which is a cheaper starting material, will not give perchloric acid when treated with hydrochloric acid. The simplest method of making perchloric acid from potassium perchlorate is to distill with an excess of sulphuric acid.

Method of Analysis of the Distillate. Sulphuric acid was determined by precipitation as barium sulphate. The total acidity, after correcting for the sulphuric acid present, was calculated as perchloric acid. Chlorides and free chlorine, which were determined in a few cases, were present in such small amounts that these determinations were discontinued. Non-volatile matter, which was determined in a few experiments, was about 0.065 gram for each 100 grams of potassium perchlorate used.

Experiments. The distillation of potassium perchlorate with sulphuric acid under atmospheric pressure gave yields of perchloric acid which varied from 54 to 74 per cent. No conditions were found which would give satisfactory yields. The distillates were colored pale yellow and much chlorine or oxides of chlorine were evolved during the distillation. The presence of water was necessary for even fair yield. Large amounts of water were of no advantage because the excess was distilled out before any perchloric

[1] Mathers, *Chemiker-Zeitung*, No. 148, 1316 (1910).
Mathers, *Indiana University Studies*, I, No. 4, 30 (1910).
Mathers, *Transactions American Electrochemical Society*, XVIII, 261 (1910).
Mathers and Germann, *Indiana University Studies*, I, No. 5, 41 (1910).
Mathers and Germann, *Transactions American Electrochemical Society*, XIX, 69 (1911)
Mathers and Overman, *Ibid*, XXI (1912).

[2] Mathers, *Indiana University Studies*, I, No. 3, 24 (1910).
Mathers, *Journal American Chemical Society*, XXXII, 66 (1910).

acid was formed. Rapid distillation was also essential, for in one experiment, where the heating extended over a period of two hours, the yield was only 20 per cent.

The distillation under reduced pressure gave much better yields. A tubulated retort was used as the distilling vessel. Syrupy phosphoric acid was employed to make the ground glass stop-cock airtight. As there was no way of introducing a thermometer into the retort, temperature readings could not be made. The hot perchloric acid vapors attacked the cork stopper which connected the retort to the condenser, especially when no water was added to the mixture in the retort. The neck of the retort was bent downwards so that potassium perchlorate which spattered during the distillation would not be carried over into the receiver. A Chapman water pump was used to produce the reduction in atmospheric pressure. As water pressure was variable, the vacuum was continually changing. A Bunsen rubber valve,[3] used to prevent water being drawn into the apparatus from the pump, was placed in the train of apparatus nearest the water pump. In each of the experiments given in the following tables, ten grams of potassium perchlorate were used.

Cc. H_2SO_4.*	Cc. H_2O.	Pressure, in cm. of Hg.	Distillate Contained Grams of		Yield in Per Cent.
			H_2SO_4.	$HClO_4$.	
5	2.5	5 – 9	0.89	6.16	84.9
5	5	8 –11	1.04	5.64	77.7
7.5	2.5	13	0.85	6.25	86.2
7.5	5	10 –13	0.84	6.5	89.6
7.5	7.5	10 –12	0.64	6.5	89.6
10	0	3 – 7	0.41	6.2	85.2
10	0.5	9 –11	0.5	6.7	92.4
10	1	8 –10	0.51	6.7	93.3
10	2.5	9 –11	0.45	6.8	93.4
10	5	10 –11	0.56	6.5	90.3
10	7.5	10 –11	0.58	6.4	88.9
10	10	10.3–10.6	0.47	6.3	87.3
15	5	7.5– 8.9	0.71	6.8	94.

* Four cc. of concentrated sulphuric acid is the theoretical amount to form $KHSO_4$ with 10 grams of potassium perchlorate.

[3] This valve was made from two pieces of 1 cm. diam. glass tubes. One piece was drawn out so that it would pass part way into the other piece. Over the small end of this glass tube was placed a short piece of rubber tubing which was then plugged at the open end. A slit, about 0.5 cm. long, was made in the rubber at a place near the plug. The two pieces of glass were then placed together, the one part way into the other, and the joint was covered with a rubber tube. This valve was extremely satisfactory and it is recommended for use in all vacuum distillations.

This table shows a variety of results, but in general the yields are fairly satisfactory. The best mixture seems to be: 10 cc. concentrated sulphuric acid, 1–5 cc. water, and 10 gms. of potassium perchlorate.

To eliminate the loss of perchloric acid due to action upon the cork which connected the retort to the condenser, a glass tube (to act as the inner tube of a Liebig condenser) was sealed to the delivery arm of a 300 cc. distilling flask. A slight bend was made in the delivery arm near the flask so that no material from the flask could spatter into the condenser. Cold water was allowed to flow over the receiving flask. Troublesome foaming was encountered when quantities of potassium perchlorate greater than 20 gms. were used. This foaming was increased by lowering the pressure and by increasing the rapidity of distillation. Large crystals or finely pulverized potassium perchlorate acted alike with reference to foaming. The potassium perchlorate was attacked slowly by the sulphuric acid. The crystals were stirred up and down in the flask by the boiling and thus prevented bumping of the mixture. With this improved apparatus appreciably better results were obtained. This was partly due to better vacuum and to better manipulation. The solidification of mono-hydrated perchloric acid in the condenser often plugged the condenser and spoiled the experiment. The best plan to remove this plug was to seal a stop-cock into the condenser tube between the water jacket and the flask. The admission of a little water through this stop-cock soon dissolved the crystallized acid.

The following table gives the results with the all-glass apparatus. Twenty gms. of potassium perchlorate was used in each experiment.

Cc. H_2SO_4.	Cc. H_2O.	Pressure in cm. Hg.	Distillate Contained Grams of		Yield, Per Cent.	Remarks.
			H_2SO_4	$HClO_4$		
20	0	0.6– 2	0.9	13.6	94.2	500 cc. flask, ½ full of foam.
20	0	3.8	0.87	13.9	96.5	Time 18 minutes.
20	0	2 – 3.2	1.0	14.0	96.6	500 cc. flask. Much foam.
20	4	4.3– 5.2	3.7	14.1	97.5	Large crystals $KClO_4$.
20	4	12 –14	1.2	12.9	89.2	20 mesh $KClO_4$.
20	4	3.5– 6.7	4.1	13.7	94.3	20 mesh $KClO_4$.
20	4	5.8– 7.5	1.0	13.7	94.3	20 mesh $KClO_4$.
20	4	2.2– 3.2	4.5	14.2	97.9	500 cc. flask, ½ full of foam.

This table shows that excellent yields were obtained by using an excess of sulphuric acid. A little water was apparently helpful, but some very good results were obtained with only the water that was present in the imperfectly dried flask, and the air dried potassium perchlorate. In these experiments, the vacuum was much better than in previous experiments; this was partly responsible for the increased yields.

These excellent yields could not be duplicated when using larger quantities of potassium perchlorate. The distillation would proceed quietly for a while, then decomposition would begin. Gases would be given off which would weaken the vacuum and this in turn would cause more decomposition. The vacuum could be recovered only by removing the flame and by allowing the flask to cool. In most cases, when the flask was heated again, decomposition would begin and the vacuum would be destroyed as before. The results of some of the experiments are given in the following table. One hundred gms. of potassium perchlorate was used in each experiment.

Cc. H_2SO_4.	Cc. H_2O.	Minimum Pressure in cm. Hg.	Time of Distillation. Hours.	Yield, Per Cent.
60	5	7—	2.2	70.3
60	6	8—	2.7	63.9
60	20	4—	1.6	61.9

In all of these experiments the distillation seemed to be successful for the first 20 to 30 minutes. If the lack of water was the cause of the trouble, the addition of a large amount of water at the beginning of the experiment was useless, because the excess of water always distilled out before any perchloric acid came over. The addition of water through a separatory funnel to the contents of the flask during the distillation caused too vigorous a reaction with the hot sulphuric acid. A mixture of equal parts of sulphuric acid and water added in five portions of 5 cc. each during the distillation raised the yield to 79.7 per cent. The vaccuum was also much easier to maintain during this experiment. The solution of the problem was to pass steam into the contents of the flask during the course of the distillation. The neck of the distilling flask was made six inches longer by sealing on a glass tube of the proper diameter. A rubber stopper could be used in this flask since its position in the neck was so far from the heat that the perchloric acid fumes did not attack it badly. During a vigorous distillation some solid potassium perchlorate would spatter into the neck of the flask above the side arm and would not be acted upon by the sulphuric acid. This decreased the yield. No way was found to overcome this trouble. If the supply of steam was deficient, decomposition would begin and the yield would be lowered. Enough steam should be used to prevent the formation of crystals ($HClO_4.H_2O$) in the condenser. The evolution of gases, which destroy the vacuum, shows that too little steam is being used. An excess of steam does not lower the yield. If too small a flask is used there is some trouble with foaming. The maximum quantity of potassium perchlorate for a 1000 cc. flask is about 200 gms. The following table shows the results:

Cc. H_2SO_4.	Gms. $KClO_4$	Cc. of H_2O as Steam.	Time. Hours.	Pressure Hg.	Distillate Contained Grams of		Yield, Per Cent.	Remarks.
					H_2SO_4	$HClO_4$		
60	100	150	1.4	6–8	19	62.7	86.6	Vacuum poor twice.
60	100	200	1	6–8	14.8	67.7	93.4	Good vacuum.
60	100	650	7.2	6–7	23.6	65.7	90.6	Vacuum poor twice.
60	100	500	1.6	6–9	26	68.8	94.9	Good vacuum.
50	100	500	1.6	8–	18.7	57.8	79.8	Vacuum poor twice.
70	100	300	0.7	8–10	25.7	71.8	99	Good vacuum.
240	400	1150	3.8	8–16	66	255.	88	Vacuum never good.
180	300	550	1.3	6–9	33	190.	87	Much $KClO_4$ in neck.

Much trouble was encountered with low water pressure while performing these experiments. It was difficult to maintain a pressure below 10 cm. of mercury for a long period of time. It was important to have enough steam at all times. Any weakening of the vacuum immediately stopped the boiling of the steam flask, and this, of course, soon started decomposition in the distilling flask. Careful watching could not altogether avoid trouble if the water pressure was unsteady. The speed of distillation had no influence upon the yield and needed regulation only to avoid foaming into the condenser.

Summary and Conclusions. This research gives the results of experiments to determine the best conditions for the preparation of perchloric acid by distilling potassium perchlorate with sulphuric acid.

With each 100 gms. of potassium perchlorate, 60 cc. of concentrated sulphuric acid should be used. This is 50 per cent in excess of the amount of acid to form $KHSO_4$. Less sulphuric acid than this amount causes spattering of the contents of the flask and requires too high a temperature near the end of the distillation. More sulphuric acid than this amount increases foaming.

Steam should be passed into the contents of the flask during the distillation at such a rate that no crystals ($HClO_4 . H_2O$) will form in the condenser. An excess of steam causes spattering and lengthens the time of distillation.

A vacuum of from 6 to 10 cm. of mercury should be maintained.

At the end of an experiment, the flask should be heated until sulphuric acid distills and condenses upon the sides of the flask. Thus all the potassium perchlorate is acted upon. This will increase the amount of sulphuric acid as well as the quantity of perchloric acid in the distillate.

Considerable amounts of sulphuric acid always pass over with the perchloric acid. The sulphuric acid may be precipitated by adding the correct amount of barium carbonate to the distillate. All of the sulphuric acid can be removed by redistilling the crude perchloric acid. Of course steam should be passed through the distilling flask during the distillation.

The yields of perchloric acid vary from 88 to 98 per cent., depending upon how well the conditions of the experiment have been followed.

About 200 gms. of potassium perchlorate is the maximum amount that can be distilled rapidly from a flask of 1000 cc. capacity.

Attempts to read the temperature in the distilling flask were not successful. The stem of the thermometer and the inside of the flask always became covered with potassium perchlorate due to spattering. The thermometer scale was visible only near the end of the experiments.

The time when all perchloric acid is out of the distilling flask can be told by the disappearance of solid material ($KClO_4$) and the change from foaming or bubbling to a condition of quietness with occasional bumping.

Care must be taken to prevent the contents of the distilling flask from sucking back into the steam flask. This can be done by putting upon the steam flask a stop-cock which can be opened into the air.

There is no danger of an explosion. In all of these experiments there was no indication of an explosive decomposition.

There is no difficulty in preparing large amounts of perchloric acid for laboratory use by this method. Anyone wishing to experiment with perchlorate plating and refining baths can easily prepare a plentiful supply of perchloric acid by following the directions given in this paper.

13. QUALITATIVE SEPARATION AND DETECTION OF POTASSIUM AND SODIUM WITH PERCHLORIC ACID AND HYDROFLUOSILICIC ACID.

By FRANK C. MATHERS, Ph.D., and IRA E. LEE, A.B.

Introduction. The methods generally employed for the qualitative separation and detection of potassium and sodium are time consuming and often inaccurate. Some manuals have abandoned wet methods for spectrum tests. This is objectionable because of the great difficulty of testing for potassium in the presence of an excess of sodium and also because the test is so delicate that sodium is detected in almost every chemical substance.

The test for potassium with sodium cobaltic nitrite, $Na_3Co(NO_2)_6$, is entirely satisfactory, although ammonium compounds must be previously removed. This operation is neither difficult nor objectionable. Magnesium does not interfere unless present in very large amounts.

The potassium pyroantimonate ($K_2H_2Sb_2O_7$) is generally considered the best test for sodium. The results with this method have not been very satisfactory in this laboratory. The tests are never decisive and certain; and, in addition, the previous removal of magnesium is a time consuming operation to be avoided if possible.

A new method which has been tried in the Indiana University chemical laboratory and which has been found satisfactory is as follows: Separate the hydrogen sulphide, ammonium sulphide, and ammonium carbonate groups by the ordinary methods. This separation leaves, in the solution, magnesium, potassium, sodium, and ammonium salts and perhaps traces of barium, strontium, and calcium, which are sometimes incompletely precipitated by ammonium carbonate.

Introduce the solution into a small evaporating dish, add a few drops of sulphuric acid,[1] and evaporate to dryness. Heat vigorously (in the hood) over the free gas flame until the ammonium compounds are completely volatilized, i. e., until white fumes are no longer given off. The sides of the vessel, as well as the bottom, must be heated.

Allow the dish to cool, dissolve the residue in about one-fourth of a test tube full of distilled water (5 to 7 cc.) and *add 2 to 3 cc. of alcohol* (the volume of alcohol which is added *must not* be larger

[1] The sulphuric acid will precipitate any barium, strontium, or calcium which was not removed by the ammonium carbonate treatment.

than the volume of the water present), and filter (I) through a small paper but do not wash. Discard the residue.

Transfer about one cubic centimeter of filtrate (I) to a test tube and add one drop of sodium cobaltic nitrite, $Na_3Co(NO_2)_6$.

A. No precipitate is formed. Proceed as in B, 2, for the detection of sodium.

B. A yellow precipitate proves the presence of potassium in the solution (ammonium compounds must be absent).

1. To the remainder of filtrate (I) add an excess of perchloric acid.[2] A white crystalline precipitate of potassium perchlorate is formed. Filter (II) and test a few drops of filtrate (II) with the sodium cobaltic nitrite. If a precipitate is formed, add to filtrate (II) more perchloric acid, filter again and test as above. When the sodium cobaltic nitrite shows that all potassium has been removed, proceed as directed in B, 2, for the detection of sodium.

2. To the filtrate (II) add a few drops of hydrofluosilicic acid, H_2SiF_6. A flocculent precipitate indicates the presence of sodium in the solution. (This precipitate is not very voluminous and must be looked for carefully if only a little sodium is present. Turn the test tube and examine the sides for adhering precipitate.)

Experiments. Normal solutions of potassium chloride and sodium chloride were used in testing the method. Very strong solutions of sodium cobaltic nitrite[3] and hydrofluosilicic acid were used so that only a few drops were required to give a test. In each case in the tables given below the solution was diluted to about one cc.

The test for potassium with sodium cobaltic nitrite is very delicate, as shown by this table:

Gm. KCl.	Gm. K_2O.	Kind of Test.
.012415	.007833	Very strong.
.009932	.006266	Very strong.
.007449	.004699	Very strong.
.004966	.003133	Very strong.
.002483	.001566	Very strong.

[2] The perchloric acid must be free from sodium, but the presence of potassium does no harm because potassium was detected previously, by the use of sodium cobaltic nitrite, and any potassium present is precipitated by the alcoholic perchloric acid solution. A very satisfactory method of making perchloric acid is described in this bulletin, page 176.

[3] The sodium cobaltic nitrite is best prepared according to Erdmann, *Anorganische Chemie*, 642. Dissolve 30 gms. of crystalline cobalt nitrate in 60 cc. of water and add to this a saturated solution of sodium nitrite containing 50 gms. sodium nitrite, in 100 cc., and add to this solution 10 cc. of strong acetic acid.

The test for potassium with perchloric acid (36 per cent alcohol) gave the following results:

Gm. KCl.	Gm. K_2O.	Kind of Test.
.012415	.007833	Very strong.
.009932	.006266	Very strong.
.007449	.004699	Strong.
.004966	.003133	Strong.
.002483	.001566	Fairly strong.

These data show that perchloric acid in 36 per cent alcohol will remove the potassium so that hydrofluosilicic acid may be used to precipitate sodium.

The test for sodium with hydrofluosilicic acid is less delicate than the tests given above; but still one milligram of sodium oxide can be easily detected.

Gm. NaCl.	Gm. Na_2O.	Kind of Test.
.019490	.010666	Strong.
.009745	.005333	Strong.
.005847	.003199	Good.
.003898	.002133	Only fair.
.001949	.001066	Weak.

Summary. 1. Magnesium does not interfere and need not be removed. Magnesium perchlorate is very soluble. Magnesium fluosilicate is soluble and is precipitated, even in alcoholic solution, only when large amounts are present.

2. The test for sodium is delicate but traces of sodium which are present in so many reagents are not detected. This is an advantage over the spectrum test where all substances show sodium.

3. The tests are simple, and are easily followed and understood by students.

4. The tests are decisive, and the student has confidence in his work.

5. Only a short time is required to make a test.

14. THE ANNUAL PARALLAX OF EIGHT STARS.[1]

By William E. Howard.

Introduction. This work was begun in September, 1906, and the last observations were made in August, 1907. The instrument used was the 12-inch equatorial in the Kirkwood Observatory at Indiana University.[2]

The work as a whole was divided into three distinct divisions: (1) The history of parallax work from the earliest efforts to 1909; (2) The theory of the reductions in detail, arranged in a compact and convenient form, together with a number of computed tables; (3) A catalogue of all the work in parallax, containing the name of each star, the comparison stars, the results, the observer, the instrument used, and a reference. This paper presents in condensed form the author's own work, the second division above, without the theory, or the tables.

In selecting the observing list the magnitude or the proper motion was not considered. The purpose in view was to select spectrosopic binaries, but since it was not always possible to find a binary coming just at the right time to distribute the observations properly, it became necessary in a few instances to select other stars. The choice was limited to solar stars, because a solar star is likely to be nearer than an Orion star. The selection was further limited to stars that pass high above the horizon, in latitude of the Kirkwood Observatory, so that refraction would affect the results as little as possible. Spectroscopic binaries were selected, because knowing the parallax of a spectroscopic binary, it is possible to determine the relative mass of the bodies and thus to know considerable about the system. In order to check the results 61 Cygni was placed on the list; but unfortunately cloudy weather prevented a good series of observations on it and thus it served as a poor check.

The time of year at which to observe the maximum parallax displacements was next determined. This is simply a matter, first, of computing the longitude of the sun when it is 90 degrees from the star, for the maximum displacement occurs at that time; then of noting from the *Nautical Almanac* the time when the sun has the computed longitude. The time of second maximum will be six months later when the sun has moved 180 degrees.

[1] Accepted by the Graduate Council of Indiana University as a dissertation under the requirements for the degree of Doctor of Philosophy (June, 1909).

[2] Acknowledgment should be made of the author's indebtedness to the skill of his wife, who materially aided him in every computation, and without whose patience and encouragement he would have failed in his task.

To facilitate the choice of stars in making out an observing list, Hinks of Cambridge (Eng.) computed and constructed a chart which is highly serviceable. It shows at once the two days of the year when the parallactic displacement is greatest; the mean time on those days when it is best suited for observing; and the hour angle and zenith distance at which it is to be observed. This chart may be found in *The Monthly Notices of the Royal Astronomical Society*, Vol. 58, p. 142. Since the latitude enters into the computation, it is good for only one latitude and would have to be recomputed for any other latitude.

In Sir David Gill's work on stellar parallax, published in the *Annals of the Royal Observatory, Cape of Good Hope*, Vol. VIII, Pt. II, is a table giving the longitude of the sun at the epoch of a star's parallax maximum. This table is computed for every ten degrees in declination, north and south, and every hour of right ascension. Knowing the right ascension and declination of the star, it is a very easy matter to turn to the *Nautical Almanac* and note the time corresponding to the longitude as taken from the table.

The direction of the major axis of the parallactic ellipse was now determined. For this purpose, Table I in Sir David Gill's work referred to above, was used. This table gives the position angle of the major axis of a star's parallactic ellipse for every ten degrees of declination and each hour of right ascension.

Method of Observing. The method used was that of determining the relative parallax; in fact no one attempts absolute parallax now. One faint star was selected in the same field with the star whose parallax was to be determined. The distance between the two stars was measured each night. The observations covered the month preceding and the month following the time of maximum displacement. Then six months later, at next maximum, a similar set of measures was taken. Thus the observing of each star extended through something like four months. Cloudy weather, however, so interfered with observing, that this rule could not be closely followed. In a few instances, no measures were secured until after the time of maximum displacement. The position angle was also observed often enough to get an approximate value for it. It must be supposed that the faint star is so remote as to have little or no parallax, and that if a displacement is found it is practically all due to the brighter star.

Before beginning work each night the eye-piece and then the telescope were carefully focused. The dome was opened sometime previous to the observing so that the room might be well ventilated, though the readings of the external and internal temperatures would indicate that this precaution was not as carefully taken as it should have been.

In obtaining a full set of observations on a star the wires were first placed perpendicular to the line joining the two stars; then with the movable wire so placed that turning the micrometer screw in a positive direction moved it toward the stationary wire, seven settings were made for distance; then with the wires reversed seven more were made. The micrometer was then turned through 180 degrees and a similar set of readings were taken in reverse order. Thus a complete set of observations embraced 28 settings for distance. In reversing the wires and taking what is known as double distance, the error of coincidence was eliminated. In reversing the micrometer it was thought, too, that other errors due to the micrometer, such as unequal illumination of the wires, might be avoided. The hour angle before and after making observations, and the mean for the hour angle of the observation, or the reading of the hour angle at the middle of the observations, were taken. After observing each star, the barometer and both external and internal thermometers were read. The illumination of the wires was adjusted according to the brightness of the star, sometimes red and sometimes white light being used. In setting the micrometer wires the screw was always turned in a positive direction.

This order of work was closely adhered to, and in no case was it changed.

The intention was to observe as near the meridian as possible, but this procedure was not closely adhered to. In order to begin observations one month before and continue them one month after maximum, it was found necessary at times to observe on rather large hour angles.

The micrometer light, being controlled by the city current, was not as steady as it should have been and was a source of some annoyance.

The instrument used was the 12-inch equatorial of the Kirkwood Observatory, Bloomington, Indiana. The objective was made by Brashier and mounted by the Warner & Swasey Company. The micrometer has electric illumination and a position circle of about 5″ diameter. It was in excellent condition. The wires, which had been in place for about a year, were an unusually fine set. Unfortunately, however, these wires were accidently torn out, and some of the last measures were made with a poorer set of wires.

Observing List. The observing list is tabulated below, with the magnitude, right ascension, declination, and dates of maximum displacement.

Stars.	Mag.	α	δ	First Observation.	Second Observation.
70 Ophiuchi......	4.1	18h 1m	2° 31′	1906, Sept. 21	1907, Mar. 21
ζ Lyrae..........	4.2	18 41	37 30	1906, Sept. 21	1907, Mar. 21
ζ Geminorum....	3.8	6 58	20 43	1906, Oct. 8	1907, Apr. 4
γ Canis Minoris..	4.6	7 22	9 8	1906, Oct. 14	1907, Apr. 11
δ Equulei.........	4.6	21 10	9 36	1906, Nov. 17	1907, May 16
61 Cygni..........	5.5	21 2	38 15	1906, Nov. 29	1907, May 28
η Pegasi.........	3.0	22 38	29 42	1906, Dec. 18	1907, June 17
α Andromedae...	2.3	0 3	28 33	1907, Jan. 4	1907, July 6

These stars were selected so as to make it possible to observe two or three on a west hour angle in the evening, and two or three on an east hour angle in the morning. Unfavorable weather so interfered with the observing that the number of observations is very limited. A great many more stars were observed on the first maximum than on the second, because the weather made it impossible to measure them on the second maximum.

Method of Reduction. The method used in these reductions is that of Bessel as developed in Chauvenet. The order in which the development is given is as follows: (1) Development of the parallax factor. (2) Development of the effect of proper motion and derivation of the conditional equations. (3) Computation of the auxiliaries m and M in the parallax factor. (4) Effect of differential refraction. (5) Computation of τ and q. (6) Investigation of temperature correction for screw. (7) Effect of aberration.

The Parallax Factor. The parallax factor $\triangle s = prm \cos (\odot - M)$, where p = annual parallax, r = radius vector of earth, m, M = auxiliaries, and $\odot$ = longitude of the sun, is derived in Chauvenet I, p. 694. To compute the auxiliaries m and M use was made of Table III in Sir David Gill's work on stellar parallax.[2] This gives the log f, log g, F, and G for each ten minutes of right ascension and for every 5 degrees in declination. This table is computed for stars in the southern hemisphere, but it can be used for stars in the northern hemisphere by adding 12 hours to the right ascension and taking log f, log g, F, and G with negative signs.

[2] *Annals of the Royal Observatory, Cape of Good Hope,* Vol. VIII, Pt. II.

Proper Motion. The effect of proper motion on the distance between the stars is shown in the formula

$$\triangle' s = f\tau + f'\tau^2$$

The development of this formula is given in Chauvenet, Vol. I, p. 695.

The distance between the stars is affected by refraction, the correction of which is completely discussed in Chauvenet, Vol. II.

$$\sigma - s = \triangle\rho = s\,X\,[\tan^2 Z \cos^2 (p - q) + 1]^1$$

This is the formula used in computing the differential refraction in almost all of these observations. When these observations were begun no barometer was at hand, so Professor Comstock's formula was used instead.

$$r = \frac{983\,b}{460 + t} \text{ tau } Z$$

$$\text{Thus } X = \frac{983\,b}{460 + t} \cdot \frac{1}{206265}$$

This gives the refraction correct to the third decimal.

Aberration. The effect of abereation on the distance between the stars is fully discussed in Chauvenet, Vol. II.

$$\triangle\sigma = \gamma c + D\delta$$

Now σ represents the true distance between the stars; but in these reductions σ was taken to be the mean of the apparent distances. This may be done without sensible error. Applying the above corrections and reducing, the final formula for the conditional equation may be obtained:

$$\chi + \tau y + cp + n = 0$$

In the above formula τ is the fractional part of the year from the time of observation to the assumed epoch, January 1, 1907.

Temperature Coefficient of the Micrometer Screw. Satisfactory results in parallax work can not be hoped for without a thorough knowledge of the effect of temperature on the micrometer screw; consequently the temperature coefficient was carefully determined.

At various times and temperatures, 383 observations in all were made for the value of the screw. Many of these observations were made on nights too poor for other work, and as the results were not consistent, a number of them were rejected. which limited the range of temperature.

Several methods were used in making these observations. Observations were taken of 76 transits of stars on the equator on three different nights; 72 transits of stars passing near the center of the field with the telescope set at −10 degrees declination on one night; of 142 observations on δ Ursae Minoris on two nights. Nine sets of observations were made on as many different nights, of the difference of declination of stars 37 and 38 in the Pleiades; 84 observations on 51 Cephei on one night.

Temperature affects the screw value by changing the absolute length of the screw, and by changing the focal length of the telescope. The effect of these two changes on the screw is very small and may be taken as proportional to the change in temperature.

If R_0 = the value of the screw for temperature τ_0

R = the value of the screw for temperature τ

x = the temperature coefficient

Then

$$R_0 = R + R\,(\tau-\tau_0)x$$
$$= R\,[1+(\tau-\tau_0)x].$$

Let R_1 be an assumed value of R_0, and y be the correction to R_1, then

$$R_1+y=R\,[1+(\tau-\tau_0)x]$$
$$R_1+y=R+R(\tau-\tau_0)x$$
$$\therefore -R(\tau-\tau_0)x+y-(R-R_1)=0.$$

Using this last as the equation of condition, the most probable value of the screw was computed. This theory is developed in Chauvenet.

Below is tabulated the results obtained from time to time, of the value of the screw:

Date.	Method.	No. Observations.	Temp.	R.	Seeing.
1906, Sept. 6	δ Ursae Minoris	18	75.5	11.5327″	
1906, Sept. 6	" "	26	75	11.5431	
1906, Sept. 7	" "	26	76	11.5386	
1906, Sept. 7	" "	31	77	11.5376	
1906, Sept. 7	" "	41	76	11.5305	
1906, Dec. 3	$\Delta\delta$ of 37 and 38 Pleiades	1	33	11.5333	Fair.
1906, Dec. 12	" "	1	44	11.5158	Hazy.
1907, Feb. 2	" "	1	26	11.5170	Poor.
1907, Feb. 8	" "	1	29	11.5371	Good.
1907, Feb. 9	" "	1	37.5	11.5163	Good.
1907, Feb. 16	51 Cephei.............	84	43	11.5325	Good.
1907, Mar. 5	$\Delta\delta$ of 37 and 38........	1	39	11.5338	Unsteady

Assuming R_1=11.5300″, τ_0=50°, and substituting the values given above in the equation of condition, we get the following conditional equations:

	$v.$	$vv.$
$-294x+y-0.0027=0$	$+0.018$	0.000324
$-289x+y-0.0131=0$	-0.006	0.000036
$-300x+y-0.0086=0$	-0.001	0.000001
$-312x+y-0.0076=0$	0.000	0.000000
$-300x+y-0.0005=0$	$+0.006$	0.000036
$+196x+y-0.0033=0$	-0.006	0.000036
$+69x+y+0.0142=0$	$+0.014$	0.000196
$+276x+y+0.0130=0$	$+0.009$	0.000081
$+242x+y-0.0071=0$	-0.010	0.000100
$+144x+y+0.0137=0$	$+0.012$	0.000144
$+81x+y-0.0025=0$	-0.003	0.000009
$+127x+y-0.0038=0$	-0.005	0.000025
	$[vv]=$	0.000988

The normal equations are:

$$668644\text{x} - 360y + 13.1714 = 0$$
$$-360\text{x} + 12y - 0.0083 = 0$$

from which

$$\text{x} = -0.000019 \pm 0.000006$$
$$y = +0.000126 \pm 0.000018$$

since $R_0 = R_1 + y$

$$R_0 = 11.53126 \pm 0.000018.$$

Assume $R_1 = 11.5313 =$ the adopted value; now

$$R = \frac{11.53126}{1 + (\tau - \tau_0)\text{x}}$$

$$= 11.5313\,[1 - (\tau_0 - \tau)\text{x}] \text{ approximately.}$$

$$\therefore\ R = 11.5313 + 0.000219\,(50 - \tau) \text{ which is the value used.}$$

The obtained values of R must now be divided into three groups. The first group containing all values of R obtained at a temperature above 70°; the second all values near 40°; and the third, all those at a lower temperature. Then taking the mean of the temperatures and the mean of the R's in each group and computing the values of R, correcting for temperature, we get the following results:

Mean Temperature.	No. of Observations.	Observed R.	Computed R.	Ro-Rc.
76	5	11.5365	11.5369	0.0004
39.8	3	11.5275	11.5335	0.0060
29.5	3	11.5291	11.5358	0.0067

Taking the mean of the results of R obtained by the different methods and the average of the temperatures, we get:

Method.	Mean Temperature.	Observed R.	Computed R.	Ro-Rc.
δ Ursae Min..	76	11.5365	11.5369	0.0004
$\triangle\delta$ of 37 and 38	39.8	11.5275	11.5245	0.0030
51 Cephei.....	29.3	11.5291	11.5248	0.0043

Thus we see that the observed value of R and the value computed by using the temperature coefficient agree reasonably well.

Tabulation of Results. Following is tabulated, first, the observations giving the date, hour angle, the external temperature, the temperature of the attached thermometer, the barometer reading, the mean of micrometer readings when movable wire is to the left of fixed wire (M_1), and when it is to the right (M_2), the distance in revolutions of the screw ($\triangle r$), and the distance in seconds of arc ($\triangle''$). Next is given the corrections and factors computed for each observation. Then, follow the conditional equations and the normal equations, and lastly the value of annual parallax (p).

The position angles of the comparison stars are as follows:

α Andromedae..................	268°.2
70 Ophiuchi......................	102°.4
ζ Lyrae.........................	239°.8
ζ Germinorum..................	84°.3
γ Canis Minoris..................	289°.3
δ Equulei........................	61°.4
η Pegasi.........................	337°.4
61 Cygni.........................	37°.0

α Andromedae.

Date.	H. A. hours.	H. A. min.	Ex. Temp.	At. Temp.	Barometer.	M_1.	M_2.	Δr.	Δ''.	Remarks.
1906, Dec. 17	+3	10	24°	28°.5	29.508	6.4969	19.4490	6.476	74.714	
1906, Dec. 24	+1	15	15	21	29.576	6.5056	19.4073	6.451	74.430	Seeing poor.
1907, June 29	−2	35	60	63	29.060	45.6827	8.6213	6.469	74.578	
1907, June 30	−3	15	64	66	29.100	45.7037	8.6713	6.484	74.746	
1907, July 5	−3	15	69	72	29.240	45.7303	8.6731	6.471	74.588	
1907, July 6	−2	50	75	77	29.170	45.7360	8.6586	6.461	74.466	
1907, July 7	−3	00	68	70	29.110	45.7236	8.6778	6.477	74.660	
1907, July 8	−2	37	74	77	29.230	45.7402	8.6899	6.475	74.627	
1907, July 9	−2	45	78	80	29.238	45.7106	8.6899	6.490	74.795	
1907, July 12	−3	17	63	65	29.290	45.6798	8.6394	6.480	74.701	
1907, July 16	−3	30	75	77	29.230	45.6982	8.6516	6.477	74.650	

Corrections, Constants, and Factors.

Date.	$\Delta\rho$.	$\Delta\sigma$.	Log τ^2.	Δ's.	c.	n.
1906, Dec. 17.3910	0.03145	+0.0064	7.158284	−0.00481	−0.8733	−0.101
1906, Dec. 24.2992	0.01016	+0.0066	6.558890	−0.00241	−0.8714	+0.206
1907, June 29.6264	0.02713	−0.0067	9.388382	+0.06268	+0.8913	+0.120
1907, June 30.5816	0.03329	−0.0067	9.392964	+0.06301	+0.8889	−0.054
1907, July 5.5833	0.03256	−0.0067	9.416566	+0.06476	+0.8725	+0.106
1907, July 6.5929	0.02838	−0.0067	9.421254	+0.06511	+0.8684	+0.233
1907, July 7.5875	0.03009	−0.0067	9.425846	+0.06546	+0.8641	+0.037
1907, July 8.5911	0.02632	−0.0067	9.420456	+0.06580	+0.8616	+0.075
1907, July 9.5938	0.02763	−0.0067	9.435038	+0.06615	+0.8548	−0.095
1907, July 12.5671	0.03336	−0.0066	9.448484	+0.06718	+0.8393	−0.005
1907, July 16.5412	0.03499	−0.0065	9.466136	+0.06856	+0.8151	+0.046

Conditional Equations.

$$x - 0.0379y - 0.8733p - 0.101 = 0$$
$$x - 0.0190y - 0.8714p + 0.206 = 0$$
$$x + 0.4945y + 0.8913p + 0.120 = 0$$
$$x + 0.4971y + 0.8889p - 0.054 = 0$$
$$x + 0.5108y + 0.8725p + 0.106 = 0$$

$$x + 0.5136y + 0.8684p + 0.233 = 0$$
$$x + 0.5163y + 0.8641p + 0.037 = 0$$
$$x + 0.5191y + 0.8616p + 0.075 = 0$$
$$x + 0.5218y + 0.8548p - 0.095 = 0$$
$$x + 0.5300y + 0.8393p - 0.005 = 0$$
$$x + 0.5408y + 0.8151p + 0.046 = 0$$

Normal Equations.

$$11.000x + 4.5880y + 6.0120p + 0.5680 = 0$$
$$4.588x + 2.4009y + 4.0500p + 0.2371 = 0$$
$$6.012x + 4.0500y + 8.2087p + 0.3112 = 0$$

$$x = -0.0710, \quad y = +0.0792, \quad Wp = 0.040$$
$$p = -0.025 \pm 0.042.$$

61 Cygni.

Date.	H. A. hours.	H. A. min.	Ex. Temp.	At. Temp.	Barometer.	M_1.	M_2.	$\triangle r$.	$\triangle''$.	Remarks.
1906, Dec. 1	+3	00	30°	35°	29.546	43.1850	30.6710	18.743	216.193	Seeing fair.
1906, Dec. 3	+4	15	30	35.5	29.376	43.2593	30.6494	18.696	215.649	Seeing fair.
1906, Dec. 12	+3	00	45	46	29.274	44.2620	31.5853	18.662	215.214	
1906, Dec. 18	+2	45	21	26	29.672	44.2479	31.6317	18.692	215.642	
1906, Dec. 24	+3	00	16	22.5	29.594	44.2744	31.6480	18.687	215.596	Seeing poor.
1907, May 19	−2	13	49	53	29.250	33.7522	20.7091	18.478	213.062	
1907, May 20	−3	06	40	45.5	29.420	33.7525	20.7140	18.481	213.128	
1907, May 21	−2	50	46	50	29.376	33.7576	20.7015	18.472	213.006	
1907, June 5	−2	52	56.5	60	29.200	33.7703	20.6676	18.449	212.700	
1907, June 10	−0	42	64	67	29.100	33.7346	20.6793	18.472	212.938	
1907, June 13	−1	30	58	62	29.190	33.7295	20.7327	18.502	213.304	

Corrections, Constants, and Factors.

Date.	$\Delta\rho$.	$\Delta\sigma$.	Log τ^2.	Λ's.	c.	n.
1906, Dec. 1.3214	0.07491	+0.0130	7.826992	+0.4269	+0.90699	−1.574
1906, Dec. 3.3555	0.09791	+0.0130	7.765858	+0.3979	+0.91633	−1.082
1906, Dec. 12.2792	0.07724	+0.0126	7.430990	+0.2706	+0.94309	−0.753
1906, Dec. 18.2502	0.06069	+0.0122	7.102692	+0.1854	+0.94799	−1.250
1906, Dec. 24.2465	0.08299	+0.0121	6.565450	+0.0999	+0.94232	−1.311
1907, May 19.6292	0.06103	−0.0130	9.164774	−1.9912	−0.86076	−0.821
1907, May 20.5896	0.06395	−0.0130	9.170726	−2.0049	−0.86819	−0.904
1907, May 21.5979	0.06262	−0.0131	9.176934	−2.0193	−0.87575	−0.795
1907, June 5.5555	0.06098	−0.0129	9.264156	−2.2325	−0.95721	−0.701
1907, June 10.6319	0.05693	−0.0128	9.291922	−2.3050	−0.97129	−1.007
1907, June 13.5902	0.05871	−0.0125	9.307628	−2.3470	−0.97625	−1.417

Conditional Equations.

$$x - 0.082y + 0.907p - 1.574 = 0$$
$$x - 0.076y + 0.916p - 1.082 = 0$$
$$x - 0.052y + 0.943p - 0.753 = 0$$
$$x - 0.036y + 0.948p - 1.250 = 0$$
$$x - 0.019y + 0.942p - 1.310 = 0$$

$$x + 0.382y - 0.861p - 0.821 = 0$$
$$x + 0.385y - 0.868p - 0.904 = 0$$
$$x + 0.388y - 0.876p - 0.795 = 0$$
$$x + 0.429y - 0.957p - 0.701 = 0$$
$$x + 0.443y - 0.971p - 1.007 = 0$$
$$x + 0.451y - 0.976p - 1.417 = 0$$

Normal Equations.

$$11.000x + 2.213y - 0.853p - 11.614 = 0$$
$$2.213x + 1.045y - 2.528p - 2.038 = 0$$
$$-0.853x - 2.528y + 9.410p - 0.328 = 0$$

$$x = +0.7348, \quad y = +1.8238, \quad Wp = 0.093$$
$$p = 0.5914 \pm 0.647$$

Such a result as this may possibly be accounted for by the limited number of observations and by the fact that not a single observation was secured before the first maximum.

η PEGASI.

Date.	H. A. hours.	H. A. min.	Ex. Temp.	At. Temp.	Barometer.	M_1.	M_2.	Δr.	Δ''.	Remarks.
1906, Nov. 22	+3	15	36°	36°	29.600	4.0828	19.7879	7.852	90.568	
1906, Dec. 1	+2	00	30	34.5	29.546	4.0559	19.8202	7.882	90.917	Seeing fair.
1906, Dec. 3	+3	15	30	35	29.376	4.0644	19.8024	7.869	90.766	Seeing fair.
1906, Dec. 12	+3	00	46	45.5	29.274	5.0195	20.8055	7.893	91.024	Seeing hazy.
1906, Dec. 17	+3	45	25	29	29.508	5.0666	20.8100	7.872	90.811	
1906, Dec. 24	+2	00	16	21	29.594	5.0756	20.8100	7.867	90.767	Seeing fair.
1907, Jan. 5	+4	00	47	47	29.216	5.0443	20.7833	7.865	90.699	
1907, June 6	−3	40	55	59	29.200	44.3735	10.0458	7.836	90.344	
1907, June 11	−1	52	64	67	29.100	44.3727	10.0327	7.830	90.261	
1907, June 14	−2	32	58	62	29.190	44.3953	10.0551	7.829	90.258	
1907, June 15	−3	12	60	64	29.208	44.3932	10.0577	7.832	90.289	
1907, June 16	−2	55	60	64.5	29.350	44.3675	10.0676	7.850	90.496	
1907, June 17	−3	40	64	68.5	29.430	44.3496	10.0711	7.860	90.625	
1907, June 22	−1	47	64	68.5	29.430	44.3061	10.0496	7.871	90.731	
1907, June 29	−1	54	60	63	29.060	44.3628	10.0450	7.841	90.395	
1907, June 30	−2	20	64	66	29.100	44.3605	10.0302	7.835	90.320	
1907, July 5	−2	27	69	72	29.240	44.3978	10.0451	7.824	90.183	
1907, July 6	−2	00	75	77	29.170	44.3418	10.0471	7.853	90.509	
1907, July 7	−2	05	65	70	29.110	44.3390	10.0714	7.866	90.671	
1907, July 8	−1	40	74	77	29.230	44.3468	10.0673	7.860	90.410	
1907, July 9	−1	50	78	80	29.238	44.3664	10.0677	7.851	90.480	
1907, July 12	−2	20	63	65	29.290	44.3559	10.0532	7.849	90.484	

Corrections, Constants, and Factors.

Date.	$\Delta\rho$.	$\Delta\sigma$.	Log τ^2.	$\Delta' s$.	c.	n.
1906, Nov. 22.4111	0.02592	+0.0001	8.053354	0.0000	−0.1621	−0.124
1906, Dec. 1.3340	0.02620	+0.0001	7.826628	0.0000	−0.0736	−0.476
1906, Dec. 3.3806	0.02605	+0.0002	7.765074	0.0000	−0.0529	−0.322
1906, Dec. 12.3458	0.02503	+0.0003	7.427938	0.0000	+0.0617	−0.579
1906, Dec. 17.3632	0.02652	+0.0004	7.160024	0.0000	+0.0887	−0.368
1906, Dec. 24.2715	0.02707	+0.0004	6.562344	0.0000	+0.1572	−0.324
1907, Jan. 5.3215	0.02499	+0.0005	6.326888	0.0000	+0.2704	−0.254
1907, June 6.5854	0.02477	−0.0001	9.269852	0.0000	+0.0096	+0.101
1907, June 11.6462	0.02720	−0.0001	9.297316	0.0000	−0.0403	+0.182
1907, June 14.6105	0.03004	−0.0001	9.312996	0.0000	−0.0694	+0.182
1907, June 15.5805	0.03492	−0.0000	9.318068	0.0000	−0.0788	+0.146
1907, June 16.5895	0.03213	−0.0000	9.323274	0.0000	−0.0887	−0.058
1907, June 17.5515	0.03877	−0.0000	9.328286	0.0000	−0.0981	−0.194
1907, June 22.6200	0.02735	−0.0004	9.354020	0.0000	−0.1468	−0.288
1907, June 29.5958	0.02812	−0.0004	9.388236	0.0000	−0.2122	+0.047
1907, June 30.5749	0.02965	−0.0004	9.392932	0.0000	−0.2217	+0.120
1907, July 5.5566	0.02916	−0.0006	9.416442	0.0000	−0.2658	+0.258
1907, July 6.5729	0.02707	−0.0005	9.421158	0.0000	−0.2747	−0.066
1907, July 7.5666	0.02780	−0.0005	9.425750	0.0000	−0.2833	−0.229
1907, July 8.5749	0.02643	−0.0005	9.430382	0.0000	−0.2920	+0.034
1907, July 9.5712	0.02650	−0.0005	9.434936	0.0000	−0.3006	−0.037
1907, July 12.4904	0.02905	−0.0040	9.448060	0.0000	−0.3249	−0.039

Conditional Equations.

$$x - 0.1063y - 0.1621p - 0.124 = 0$$
$$x - 0.0819y - 0.0736p - 0.473 = 0$$
$$x - 0.0763y - 0.0529p - 0.322 = 0$$
$$x - 0.0518y + 0.0617p - 0.579 = 0$$
$$x - 0.0380y + 0.0887p - 0.368 = 0$$

$$x - 0.0191y + 0.1572p - 0.324 = 0$$
$$x + 0.0146y + 0.2704p - 0.254 = 0$$
$$x + 0.4315y + 0.0096p + 0.101 = 0$$
$$x + 0.4453y - 0.0403p + 0.182 = 0$$
$$x + 0.4534y - 0.0694p + 0.182 = 0$$

$$x + 0.4561y - 0.0788p + 0.146 = 0$$
$$x + 0.4588y - 0.0887p - 0.058 = 0$$
$$x + 0.4615y - 0.0981p - 0.194 = 0$$
$$x + 0.4754y - 0.1468p - 0.288 = 0$$
$$x + 0.4944y - 0.2122p + 0.047 = 0$$

$$x + 0.4971y - 0.2217p + 0.120 = 0$$
$$x + 0.5108y - 0.2658p + 0.258 = 0$$
$$x + 0.5135y - 0.2747p - 0.066 = 0$$
$$x + 0.5163y - 0.2833p - 0.229 = 0$$
$$x + 0.5190y - 0.2920p + 0.034 = 0$$

$$x + 0.5218y - 0.3006p - 0.037 = 0$$
$$x + 0.5297y - 0.3247p - 0.039 = 0$$

Normal Equations.

$$22.0000x + 6.9258y - 2.3983p - 2.285 = 0$$
$$6.9258x + 3.5811y - 1.3345p + 0.1839 = 0$$
$$-2.3983x - 1.3345y + 0.7977p - 0.0883 = 0$$

$$x = +0.309, \quad y = -0.695, \quad Wp = 0.2965$$
$$p = -0.1224 \pm 0.2059$$

δ Equulei.

Date.	H. A. hours.	H. A. min.	Ex. Temp.	At. Temp.	Barometer.	M_1.	M_2.	Δr.	Δ''.	Remarks.
1906, Oct. 22	+2	00	60°	61°	29.324	40.7906	29.0486	19.129	220.536	Seeing good.
1906, Oct. 25	+0	30	54.5	56	29.042	41.8458	30.0076	19.081	219.622	Seeing good.
1906, Oct. 26	+1	00	51	52.5	29.162	41.8150	30.0216	19.103	220.271	Seeing good.
1906, Oct. 31	+0	45	41.5	40	29.700	41.8343	30.0493	19.108	220.382	Seeing fair.
1906, Nov. 1	+0	45	40	40.5	29.600	41.8191	30.0235	19.102	220.342	Seeing poor.
1906, Nov. 3	+2	15	48.5	49	29.486	42.8397	31.0136	19.086	220.090	Seeing poor.
1906, Nov. 6	+1	45	53	54	29.388	42.7774	31.0294	19.126	220.530	Seeing fair.
1906, Nov. 23	+2	15	38	39	29.662	42.8337	31.0688	19.118	220.501	
1906, Dec. 1	+2	00	32	37	29.566	42.8475	31.0301	19.091	220.198	
1906, Dec. 3	+2	15	33	38	29.348	42.8463	31.0403	19.097	220.263	Seeing fair.
1906, Dec. 8	+2	30	44	46	29.258	43.8472	32.0015	19.076	219.988	Seeing very poor.
1907, May 11	−2	33	42	46	29.160	33.0775	21.3113	19.117	220.641	
1907, May 12	−3	13	58	60.5	29.040	33.0551	21.2862	19.116	220.338	
1907, May 13	−2	50	64	66.5	29.024	33.0781	21.3328	19.127	220.490	
1907, May 15	−2	33	44	47.5	29.200	33.0614	21.3348	19.137	220.686	
1907, May 19	−1	51	49	53	29.250	33.1127	21.3370	19.112	220.373	
1907, May 20	−2	43	39	44	29.424	33.1011	21.3623	19.131	220.630	
1907, May 21	−2	27	45	47	29.376	33.0995	21.3128	19.107	220.342	

Corrections, Constants, and Factors.

Date.	$\Delta\rho$.	$\Delta\sigma$.	Log τ^2.	$\Delta's$.	c.	n.
1906, Oct. 22.3819	0.05944	+0.0132	8.563378	−0.0270	+0.2437	−0.235
1906, Oct. 25.3110	0.06861	+0.0141	8.526178	−0.0257	+0.1405	+0.669
1906, Oct. 26.3291	0.08327	+0.0143	8.512866	−0.0253	+0.1376	+0.007
1906, Oct. 31.3055	0.07433	+0.0156	8.444690	−0.0234	+0.0546	−0.095
1906, Nov. 1.3027	0.07426	+0.0157	8.430358	−0.0230	+0.0379	−0.055
1906, Nov. 3.3597	0.10470	+0.0162	8.400032	−0.0222	+0.0034	+0.167
1906, Nov. 6.3305	0.08918	+0.0169	8.354274	−0.0211	−0.9579	−0.257
1906, Nov. 23.3047	0.10660	+0.0200	8.033136	−0.0146	−0.8976	−0.243
1906, Dec. 1.2722	0.10060	+0.0204	7.828420	−0.0115	−0.8419	+0.069
1906, Dec. 3.2771	0.10760	+0.0208	7.768296	−0.0107	−0.8253	−0.003
1906, Dec. 8.2743	0.11430	+0.0211	7.597358	−0.0088	−0.7794	+0.268
1907, May 11.7757	0.06457	−0.0181	9.114492	+0.0506	+0.1649	−0.231
1907, May 12.7479	0.06820	−0.0186	9.120876	+0.0509	+0.1797	+0.085
1907, May 13.7639	0.06345	−0.0188	9.127498	+0.0513	+0.1962	−0.083
1907, May 15.7757	0.06439	−0.0191	9.140464	+0.0521	+0.2286	−0.279
1907, May 19.8034	0.06080	−0.0196	9.165856	+0.0537	+0.2928	+0.040
1907, May 20.7688	0.06672	−0.0198	9.171832	+0.0540	+0.3078	−0.223
1907, May 21.7799	0.06402	−0.0199	9.178050	+0.0544	+0.3236	+0.068

Conditional Equations.

$$x - 0.1913y + 0.2437p - 0.234 = 0$$
$$x - 0.1833y + 0.1405p + 0.669 = 0$$
$$x - 0.1805y + 0.1376p + 0.006 = 0$$
$$x - 0.1669y + 0.0546p - 0.095 = 0$$
$$x - 0.1641y + 0.0379p - 0.055 = 0$$

$$x - 0.1585y + 0.0034p + 0.167 = 0$$
$$x - 0.1504y - 0.9579p - 0.257 = 0$$
$$x - 0.1039y - 0.8976p - 0.243 = 0$$
$$x - 0.0821y - 0.8419p + 0.069 = 0$$
$$x - 0.0766y - 0.8253p - 0.003 = 0$$

$$x - 0.0629y - 0.7794p + 0.268 = 0$$
$$x + 0.3608y + 0.1649p - 0.231 = 0$$
$$x + 0.3634y + 0.1797p + 0.085 = 0$$
$$x + 0.3662y + 0.1962p - 0.083 = 0$$

$$x + 0.3717y + 0.2386p - 0.279 = 0$$
$$x + 0.3828y + 0.2928p + 0.040 = 0$$
$$x + 0.3854y + 0.3078p - 0.223 = 0$$
$$x + 0.3882y + 0.3236p + 0.068 = 0$$

Normal Equations.

$$18.0000x + 1.0980y - 1.9908p - 0.331 = 0$$
$$1.0980x + 1.2129y + 0.9436p - 0.270 = 0$$
$$- 1.9908x + 0.9436y + 4.2585p + 0.092 = 0$$

$$x = - 0.0108, \quad y = + 0.30697, \quad Wp = 3.0459$$
$$p = - 0.0947 \pm 0.022$$

70 Ophiuchi.

Date.	H. A. hours.	H. A. min.	Ex. Temp.	At. Temp.	Barometer.	M_1.	M_2.	Δr.	Δ''.	Remarks.
1906, Sept. 6	+1	00	70°	......	......	41.511	12.157	10.323	118.992	
1906, Sept. 7	+1	00	74	......	......	41.599	12.2605	10.3307	119.075	
1906, Sept. 13	+2	00	70	......	......	48.5472	19.2363	10.3445	119.246	
1906, Sept. 15	+2	00	68	......	......	48.5627	19.229	10.3330	119.113	
1906, Sept. 16	+2	15	70	......	......	48.558	19.234	10.338	119.165	
1906, Sept. 19	+2	30	73.5	......	......	49.5812	20.2105	10.3146	118.893	Seeing good.
1906, Sept. 20	+2	45	70	......	......	49.5638	20.2222	10.3290	119.061	Seeing fine.
1906, Sept. 21	+2	30	70	......	......	49.5720	20.2402	10.3340	119.119	
1906, Sept. 23	+0	30	67	......	......	49.5718	20.2492	10.3390	119.219	Seeing poor.
1906, Oct. 6	+3	00	51	......	......	49.5616	20.2355	10.3370	119.196	
1906, Oct. 12	+3	00	51	51.5°	29.363	49.5742	20.1987	10.2120	118.908	
1907, Mar. 11	−2	05	25	30	29.448	1.6357	22.2810	10.3230	119.083	Seeing poor.
1907, Mar. 15	−2	20	35	39	29.526	39.7628	10.4038	10.3210	119.039	Seeing very poor.
1907, Mar. 22	−1	02	64	66.5	29.062	39.8275	10.4513	10.312	118.874	
1907, Mar. 23	−1	18	63.5	67	29.166	39.8688	10.4745	10.303	118.769	Seeing very hazy.
1907, Mar. 24	−1	22	59.5	64	29.166	39.8694	10.5400	10.335	119.144	Seeing very poor.
1907, Apr. 2	−1	09	25	29.5	29.510	39.8625	10.5334	10.335	119.222	Full moon near.
1907, Apr. 17	−1	47	31	35	29.116	39.8867	10.4728	10.293	118.726	
1907, Apr. 20	−1	13	30	34.5	29.320	39.8910	10.5120	10.311	118.934	

Corrections, Constants, and Factors.

Date.	$\Delta\rho$.	$\Delta\sigma$.	Log τ^2.	$\Delta's$.	c.	n.
1906, Sept. 6.3758	0.03179	+0.0101	9.002762	+0.1958	+0.9699	+0.242
1906, Sept. 7.3750	0.03155	+0.0102	8.995233	+0.1543	+0.9727	+0.118
1906, Sept. 13.4166	0.03539	+0.0105	8.938417	+0.1462	+0.9840	−0.066
1906, Sept. 15.4166	0.03553	+0.0105	8.932206	+0.1435	+0.9855	+0.064
1906, Sept. 16.4270	0.03749	+0.0105	8.923955	+0.1422	+0.9858	+0.009
1906, Sept. 19.4374	0.03969	+0.0106	8.898890	+0.1380	+0.9849	+0.174
1906, Sept. 20.4479	0.04312	+0.0106	8.890315	+0.1367	+0.9840	+0.102
1906, Sept. 21.4374	0.03995	+0.0106	8.881827	+0.1354	+0.9829	+0.045
1906, Sept. 23.4374	0.04018	+0.0106	8.864421	+0.1327	+0.9797	−0.022
1906, Oct. 6.4580	0.04895	+0.0103	8.741693	+0.1151	+0.9309	−0.061
1906, Oct. 12.4583	0.04856	+0.0102	8.678716	+0.1071	+0.8929	+0.220
1907, Mar. 11.6979	0.05462	−0.0105	8.573658	−0.0975	−0.9722	−0.144
1907, Mar. 15.6687	0.05838	−0.0106	8.621112	−0.1002	−0.9762	−0.106
1907, Mar. 22.7083	0.03723	−0.0106	8.699370	−0.1093	−0.9722	+0.081
1907, Mar. 23.6944	0.05789	−0.0106	8.709726	−0.1106	−0.9705	+0.166
1907, Mar. 24.6874	0.03847	−0.0106	8.720167	−0.1119	−0.9605	−0.202
1907, Apr. 2.6749	0.04197	−0.0104	8.808698	−0.1240	−0.9376	−0.298
1907, Apr. 17.6041	0.04818	−0.0095	8.938444	−0.1439	−0.8375	+0.171
1907, Apr. 20.6250	0.04183	−0.0092	8.962565	−0.1479	−0.8102	−0.035

Equations of Condition.

$$x - 0.317y + 0.970p + 0.242 = 0$$
$$x - 0.315y + 0.973p + 0.118 = 0$$
$$x - 0.298y + 0.984p - 0.066 = 0$$
$$x - 0.293y + 0.986p + 0.064 = 0$$
$$x - 0.290y + 0.986p + 0.009 = 0$$

$$x - 0.282y + 0.985p + 0.174 = 0$$
$$x - 0.279y + 0.984p + 0.102 = 0$$
$$x - 0.276y + 0.983p + 0.045 = 0$$
$$x - 0.271y + 0.980p - 0.022 = 0$$
$$x - 0.235y + 0.931p - 0.061 = 0$$

$$x - 0.219y + 0.893p + 0.220 = 0$$
$$x + 0.194y - 0.972p - 0.146 = 0$$
$$x + 0.204y - 0.976p - 0.106 = 0$$
$$x + 0.224y - 0.972p + 0.081 = 0$$
$$x + 0.226y - 0.971p + 0.166 = 0$$

$$x + 0.229y - 0.969p - 0.202 = 0$$
$$x + 0.254y - 0.938p - 0.298 = 0$$
$$x + 0.295y - 0.838p + 0.171 = 0$$
$$x + 0.303y - 0.810p - 0.035 = 0$$

Normal Equations.

$$19x - 1.146y + 3.209p + 0.4560 = 0$$
$$-1.146x + 1.345y - 4.763p - 0.3100 = 0$$
$$3.209x - 4.763y + 17.291p + 1.1579 = 0$$

$$p = -0.1795 \pm 0.1557$$

ζ Lyrae.

Date.	H. A.		Ex. Temp.	At. Temp.	Barometer.	M_1.	M_2.	Δr.	Δ''.	Remarks.
	hours.	min.								
1906, Sept. 10....	+4	00	72°	....	....	41.2006	26.6830	17.7412	204.493	
1906, Sept. 13....	+2	15	66.5	....	....	41.1470	26.6410	17.7470	204.582	
1906, Sept. 14....	+2	30	63	....	....	41.1795	26.6486	17.7340	204.446	
1906, Sept. 15....	+2	15	67	....	....	41.1817	26.6476	17.7330	204.419	
1906, Sept. 16....	+3	30	68	....	....	41.1905	26.6512	17.7300	204.381	
1906, Sept. 20....	+2	45	67.5	....	....	42.1732	27.6438	17.7350	204.440	
1906, Sept. 21....	+2	45	68.5	....	....	42.1980	27.6404	17.7210	204.274	
1906, Sept. 23....	+2	45	65	....	....	42.2101	27.6575	17.7240	204.323	Seeing fair.
1906, Oct. 6....	+3	15	48	....	....	42.2028	27.6537	17.7250	204.399	
1907, Mar. 21....	−3	20	65	67°	29.062	32.4424	17.8777	17.7180	204.246	Seeing very poor.
1907, Mar. 22....	−3	33	65	68	29.136	32.4128	17.8538	17.7210	204.277	Seeing very hazy.
1907, Mar. 23....	−3	31	63	67	29.138	32.4591	17.9131	17.7270	204.350	Seeing fair.
1907, Mar. 24....	−3	42	45	51	29.292	32.4242	17.8490	17.7120	204.239	
1907, Mar. 25....	−2	52	63.5	65	29.160	32.4463	17.8991	17.7260	204.345	
1907, Apr. 6....	−2	45	41	44	29.780	32.4963	17.9055	17.7050	204.185	
1907, Apr. 13....	−2	30	25	29	29.284	32.4977	17.8930	17.6980	204.162	
1907, Apr. 19....	−2	31	31	35	29.320	32.4683	17.8955	17.7140	204.324	

Corrections, Constants, and Factors.

Date.	$\Delta\rho$.	$\Delta\sigma$.	Log τ^2.	$\Delta's$.	c.	n.
1906, Sept. 10.4771	0.06930	+0.0088	8.971492	0.0000	−0.6526	−0.170
1906, Sept. 13.3965	0.06642	+0.0088	8.948506	0.0000	−0.6882	−0.257
1906, Sept. 14.4113	0.06936	+0.0089	8.940370	0.0000	−0.7001	−0.124
1906, Sept. 15.3908	0.06529	+0.0089	8.932444	0.0000	−0.7110	−0.093
1906, Sept. 16.4470	0.08921	+0.0090	8.923816	0.0000	−0.7235	−0.079
1906, Sept. 20.3908	0.07396	+0.0092	8.890820	0.0000	−0.7663	−0.123
1906, Sept. 21.3950	0.07347	+0.0093	8.882216	0.0000	−0.7760	+0.043
1906, Sept. 23.3896	0.06820	+0.0094	8.864866	0.0000	−0.7965	−0.001
1906, Oct. 6.3750	0.08332	+0.0098	8.742554	0.0000	−0.9019	−0.092
1907, Mar. 21.6408	0.06996	−0.0094	8.687930	0.0000	+0.7958	+0.093
1907, Mar. 22.6320	0.07232	−0.0095	8.698540	0.0000	+0.8038	+0.061
1907, Mar. 23.6320	0.07238	−0.0110	8.709116	0.0000	+0.8154	−0.012
1907, Mar. 24.6250	0.07719	−0.0096	8.719492	0.0000	+0.8252	+0.094
1907, Mar. 25.6604	0.06456	−0.0096	8.730180	0.0000	+0.8344	−0.001
1907, Apr. 6.6654	0.06746	−0.0098	8.845362	0.0000	+0.9257	+0.158
1907, Apr. 13.6754	0.07007	−0.0097	8.906170	0.0000	+0.9611	+0.178
1907, Apr. 19.6750	0.06709	−0.0096	8.955036	0.0000	+0.9801	+0.019

Equations of Condition.

$$x - 0.3060y - 0.6526p - 0.170 = 0$$
$$x - 0.2980y - 0.6882p - 0.257 = 0$$
$$x - 0.2952y - 0.7001p - 0.124 = 0$$
$$x - 0.2926y - 0.7110p - 0.093 = 0$$
$$x - 0.2897y - 0.7235p - 0.079 = 0$$

$$x - 0.2789y - 0.7663p - 0.123 = 0$$
$$x - 0.2761y - 0.7760p - 0.043 = 0$$
$$x - 0.2707y - 0.7965p - 0.001 = 0$$
$$x - 0.2351y - 0.9019p - 0.092 = 0$$
$$x + 0.2208y + 0.7958p + 0.093 = 0$$

$$x + 0.2235y + 0.8038p + 0.061 = 0$$
$$x + 0.2262y + 0.8154p - 0.012 = 0$$
$$x + 0.2290y + 0.8252p + 0.094 = 0$$
$$x + 0.2318y + 0.8344p - 0.001 = 0$$
$$x + 0.2647y + 0.9257p + 0.158 = 0$$

$$x + 0.2838y + 0.9611p + 0.178 = 0$$
$$x + 0.3003y + 0.9801p + 0.019 = 0$$

Normal Equations.

$$17x - 0.5622y + 0.2254p - 0.306 = 0$$
$$-0.5622x + 1.2185y + 3.6189p + 0.4103 = 0$$
$$+0.2254x + 3.6189y + 11.1186p + 1.1686 = 0$$

$x = -0.01978$
$y = -1.048$
$p = +0.2363$ Weight 0.1557

Probable error of $p = \pm 0.1308$
$\therefore p = +0.2363 \pm 0.1308$

γ Canis Minoris.

Date.	H. A. hours.	H. A. min.	Ex. Temp.	At. Temp.	Barometer.	M_1.	M_2.	Δr.	Δ''.	Remarks.
1906, Oct. 16	−1	30	61°	61.5°	29.180	47.3878	22.3514	12.482	143.902	
1906, Oct. 18	−2	00	51	51.5	29.333	47.4209	22.3653	12.472	143.815	Seeing good.
1906, Oct. 20	−3	15	51.5	52.0	29.300	47.4379	22.3842	12.473	143.825	Seeing good.
1906, Oct. 31	−3	00	31	31	29.680	48.4623	23.3986	12.468	143.825	Moon full.
1906, Nov. 1	−0	45	34	35	29.598	49.4546	24.3763	12.461	143.733	Seeing poor.
1907, Mar. 23	+1	57	70	71.5	29.086	37.6973	12.6830	12.493	144.004	Unsteady.
1907, Mar. 25	+2	00	64.5	68	29.186	37.7064	12.6366	12.466	143.701	
1907, Mar. 31	+2	11	30	35	29.730	37.7058	12.6601	12.477	143.917	
1907, Apr. 1	+1	08	33	38	29.556	37.7344	12.6733	12.469	143.816	
1907, Apr. 14	+3	05	29.5	34	29.360	37.7300	12.6621	12.466	143.793	
1907, Apr. 20	+3	25	41	45	29.482	37.7287	12.6792	12.475	143.867	
1907, Apr. 21	+3	05	44	49	29.368	37.7061	12.6517	12.473	143.832	
1907, Apr. 23	+3	52	45	50	29.130	37.7393	12.6437	12.452	143.588	
1907, Apr. 24	+3	40	59	61	29.600	37.7063	12.6650	12.479	143.969	

Corrections, Constants, and Factors.

Date.	$\Delta\rho$.	$\Delta\sigma$.	Log T^2.	's.	c.	n.
1906, Oct. 16.6785	0.04958	+0.01388	8.631536	0.0000	+0.9790	−0.076
1906, Oct. 18.6521	0.05893	+0.01386	8.608550	0.0000	+0.9782	+0.002
1906, Oct. 20.5944	0.09728	+0.01381	8.587742	0.0000	+0.9761	0.046
1906, Oct. 31.5742	0.05925	+0.01326	8.440852	0.0000	+0.9451	−0.007
1906, Nov. 1.6660	0.04685	+0.01310	8.425080	0.0000	+0.9380	+0.097
1907, Mar. 23.3889	0.04022	+0.01289	8.706558	0.0000	−0.9116	−0.172
1907, Mar. 25.3910	0.04367	+0.01334	8.727412	0.0000	−0.9243	+0.132
1907, Mar. 31.3986	0.04989	+0.01367	8.787144	0.0000	−0.9546	−0.091
1907, Apr. 1.3548	0.05417	+0.01366	8.796282	0.0000	−0.9586	+0.006
1907, Apr. 11.4360	0.05385	+0.01387	8.912520	0.0000	−0.9833	+0.029
1907, Apr. 20.4499	0.05930	+0.01371	8.961152	0.0000	−0.9815	−0.050
1907, Apr. 21.4360	0.05187	+0.01367	8.968870	0.0000	−0.9801	−0.012
1907, Apr. 23.4687	0.06840	+0.01358	8.984572	0.0000	−0.9729	+0.230
1907, Apr. 24.4423	0.06065	+0.01351	8.991994	0.0000	−0.9733	−0.154

Equations of Condition.

$$
\begin{aligned}
x - 0.2069y + 0.9790p - 0.076 &= 0\\
x - 0.2015y + 0.9782p + 0.002 &= 0\\
x - 0.1967y + 0.9764p - 0.046 &= 0\\
x - 0.1661y + 0.9451p - 0.007 &= 0\\
x - 0.1631y + 0.9380p + 0.097 &= 0
\end{aligned}
$$

$$
\begin{aligned}
x + 0.2256y - 0.9116p - 0.172 &= 0\\
x + 0.2310y - 0.9243p + 0.132 &= 0\\
x + 0.2475y - 0.9546p - 0.091 &= 0\\
x + 0.2501y - 0.9586p + 0.006 &= 0\\
x + 0.2859y - 0.9833p + 0.029 &= 0
\end{aligned}
$$

$$
\begin{aligned}
x + 0.3024y - 0.9815p - 0.050 &= 0\\
x + 0.3051y - 0.9851p - 0.012 &= 0\\
x + 0.3107y - 0.9729p + 0.230 &= 0\\
x + 0.3133y - 0.9733p - 0.154 &= 0
\end{aligned}
$$

Normal Equations.

$$
\begin{aligned}
14.0000x + 1.5382y - 3.8235p - 0.1120 &= 0\\
1.5382x + 0.8658y - 3.2820p - 0.0068 &= 0\\
-3.8235x - 3.8220y + 12.9418p + 0.0415 &= 0
\end{aligned}
$$

$$x = +0.0505, \quad y = -0.9687, \quad Wp = 0.1432$$

$$p = -0.2339 \pm 0.2038.$$

ζ Geminorum.

Date.	H. A. hours.	H. A. min.	Ex. Temp.	At. Temp.	Barometer.	M_1.	M_2.	Δr.	Δ''.	Remarks.
1906, Sept. 22	–2	30	59.5°	....	....	2.3122	17.5155	7.602	87.645	Seeing poor.
1906, Oct. 11	–2	00	47	47°	29.440	2.3750	17.4858	7.555	87.124	
1906, Oct. 12	–2	30	48.5	50	29.534	2.3557	17.4673	7.555	87.124	
1906, Oct. 17	–2	15	61	62	29.171	2.3470	17.5189	7.586	87.457	
1906, Oct. 18	–2	30	51.5	52	29.332	2.3176	17.5205	7.601	87.646	Seeing good.
1906, Oct. 20	–3	45	51.5	53	29.314	2.3286	17.5018	7.587	87.473	Seeing fair.
1906, Oct. 26	–2	15	46	47	29.094	3.2840	18.4409	7.578	87.309	Seeing poor.
1906, Oct. 28	–2	00	34	36	29.286	3.2916	18.5052	7.607	87.742	Seeing good.
1906, Oct. 31	–3	15	31	31	29.684	3.3306	18.5260	7.598	87.647	Moon full.
1906, Nov. 1	–1	30	35	35.5	29.598	4.4145	19.4271	7.506	86.578	Seeing fair.
1907, Mar. 23	+1	47	70	72	29.076	42.6499	7.6900	7.520	86.679	Bright moon near.
1907, Mar. 25	+1	41	66	69	29.186	42.6350	7.6921	7.529	86.788	
1907, Mar. 31	+3	37	29	34	29.730	42.7053	7.6852	7.490	86.396	Unsteady. Full moon.
1907, Apr. 1	+1	00	34	39	29.556	42.6789	7.7702	7.546	87.033	Seeing fair.
1907, Apr. 14	+3	01	31	35	29.360	42.6578	7.7000	7.521	86.752	
1907, Apr. 20	+2	53	43	46	29.474	42.6976	7.6803	7.491	86.388	
1907, Apr. 21	+3	00	45	50	29.370	42.6794	7.6871	7.504	86.531	
1907, Apr. 23	+3	51	46	50.5	29.130	42.7048	7.7165	7.506	86.553	
1907, Apr. 24	+3	07	59	62	29.070	42.6711	7.6680	7.499	86.454	
1907, Apr. 26	+3	32	41	45	29.386	9.6570	44.6774	7.490	86.378	
1907, May 2	+4	13	49	52	29.350	9.6797	44.6791	7.500	86.482	

Corrections, Constants, and Factors.

Date.	$\Delta\rho$.	$\Delta\sigma$.	Log τ^2.	$\Delta's$.	c.	n.
1906, Sept. 22.1645	0.030670	−0.0085	8.871028	0.0000	−0.9691	−0.601
1906, Oct. 11.1570	0.028310	−0.0086	8.687444	0.0000	−0.9902	−0.076
1906, Oct. 12.1513	0.031270	−0.0086	8.676858	0.0000	−0.9900	−0.074
1906, Oct. 17.1507	0.028597	−0.0084	8.620556	0.0000	−0.9747	−0.412
1906, Oct. 18.1475	0.031070	−0.0084	8.608992	0.0000	−0.9717	−0.603
1906, Oct. 20.1337	0.032927	−0.0083	8.585776	0.0000	−0.9636	−0.433
1906, Oct. 26.1447	0.029421	−0.0081	8.509254	0.0000	−0.9322	−0.267
1906, Oct. 28.1458	0.029807	−0.0080	8.482314	0.0000	−0.9197	−0.702
1906, Oct. 31.1313	0.040288	−0.0078	8.441238	0.0000	−0.8992	−0.619
1906, Nov. 1.1467	0.027240	−0.0077	8.425878	0.0000	−0.8912	+0.462
1907, Mar. 23.8770	0.027060	+0.0085	8.706308	0.0000	+0.9739	+0.199
1907, Mar. 25.8670	0.026930	+0.0085	8.727106	0.0000	+0.9805	+0.089
1907, Mar. 31.1060	0.042020	+0.0086	8.787556	0.0000	+0.9934	+0.462
1907, Apr. 1.7980	0.040680	+0.0086	8.796072	0.0000	+0.9944	−0.170
1907, Apr. 14.1000	0.025410	+0.0084	8.912360	0.0000	+0.9821	+0.127
1907, Apr. 20.9870	0.024670	+0.0082	8.960844	0.0000	+0.9577	+0.495
1907, Apr. 21.9980	0.039310	+0.0082	8.968708	0.0000	+0.9551	+0.338
1907, Apr. 23.1083	0.054570	+0.0081	8.984420	0.0000	+0.9447	+0.301
1907, Apr. 24.9110	0.024420	+0.0080	8.991520	0.0000	+0.9395	+0.432
1907, Apr. 26.1051	0.024530	+0.0079	9.007010	0.0000	+0.9273	+0.508
1907, May 2.1120	0.066910	+0.0075	9.050572	0.0000	+0.9704	+0.366

Equations of Conditions.

$$x - 0.2726y - 0.9691p - 0.611 = 0$$
$$x - 0.2207y - 0.9902p - 0.076 = 0$$
$$x - 0.2180y - 0.9900p - 0.074 = 0$$
$$x - 0.2043y - 0.9747p - 0.412 = 0$$
$$x - 0.2016y - 0.9717p - 0.603 = 0$$

$$x - 0.1963y - 0.9636p - 0.433 = 0$$
$$x - 0.1797y - 0.9322p - 0.267 = 0$$
$$x - 0.1742y - 0.9179p - 0.702 = 0$$
$$x - 0.1662y - 0.8992p - 0.619 = 0$$
$$x - 0.1633y - 0.8912p + 0.462 = 0$$

$$x + 0.2255y + 0.9739p + 0.199 = 0$$
$$x + 0.2310y + 0.9805p + 0.089 = 0$$
$$x + 0.2476y + 0.9934p + 0.462 = 0$$
$$x + 0.2502y + 0.9944p - 0.170 = 0$$
$$x + 0.2859y + 0.9821p + 0.127 = 0$$

$$x + 0.3023y + 0.9577p + 0.495 = 0$$
$$x + 0.3050y + 0.9551p + 0.338 = 0$$
$$x + 0.3106y + 0.9447p + 0.301 = 0$$
$$x + 0.3132y + 0.9395p + 0.432 = 0$$
$$x + 0.3188y + 0.9273p + 0.508 = 0$$

$$x + 0.3352y + 0.9704p + 0.366 = 0$$

Normal Equations.

$$21x + 1.1283y + 1.1175p - 0.178 = 0$$
$$1.1283x + 1.3111y + 4.9163p + 1.625 = 0$$
$$1.1175x + 4.9163y + 19.2963p + 6.184 = 0$$

$x = +0.1423$

$y = -2.895$

$p = +0.409$ Weight 0.3047

$$\therefore p = +0.409 \pm 0.3047.$$

These results are doubtless much too large, but it is believed that they are as good as could be obtained under such unfavorable weather as prevailed all that year.

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INDIANA UNIVERSITY STUDIES

15. State Banking in Indiana 1814-1873

By Logan Esarey, A.M.

INDIANA UNIVERSITY STUDIES

No. 15 BLOOMINGTON, INDIANA April 15, 1912

Prefatory Note

This paper is the result of several years' study on the part of Mr. Esarey in the financial history of Indiana during the middle period of the nineteenth century. It covers in time almost two generations of Indiana's statehood, from 1814 to 1870. A part of this study was used as the author's thesis upon which, together with his other graduate work, he was awarded the Master's degree from Indiana University in 1909. This thesis related to the "Old Vincennes Bank", which became the First State Bank. The findings and conclusions of that thesis have been substantially incorporated in this bulletin. The paper is written entirely from the sources, such as the *Documentary Journal of the Indiana Legislature*, the *Journals* of the Senate and House, the *Laws of Indiana*, and the official reports of the State banks. When the subject was first assigned and undertaken in the graduate work of the Department of History, it was the purpose to use a limited survey of Indiana history as a field for training in historical research, and to show the connection between local and national history, while at the same time indicating some of the achievements of the State which in themselves are worthy of historical record and preservation.

I believe that Mr. Esarey in this study has performed a valuable service to Indiana history. He will soon publish, also, in the publications of the Indiana Historical Society, a study on "Internal Improvements in Indiana". These studies represent a part of the work that is being attempted in the history of the State by the Indiana Historical Survey, organized under the direction of the Department of History and Political Science of the University.

James A. Woodburn,
Professor of American History and Politics.

Contents

BRANCH BANKS OF INDIANA AS PROPOSED BY THE STATE LEGISLATURE, 1816-1817

Map compiled from the documentary sources by Ernest V. Shockley.

The four towns starred (*) were the only towns which took advantage of this Act.

State Banking in Indiana, 1814-1873*

By Logan Esarey, A.M., Research Fellow in American History.

I

INTRODUCTION

The following paper deals with a phase of our national experience of which Americans are not proud. Successful banking on a comprehensive scale is not an old business. The present standard in banking has been reached after many experiments, but within a comparatively short time. One of these experiments was State Banking. It was tried during the first half of the nineteenth century.

In all conventional pictures of state regulated banking, the "wildcat" banker from "Owl Creek" has usually been thought worthy of a full length portrait. Before approaching our subject seriously, we must blot his picture from our minds. He has his counterpart in every occupation. It would be just as fair to judge mining by the broker who peddles "gold bricks" or bogus mining stock, as to judge banking by the depredations of the "wildcat" banker. Every gainful occupation gives rise to a class of expert criminals peculiar to that calling. The "wildcat" banker belongs to the same class as the professional bank robber. Both are law-breakers, and both violate the law with the same intent. There were not more "wildcat" bankers in the first half of the nineteenth century than there are defaulting cashiers today. Higher intelligence among the people and greater care on the part of law makers have driven the same class of men from the earlier to the more modern form of crime.

The bankers of that era were as honest and competent, compared with the standards of the time, as are the bankers of today. But they had a much more difficult problem to solve. Banking flourishes in an orderly community. Steadiness and continuity in commerce make banking easy and safe. During the State Bank

* This paper is No. 15 of the Indiana University Studies.

era the directions of commerce were not so constant as they are now. Bankers could not calculate, with much assurance, the probable demands for money. Land purchases made heavy and uncertain inroads on the currency. The construction of costly and unprofitable lines of transportation deranged circulation. The migration of the people disturbed business; so that localities that one year made large calls for loans the next year made none. It is inaccurate to speak of the banking of that era as a system. The banking of New England, Indiana, and Louisiana was done on general assets, and the notes were redeemable in coin. These bankers have an excellent record and furnish ample vindication of that kind of banking when well managed. The banking of New York under the law of 1838, of Indiana under the Free Banking Law of 1852, and of Illinois and Wisconsin, was done under state supervision, and the circulation was predicated on state bonds. This plan proved a failure, and its adoption in the National Banking Law of 1863 was due more to expediency than to an approval of the principle. The experience of Alabama, Mississippi, and Kentucky illustrates banking based on the credit of the state. This currency was the prototype of the greenbacks of the present day, just as the notes of the free banks, based on state bonds, were of our present national bank notes. Banking on the credit of the state proved disastrous as the results in the last named states abundantly prove.

State banks have a very unsavory reputation among our people. The best of these banks failed to give a uniform circulation and were not as good as those under the present system. The worst were worse than none. Tradition has preserved only the reputation of the worst.

II

THE FIRST STATE BANK OF INDIANA

There was very little money, either specie or paper, in circulation in Indiana before the territory was admitted to the Union in 1816.[1] The period just preceding the admission of Indiana to statehood was the most flourishing period in our history for "wild-cat" banks. The charter of the First United States Bank expired in 1811, and the Second United States Bank was not chartered until 1816. During this era the "wildcat" banks were unhampered. So great was the prejudice of the western Democrats against a national bank that they would rather endure all the evils of a private bank system than see a national currency circulated by one strong bank. This prejudice is accounted for if we recall that the Second United States Bank, when it went into business at the beginning of the year 1817, broke 165 of the 446 state and private banks then in existence; and that of $90,000,000 of their notes in circulation it stopped $30,000,000.[2] The whole debtor class—a large majority of the pioneers—favored the private banks, because it was much easier to borrow money from them.[3] Paper money, at this time, ranged in value all the way from the notes of Massachusetts banks, worth twenty per cent more than the treasury notes of the United States, to the counterfeits that deluged the country.

A western "bank" in these early days was a very simple affair. Any man inclined to start a "bank" had a supply of notes engraved and then opened a "bank" in some convenient town. Since these "banks" rarely received deposits, their only function was to dis-

[1] On this subject, Nathaniel Ewing, President of the Vincennes Bank, wrote the Secretary of the Treasury, January 9, 1819: "The situation of the farmers here [Vincennes] is distressing. They cannot get one dollar for their produce. They have plenty of produce but can get no money. Our banking capital, here in the West, is all tied up in city improvements, and there is none to move our produce." *American State Papers, Finance*, III, 734.

[2] W. Jones, President of the Second Bank of U. S., to Secretary Crawford, October 31, 1817: "It is the earnest desire of the Board of Directors of the Bank that you dispense with the employment of State Banks, northwest of the Ohio river. The Bank's branches in that section will be opened soon; the state of the currency there and the heavy collections from land sales require greater circumspection and control by this bank. A gentleman of unquestioned veracity has assured me that he saw good paper money sold by the receiver at the land office for a premium and the depreciated paper deposited for the government. Let me suggest that land sales be limited to specie." *Am. Sta. Pa., Fin.*, IV, 820. See also the joint protest of the senators and representatives of Ohio, Kentucky, and Indiana, April 18, 1818, against "the tyranny of the United States Bank." *Am. Sta. Pa., Fin.*, V, 66. Also the letter of J. D. Hay to Senator Taylor (*ibid.*, 65), and the letter of Langdon Cheeves (*ibid*, IV, 874).

[3] There was due from land buyers at Jeffersonville, January 1, 1815, $242,176; at Vincennes, $122,723. On January 1, 1819, there was due at Jeffersonville, $1,021,834; at Vincennes, $1,390,909. *Am. Sta. Pa., Fin.*, III, 782.

count notes. They were usually opened only one day in the week, or two half days. If business prospered, and if the bank floated much money at a fair price, the banker remained. If the situation did not prove favorable, he packed his notes in his grip and departed for more favorable fields, leaving his bank notes that had been placed in circulation to care for themselves.[4] This might be called the nomadic stage of banking. Such were the early banks at Brookville, New Harmony, and Lexington.

However, the territorial legislature, sitting at Corydon during the summer of 1814, chartered two banks intended to be of a more permanent character.[5] On Monday, August 21, 1814, William Polke, representing Knox county, laid before the House a petition, signed by Nathaniel Ewing[6] and others, praying for a charter to establish a bank at Vincennes. The petition was read, and referred to a committee of three, Polke, Ferris, and Clarke. On the same afternoon, Polke reported a bill for a bank. This was read the first time that same evening, the second time the next day, Tuesday. It was at once referred to the committee of the whole and made the order of the day for Wednesday. On Thursday amendments were called for, and on Friday it was placed on its passage. Three days after this bill was introduced, a Mr. Brown asked the legislature to charter a similar bank for Madison, Indiana.[7] This bank was to be known as the Farmers and Mechanics' Bank of Madison. These two charters were alike, were to run the same length of time, and by special amendment, the banks were not to go out of business until they had redeemed all their notes and paid all their debts. The incorporators further agreed to wind up their affairs at once after the expiration of their charter.

Though these two territorial banks started under like charters and similar cicumstances, their later careers were very different. The Farmers and Mechanics' Bank of Madison was organized by John Paul, John Ritchie, Christopher Harrison, Henry Ristine, N. Hurst, and D. Blackmore. The charter was signed by William Hendricks, speaker of the House, and Jesse L. Holman, president of the Council. John Paul was chosen president and John Sering, cashier. The bank had the right under its charter to issue notes payable

[4] *Centinel*, January 1, 1820; also *Western Sun*, March 31, 1821.

[5] *Laws Indiana Ter.*, 1814, p. 95.

[6] Nathaniel Ewing came to Vincennes to accept the position of receiver of money at the land office established by Act of March 26, 1804. He was the first receiver. He helped adjust the land titles around Vincennes. He aided in most of the business enterprises of his time and was one of the best known of the early business men of Vincennes. He died August 6, 1846, at the Ewing homestead, four miles east of Vincennes.

[7] See MSS. records of territorial Legislature of Indiana in office of the Secretary of State, at Indianapolis.

in specie; its capital stock was not to exceed $750,000. The bank agreed to lend the government $5,000 to pay the salaries of officers and to advance any sum the territorial government might need in anticipation of taxes. The rate of interest was not to exceed six per cent on any money lent by the bank.

The town of Madison was small at this time, having not over 700 or 800 inhabitants. Its trade was correspondingly limited. Its merchants handled such goods as are usually kept in large country stores. The bank occupied a part of the brick building on the east side of Main Street, well up from the river. For the purpose of making change, all merchants issued "shinplasters" in denominations of 50, 25, 12½, and 6¼ cents. These were redeemed in the bank notes of the Commonwealth Bank of Kentucky, if presented at the Farmers and Mechanics' Bank in sums of one dollar or over. The bank furnished some aid to the farmers of Jefferson, and adjoining counties, in making payments on their land.[8] Its notes were received at the United States land offices for many years; and were rated highest of all in the Northwest, except the notes of the Commonwealth Bank of Kentucky, until the notes of the Second Bank of the United States came into circulation. The Madison Bank had a branch at Lexington, in Scott county, a town almost as large as Madison, and another at Lawrenceburg.

The history of the Farmers and Mechanics' Bank illustrates well the difficulties at this time of honest banking in the West. The bank stipulated in its charter to pay specie. Its capital was paid largely in specie, and its stockholders were business men of wealth and integrity. It did a conservative business, furnishing money to buyers of public lands, and to the traders with New Orleans and the East. Throughout the West the standing of banks was completely in the hands of the receivers at the land offices. Money that was not acceptable to the receivers could not circulate with money that was. By resolution of Congress, April 30, 1816, the Secretary of the Treasury was directed to collect all dues in legal currency, which was interpreted as coin, notes of the Bank of the United States, treasury notes, and notes of specie paying banks. This order was to take effect February 20, 1817. The Bank of the United States had gone into operation on the first of January preceding. It was made the depository of all government funds. After sustaining considerable loss by receiving western bank

[8] John Sering, cashier, to Secretary Crawford, June 14, 1820. "This bank continued to pay specie until its notes were refused at the land office, when its payment became only an accommodation to brokers. Even after that we have continued to furnish our people such paper as is taken at the land office in exchange for our notes." *Am. Sta. Pa., Fin.*, III, 739.

notes as cash the directors of the Bank of the United States ordered its cashiers to recieve nothing as cash except its own notes and specie; and announced that all agreements between it and state banks would terminate June 30, 1818.[9]

Writing of this order, March 30, 1819, the cashier of the Farmers and Mechanics' Bank said: "We have been caused much trouble and our customers and people much loss by the Bank of the United States not receiving our paper as payment. We are even with all the branches of that bank and can give full evidence of our solvency."[10] Without warning and without any fault of its own the notes of the Farmers and Mechanics' Bank were thus thrown out of circulation and rendered of no value except as a means by which brokers could get specie out of the vaults of the bank. Most of this specie found its way directly into the vaults of the Bank of the United States.

Under these circumstances there were only two things to do, either call in all the circulation of the bank or stop specie payment. The latter alternative was chosen by practically all the western banks. The Farmers and Mechanics' Bank did not suspend till the fall of 1818, and was not then compelled to. But it was found impossible to keep its notes in circulation. They were returned for specie as soon as issued. In this situation the bank simply stopped the issuing of its notes, rather than suspend specie payment.[11] The Vincennes Bank did the same thing. The crushing business depression of this period followed on the heels of these acts of the Bank of the United States.

The withdrawal of the deposits from the banks of the state and the refusal to accept the notes of Indiana banks brought a storm of protest from the state.[12] The loss of revenue from the sale of the public lands was embarrassing the national treasury also. The western states were, moreover, beginning to have a political importance not to be trifled with. The votes of the eight senators from the four states, Ohio, Illinois, Indiana, and Kentucky, were often a determining factor in the United States Senate, and in the approaching struggle for a nomination to the presidency their influences might control the Congressional Caucus. Therefore when William Hendricks, who represented Indiana in the House, and together with Governor Jennings controlled its politics,

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[9] *Am. Sta. Pa., Fin.*, V., 69.

[10] *Am. Sta. Pa., Fin.*, IV, 725.

[11] John Paul, President, to Secretary Crawford, *Am. Sta. Pa., Fin.*, IV, 746; Sering to Crawford, *ibid.*, 739.

[12] Taylor to Crawford, March 31, 1818. *Am. Sta. Pa., Fin.*, V, 65.

addressed a note to Secretary Crawford in behalf of the Farmers and Mechanics' Bank, that officer gave it his immediate attention.[13]

The Madison bank had previously offered to handle the public deposits on the same conditions as were accorded by the treasury to the bank at Cincinnati. These conditions were: an unqualified specie payment by the bank; an agreement to take as "cash" all the money at the land office (but the cashier had the right, and it was made his duty, to send every month to the land office a list of banks whose notes were to be accepted); a permanent deposit of $40,000 which was to be allowed the bank for its service, and all above which was to be transferred monthly to the Branch Bank of the United States; and a provision that the bank was to send a monthly statement to the Secretary of the Treasury, together with a bank statement and a list of its debtors.[14]

The bank at Madison discharged its obligations punctually, and complied cheerfully with every requirement of the treasury;[15] but the inveterate hostility of the Bank of the United States continued. On the 18th of August, 1821, the Secretary of the Treasury asked President Langdon Cheeves of the Bank of the United States to make arrangements with some local banks in the West, to handle the pension money to be disbursed there. In the list recommended was the bank at Madison. Cheeves, however, refused to have financial dealings with any of them.[16] At this time nearly all the banks in the West were broken, and large sums of government money were tied up in them or lost.[17] By refusing, or omitting,

[13] Hendricks to Crawford, May 11, 1820: "Should Mr. Crawford adopt the principle of giving the deposits of public moneys to any local bank of the western country we would recommend the Farmers and Mechanics' of Madison, Indiana, as one entitled to the fullest confidence. We are well acquainted with the reputation of that institution and consider its solvency and good management as well ascertained as that of any bank in the western country. The president and many of its stockholders are men of wealth and integrity. In our opinion the treasury would be perfectly safe in depositing its funds in that institution." *Am. Sta. Pa., Fin.*, IV, 744.

[14] Crawford to Sering, July 7, 1820. *Am. Sta. Pa., Fin.*, III, 739.

[15] Crawford to Cashier of Farmers and Mechanics' Bank, September 18, 1821: "It is presumed from the punctuality with which your bank has always made its transfers that the surplus has already been placed to the credit of the treasurer of the United States. The treasurer has accordingly been instructed to draw on you in favor of the Bank of the United States at Louisville for $140,000." *Am. Sta. Pa., Fin.*, IV, 701.

[16] "The Bank refuses to deal with the banks in Tennessee, Indiana, and Illinois, for reasons it would be invidious to mention, but among them are the general bad conditions of the currency in those states and the laws impairing the obligation of contracts passed by their legislatures and the actual depreciation of their notes." Cheeves to the Secretary of Treasury, *Am. Sta. Pa., Fin.*, IV, 956.

[17]

The Huntsville (Ala.) Bank owed	$64,044
Bank of Kentucky	58,943
Bank of Missouri	152,342
Bank of Vincennes	168,453
Bank of Edwardsville (Ill.)	46,202
Farmers and Mechanics' Bank of Cincinnati	36,966

The greater part of this was repaid, but the delay caused great annoyance to the treasury.

to include the Farmers and Mechanics' Bank in the list of those whose notes were received at the western land office,[18] and by drawing on it at sight for large sums, the Bank of the United States through its branches at Louisville and Cincinnati, hampered the operations of the Madison bank so much that its directors found the business unprofitable and its doors were closed. The bank was closed in the course of 1824–25, by J. F. D. Lanier and Milton Stapp, after meeting in an honorable way all its obligations, and fulfilling all the conditions of its charter.[19]

By the time Indiana became a state, there were several banks in it. It was thought undemocratic to limit banks by law in any way, yet in a law of 1815 some restrictions were made.[20] This measure is entitled "An Act to Prevent Swindling," and required banks to publish the names of stockholders instead of the firm name alone. The law was intended to apply to a banking firm operating at Lexington, and thought to be composed of "swindlers." Another private bank, in which Noah Noble and some members of the legislature were interested, was located at Brookville. The Steam Mill Company at Vincennes, of which Judge Benjamin Parke [21] was president, was also a bank of issue.

The State Constitution of 1816 recognized both the Vincennes, and the Madison Bank. A later law, passed January 1, 1817,[22] at the first session of the state legislature, elaborated the charter of the Vincennes bank and made it a state institution like that of Kentucky. It was to have fourteen branches, to accommodate the fourteen districts into which the state was divided.

Neither the article in the state constitution nor the law of January 1, 1817, gave the Bank any new powers.[23] They did no more than to recognize its charter, increase its capital stock, and make the state a heavy stockholder. Though there was placed in its charter no direct limitation on its power to issue paper money, and though one of the main objects of the institution was to make profit by issuing its bank notes, yet the plain design of the whole charter, and of several provisions in particular, was that the Bank should not issue more paper than it could redeem. Its total debt was

[18] *Am. Sta. Pa., Fin.*, III, 746.

[19] Elvin's scrap book, Indiana State Library, p. 68, copied from *Madison Free Press*.

[20] Samuel Judah, Report on Private Banks, *Journal of the House of Representatives*, 1839; hereafter referred to as *Ho. Jour.*

[21] Mr. Parke was born in New Jersey, September 29, 1777. He came to Vincennes in 1801 and from then till his death, August 12, 1835, he held office almost continuously. He was attorney for the territory, delegate to congress, and federal judge. He removed to Salem about 1816.

[22] *Laws of Indiana*, 1816–17, p. 185.

[23] *Blackford's Reports*, I, 268.

never to exceed twice its paid up stock, and its directors were made liable for such excess in a Common Law suit for debt.

The capital stock of the Vincennes Bank was increased from $500,000 to $1,500,000, of which $375,000 might be subscribed by the governor, as soon as he thought it advisable. The charter was to last twenty-one years. The intention of the incorporators was to acquire a complete monopoly of the banking business of the state. That the business was well planned to carry out this intention will be shown by a careful study of the political situation in Indiana, and of the men interested in the bank at Vincennes.

The first branch, with a capital stock of $20,000, was to be organized by Joseph Pegg, Aaron Martin, and John Sprow, at Centerville. The second branch, with a capital stock of $35,000, was to be organized by William H. Eads, Robert John, and John Jacobs, at Brookville. The third branch, with a capital stock of $35,000, was to be organized by Isaac Dunn, John Gray, and David Rees, at Lawrenceburg. The fourth branch, with a capital stock of $20,000, was to be organized by John Gilliland, Lawrence Nichol, and Daniel Dufour, at Vevay. The fifth branch, with a capital stock of $30,000, was to be organized by David H. Maxwell, John Sering, and Alexander Meek, at Madison. The sixth branch, with a capital stock of $35,000, was to be organized by James Scott, Evan Shelby, and A. P. Hay, at Charlestown. The seventh branch, with a capital stock of $10,000, was to be organized by John Ketcham, Alexander C. Craig, and John McCormick, at Brownstown. The eighth branch, with a capital stock of $10,000, was to be organized by John G. Clendennin, William Lindley, and Thomas Fulton, at Paoli. The ninth branch, with a capital stock of $30,000, was to be organized by Marston G. Clark, John Lyon, and Samuel Craig, at Salem. The tenth branch, with a capital stock of $35,000, was to be organized by Allen D. Thom, David Craig, and Milo R. Davis, at Corydon. The eleventh branch, with a capital stock of $10,000, was to be organized by John Stephenson, Solomon Lamb, and Thomas Morton, at Troy in Perry county. The twelfth branch, with a capital stock of $10,000, was to be organized by Daniel Grass, Hugh McGary, and Ratliff Boon, at Darlington on Pigeon Creek. The thirteenth branch, with a capital stock of $10,000, was to be organized by Frederick Rapp, Thomas E. Castlebury, and Thomas Gibson, at some point to be selected in Posey county. The fourteenth branch, with a capital stock of $10,000, was to be organized by William Prince, Robert M. Evans, and James Jones at some point to be selected in Gibson county.

Books were to be opened at these places by the various boards of commissioners who were empowered to organize the branches, on April 1, 1817. Each branch was to accommodate three counties, and residents of these three counties were to have the preference in the subscription for stock. After the above amounts should be subscribed for there would still remain $325,000 worth of stock, which the directors were empowered to place to the best advantage. All the branches were constituent parts of the parent Bank at Vincennes. Each branch was to have eleven directors chosen by the stockholders, and three, chosen by the state. A monthly statement was to be made to the governor, and an annual report to the legislature, showing: capital stock, debts, deposits, notes in circulation, and specie on hand. Six per cent was to be the rate of discount. The state might borrow a maximum of $50,000, but no director could borrow over $5,000, or be security for more than $10,000.

The plan seemed comprehensive enough on paper. It was provided that the Farmers and Mechanics' Bank of Madison should become a part of the state institution. The stockholders and directors of the Vincennes Bank included enough of the politicians of the state to control the legislature at any time, and they were thus sure of the patronage of the state. They had even looked after the patronage of the United States; as nearly all United States officers from, or in, Indiana were interested financially, many officially. The president of the Bank was the receiver of the largest land office in the state. The political situation, then, was completely secure. But there were powerful economic reasons why the Bank should not succeed, and against these obstacles it strove in vain. The best field for banking in the state was then fully occupied by the Farmers and Mechanics' Bank of Madison, but its officers and stockholders refused to let it become part of the state institution. There was very little specie in the state, and the earnings of the farmers were spent, principally, in paying for their homesteads. Ninety out of every hundred men in the state were farmers, and farmers furnish very little business for banks. Even the government policy of giving liberal time to its patrons in paying for their homes was against the Bank. In some cases, as in the Thirteenth and Fourteenth Districts, there were not even suitable villages in which to establish the branches, while Troy, situated where Anderson Creek joins the Ohio, Darlington on Pigeon Creek, Paoli, Charlestown, and Brownstown, were little struggling villages without commercial enterprise of any kind.

Stock subscriptions came in slowly, and all the branches except three, Brookville, Corydon, and Vevay, failed to organize. With scarcely 75,000 people in the state, it was attempted to organize fifteen banks in one day, and float among them bank stock, all told, to the amount of $2,225,000, an average of about $30 per capita.

From the beginning there was opposition to the Bank. The leader in this criticism was Elihu Stout,[24] editor of the *Western Sun* of Vincennes. The interests of the Bank were as warmly supported by editor Wiseman of the *Centinel*, also of Vincennes. Wiseman was an officer of the Bank and thus had the advantage of Stout so far as authentic information was concerned. In general, what was called the aristocratic party of Vincennes, Corydon, and Brookville controlled the Bank. What later became the Jacksonian Democracy opposed it. James Noble, Jonathan Jennings, and William Hendricks had political control of the state at this time, and distributed its offices.[25]

During two years there was little said about the Bank except at election times. It had been established at Vincennes, in order to secure the use of the public money collected at the land office. The advantage was mutual, since if there was no bank at that place the receiver of public moneys would have to take his funds to Louisville, Cincinnati, or New Orleans to deposit them. During the existence of the old Bank of the United States a number of state banks had been made depositories. An arrangement for this purpose still existed with the banks of New England and with the State Bank of Virginia. As stated above, the Second Bank of the United States had been made the general depository of all public money. But it had no branches in Indiana, Illinois, Missouri, Mississippi, and Alabama. In these cases it was found almost impossible for the receiver to place the money in the nearest branch of the Second Bank of the United States. When Secretary Crawford was appointed, there were 89 of these banks of deposit. Most of them carried guaranteed deposits of $50,000 and were given sixty days notice of all drafts in favor of the national treasury.[26]

After 1817, the Bank of the United States stopped deposits from being made in the banks that did not pay specie. This brought forth an effort on the part of the western banks to resume and thus to get the benefits of the public deposits. At a meeting of the north-

[24] Elihu Stout was born in New Jersey. He had worked at the printer's trade in Lexington, Ky., and Nashville, Tenn. He was a personal friend of Andrew Jackson, with whom he associated in Nashville. He brought materials and printed the first paper in Indiana, at Vincennes, July 4, 1804.

[25] O. H. Smith, *Recollections*, p. 84.

[26] *Am. Sta. Pa., Fin.*, III, 718.

western bankers at Cincinnati, it was decided to begin specie payments again, April 20, 1817. Already at a meeting of the directors of the Vincennes Bank February 20, 1817, it had been decided to pay gold and silver for all their own notes presented.[27] President Ewing notified Secretary Crawford of this action on April 3.[28]

Accordingly on the 7th of May Secretary Crawford directed the receiver to deposit the public funds in the Bank if it agreed to the conditions. These conditions were: a guaranteed deposit of $75,000 and notice of treasury drafts; a monthly statement of the public account; a monthly bank statement, together with a list of the Bank's debtors; and the acceptance as cash of all money received at the land office—the receiver of the land office to accept only such money as was directed by the Bank. The Bank promptly accepted the conditions, which were fair, and cashier Blackford, soon to become a distinguished judge, wrote on the 19th of June: "We are now engaged in receiving the deposits from the receiver on account of the sale of public lands, which will be completed in a few days." [29]

The directors of the Bank of the United States at a meeting October 31, 1817, expressed their "earnest desire" to Mr. Crawford that he dispense with the services of all the state banks northwest of the Ohio.[30] The warning was followed up; early in February, instructions were sent to the receiver at Vincennes from the branch bank at Louisville to receive no western notes except those of the State Bank of Kentucky.[31] Such a storm of protest, political and commercial, followed this high-handed conduct of the Bank of the United States that the order was soon modified.[32]

The new arrangement relieved the Bank of the United States of the responsibility for the depository banks. Money was deposited, as before, but to the credit of the Bank of the United States for the use of the United States. The deposit bank was to have the use of all money deposited for two months. If at any

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[27] *Am. Sta. Pa., Fin.*, IV, 713. At this meeting there were present Nathaniel Ewing, President; John D. Hay, Charles Smith, Elias McNamee, William Jones, Benjamin Parke, John Johnson, Isaac Blackford was cashier.

[28] *Ibid.*

[29] *Am. Sta. Pa., Fin.*, IV, 525.

[30] *Am. Sta. Pa., Fin.*, IV, 821.

[31] Hay to Senator Taylor, February 24, 1818: "If these instructions are to be permanent it will cause great inconvenience, as it is impossible for settlers to get their money changed under 20 per cent. Few entries are being made. People come here from the South and East and cannot get their money changed and have to go back without purchasing." *Am. Sta. Pa., Fin.*, V, 65.

[32] See *Am. Sta. Pa., Fin.*, V, 65, 66; IV, 854, 874, 571, 588. Langdon Cheeves, who succeeded Jones as president of the Bank of the United States, said the custom of receiving these bank notes as cash nearly broke the bank. Some of them were worthless, or proved so, on others it took time to realize and the bank lost the use of its money.

time the Secretary of the Treasury should think the money unsafe, he might withdraw it all after two months notice.[33] It was thought by this means that the Bank could afford capital to enable the traders at Vincennes to move the produce of the farmers to market. The plan was to lend the money to traders who would in turn pay it out to the farmers of the country who in their turn would pay it back into the land office. The trader would market his produce at New Orleans and place his money in the branch bank there to the credit of the Vincennes Bank. The United States could then draw on the New Orleans branch and charge it to the Vincennes Bank; no money would have to be transported.[34] Unfortunately the Bank did not carry out the plans of its president.

August 20, 1819, the Treasurer of the United States drew at 60 days for $40,000, and at 90 days for $20,000, on Vincennes. October 19, another draft for $55,000 at 60 days was drawn. These drafts were not paid and the deposit in the Vincennes Bank was marked "unavailable", for the first time, at the end of the second quarter of 1819. There was then on deposit $122,539. This amount had increased to $191,056 for the third quarter. During the following year it was reduced to about $90,000.[35]

Under these conditions, of course little or no money was deposited in the Vincennes Bank. Early in the year 1819, President Ewing at the order of the board of directors took up the question of securing the deposits again. The reasons urged for depositing in Vincennes were that there was no branch of the United States Bank nearer than Louisville; that the citizens of the community had a right to the use of the United States funds until they were needed; that the farmers were much distressed for a currency and many would be ruined; that the Bank had always met the demands of the treasury and had redeemed all its notes in specie since February 20, 1817; and that depending on the Secretary's promise of further deposits as expressed in his letters of July 1, and 11, 1818, the Bank had extended its discounts.[36] On the 12th of March, 1822, Secretary Crawford notified the Bank that the land office money would again be deposited in it. This concession was made on condition that the Bank pay specie, and accept as cash all money received at the land office. The Bank as usual was to furnish the receiver at the land office with a list of the banks whose notes he was to accept. For its services the Bank was to have a

[33] *Am. Sta. Pa., Fin.*, IV, 571, 588, and 590.

[34] Ewing to Crawford. *Am. Sta. Pa., Fin.*, III, 734.

[35] *Am. Sta. Pa., Fin.*, IV, 632, 646, 655. For deposits see *ibid*, 311, 351.

[36] *Am. Sta. Pa., Fin.*, III, 735.

permanent deposit of $75,000, the surplus to be transferred to the Bank of the United States.

On the 22d of April, the board of directors of the Bank decided on a list of banks whose notes it would receive as cash:[37] namely, the Bank of Vincennes and the branch at Vevay, the Bank of Missouri, the Bank of Illinois at Shawneetown, the Bank of Kentucky and its branches at Louisville, Shelbyville, and Lexington, the Farmers and Mechanics' Bank of Lexington, the banks of the District of Columbia, the banks of New York, Philadelphia, and Baltimore, the State Bank of Virginia and its branches, the Farmers' Bank of Virginia and its branches, the state banks of North Carolina, South Carolina, and Georgia, the Bank of the City of New Orleans, the Bank of Nachez, and the Bank of the United States and its branches; and on April 29, all the branches of the State Bank of Kentucky were added. May 6, 1819, the Bank of Vincennes again became a depository bank.

The first deposit under the new arrangement was made in April 1819, the last in June 1820. During this time, the sum of $295,325.77 was deposited and $77,062.87 paid over to the Bank of the United States. On the 7th of July, 1820, Crawford wrote the Bank complaining of its total failure to pay his drafts and notifying it that unless all drafts against it were met and all its surplus money turned over within 40 days no further deposits would be made. The receiver was notified not to accept its notes or make deposits in the meantime.[38] The Bank was unable to meet this demand and did not receive any more deposits. Under David Brown, who became president March 7, 1821, an effort was made to pay the United States deposit; and the sum of $30,000, all that could be scraped together, was sent to the branch at Louisville. On the reputation of this payment President Brown tried to get a continuance of deposits, but failed. The notes of the Bank were received as cash, however, up to the summer of 1820.[39]

Semiannual dividends of eight per cent on all stocks were paid in 1819; the first was declared by the directors in June, the second, December 18.[40] The notes of the parent Bank were accepted at the United States land office at this time and were in circulation in the State. But opposition was gradually gaining force and assuming definition at home as well as abroad. It was charged that the Bank, through the aid of the Governor, had secured a

[37] *Am. Sta. Pa., Fin.*, III, 736.

[38] *Am. Sta. Pa., Fin.*, III, 737; *ibid*, IV, 747.

[39] *Western Sun*, October 7, 1820. *Am. Sta. Pa., Fin.*, III, 746.

[40] *Centinel*, June 5 and December 18.

specie deposit of $10,000 intended for the Jeffersonville Canal, and, in place of this, the Bank had returned to the state bank notes in an equal amount, but of very doubtful value.[41] And this, it is said, was done at a time when there was not enough cash in the state treasury to pay the state officers. At the fourth session of the state legislature, a resolution was offered by General Samuel Milroy, a ginseng merchant, calling for a thorough investigation of the Bank, but the resolution was voted down.[42] Those who opposed this bill were charged with being agents of the Bank. One of the representatives so charged, Thomas H. Blake, representing Knox county, gave as his reasons for not supporting the measure that this was the duty of the governor under the law; that the state had lived off the Bank and then owed it $30,000; and that the legislators had to depend on the Bank for their own pay.[43] He had voted against Representative John H. Thompson's bill requiring the Bank to pay specie or forfeit its charter, because no other western banks were paying specie. However true these reasons may have been, the people continued to complain that the banks made hard times, and they refused to re-elect Mr. Blake to the legislature. The murmuring against banks was heard throughout the West, as well as in the South and East. Moreover, worse charges than these were appearing against the Vincennes Bank. Its integrity was being questioned.[44] Nearly all its loans were said to be to its directors and political supporters. Many of these loans were from a financial standpoint more than questionable. The Bank would not issue many of its own notes but dealt almost entirely in those of its irresponsible branches. Some of these notes were said to be unsigned; some were time notes to be paid only after two years from issue; some were issued outright by the "Steam Mill." These notes were not redeemable anywhere. The best that the holder could do was to exchange them for notes of other branches.[45] Agents of the Vincennes Bank were said to be stationed in the towns along the eastern line of the state, to exchange these branch bank notes for eastern paper money, or specie. Then, to get money receivable at the land offices, this depreciated paper had to be discounted heavily. The Vincennes Bank was one of the worst of these note shavers.

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[41] *Western Sun*, July 1, 1820.

[42] *Centinel*, July 15, 1820.

[43] *Western Sun*, August 19 and July 22, 1820.

[44] The statement of July 1, 1820, made to the national treasury shows: Capital paid in, $128,469; U. S. deposits, $219,313; notes in circulation, $68,000; total liabilities, $551,000. Resources—Notes discounted, $177,770; loans to State, $29,000; specie, $24,000; U. S. Bank notes, $3,300; State Bank notes, $245,000. *Am. Sta. Pa., Fin.*, III, 817.

[45] *Western Sun*, August 26, 1820.

The law required the parent Bank to redeem its paper in specie. This it attempted to do in a novel way. The report of 1820 shows that the branches had issued notes to the amount of $167,158, while the parent Bank had only $13,000 in notes outstanding. These were of large denominations, few under $75, and hence not in circulation.[46] Over half the circulation was issued through the Brookville branch, and exchanged for specie and eastern bank paper bought in by the settlers. For this reason, every settler became the inevitable enemy of the Bank. The United States land offices ruled the western banks. There was published, weekly, a list of banks whose notes were accepted by the agent. The one printed in the *Western Sun* for October 7, 1820, by the receiver of the land office, J. C. S. Harrison, is a fair example: "All Boston Banks, 5 New York Banks, 8 Philadelphia Banks, 8 Baltimore Banks, the Columbia bank at Washington, D. C., the Union Bank of Georgetown, 8 other District of Columbia Banks, the Farmers and Mechanics' Bank of Madison, Ind., and the Vincennes Bank—notes over $75." The newspapers circulated among a very small number of readers, so that many a prospective settler saw his resources divided in the middle by the note shaver when he went to buy land. The Vincennes Bank was a repository for United States money, and the receiver of public moneys was usually an officer of the bank.[47] As soon as the specie was collected it was deposited in the Bank and used again to shave branch bank notes.

The state election of 1820 was contested on the bank and currency questions.[48] Shall the Bank be made to redeem its own notes? Shall "shavings" go on? Few friends of the Bank were returned to the legislature. Over one third of the members were new. When the session convened November 27, 1820, the question of the Bank was taken up. In the meantime, a letter appeared in the *Western Sun* stating that the parent Bank was on the brink of ruin. Its liabilities were given at $230,000, with resources of $105,000. The letter was represented as coming from Corydon, but no one knew the author. All the editor would say was that his information was most reliable. It was known that the government deposits were in specie and would have to be paid first.

The letter at first caused surprise, and then fear. Since people did not then keep money in bank, as now, there was not a run on the bank; but they felt uneasy lest the notes of the bank and its

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[46] The notes in circulation at the time were as follows: Vincennes Bank, $13,000; Corydon Bank, $49,000; Vevay Bank, $30,000; Brookville Bank, $85,000; total, $177,000.—*Western Sun*, Dec. 23, 1820.

[47] *Am. Sta. Pa., Fin.*, V., 138. The president of the Vincennes Bank was receiver of public money. The same was true at Edwardsville, Illinois, and other places.

[48] *Western Sun*, December 16, 1820.

branches should become worthless. The value of the notes was in direct proportion to the soundness of the bank. In answer to the *Sun's* letter, the *Centinel* printed the last report of the cashier of the Vincennes Bank. This showed: debts owed by the bank, $243,898; resources: individual loans, $228,000; specie, $33,000; currency of other banks, $26,000; deposited with other banks, $17,000; total, $304,000.[49] This statement indicated a balance of $61,000 in the Bank's favor. The *Sun's* article, therefore, was to be "passed up" as political gossip not worthy of notice, unless its truth should be challenged in court, and the editor arraigned for libel.

Everybody now waited with anxiety to see the forthcoming report [50] to the legislature. In a few days this appeared, but brought little assurance. It showed: notes discounted, $128,000; loans to individuals, $29,000; specie, $33,000; besides a few other small items. On the other side of the account were: notes in circulation, $13,000; branch bank notes in circulation, $167,000; United States deposits (specie), $215,357. Elias Boudinot was cashier, Nathaniel Ewing, president, and Judge Benjamin Parke, agent of the "Steam Mill". The report indicated that the Bank was on the edge of bankruptcy, and before the people could realize it the crash came. On Tuesday, Jan. 2, 1821, the Bank suspended specie payment. Following close on this announcement, came a similar one that the Bank of Kentucky had failed, with $923,000 on deposit and $1,833,000 notes in circulation. To meet these liabilities it had less than $700,000 in resources.[51]

Meanwhile Governor Jennings was asked by the legislature to make personal investigation of the Indiana Bank, but found convenient excuses in the rush of business connected with his office, and also on account of the difficulty of travel. An investigating committee of the legislature reported that Governor Jennings had placed $5,000 of the three per cent fund, intended for the Jeffersonville Canal, in the bank at Corydon, and it was probably lost. Otherwise the report was very favorable, so far as the Corydon branch was concerned. Only one fact was suspicious, that Benjamin Parke, United States Circuit Judge for the Indiana district, and also *agent* for the "Steam Mill", had arranged to borrow $10,000 from the Vincennes Bank, and credit the loan to the Corydon branch. It seems that when State Treasurer Lane visited Vincennes in March, 1820, to pay interest on the state's loan, he had

[49] *Centinel*, December 23, 1820.

[50] *Western Sun*, December 23, 1820; January 27, 1821; January 6, 1821.

[51] *Western Sun*, January 20, 1821. The Bank of Huntsville, Ala., and the Bank of Edwardsville, Ill., had already failed, and on August 17 the Bank of Missouri, at St. Louis, the largest bank in the West, closed its doors. *Am. Sta. Pa., Fin.*, III, 757.

made arrangements for the loan to the "Steam Mill". Lane denied all knowledge of, or consent to, the deal.[52] At any rate, the parent Bank was notified that its custom of issuing notes on the Corydon branch must cease. That branch at once began to reduce its circulation.

The legislature either could not or would not help the situation. In January, 1821, it elected Abijah Bayless, Benjamin V. Beckes, and Marston G. Clark, directors on the part of the state.[53] A committee composed of Enoch D. John of Franklin County, E. Powell of Dearborn, Joseph Holman of Wayne, Samuel Merrill of Switzerland, and Charles I. Battell of Posey, spent the time of the session in the investigation of banks, but no report was given. The legislature passed an act placing a five per cent tax on irredeemable currency. A bill making it a crime to falsify bank records failed. A bill to prohibit the issue of irredeemable currency was lost. A bill empowering the Governor to borrow $1,800 from the Bank, to pay interest, was also lost January 2, 1821. February 3. 1821, a notice was posted on the bank door at Vincennes calling a meeting of the stockholders for February 5 to examine the Bank with a view to protecting depositors and stockholders, and to discuss surrendering its charter.[54] This notice was signed by the stockholders, the leading men of the borough.

At the meeting a new board of directors was chosen as follows:[55] David Brown, John D. Hay, Arthur Patterson, Nathaniel Ewing, Robert Buntin, Wilson Lagow, Dr. Elias McNamee, William Burtch, George Ewing, Samuel Tomlinson, William E. Breading, Frederick Rapp. David Brown was made president. A committee of three was selected to examine the Bank. This committee was soon discharged and another, composed of Robert Buntin, Arthur Patterson and Samuel Tomlinson, was appointed in its stead with notice to make a complete report on the condition of the Bank, May 5th.[56]

In the meantime on the dark and windy night of February 10, the people were awakened by a light in the north part of town. The "Steam Mill" was in flames, and when morning came the chief source of pride and jealousy in Vincennes was in ashes.[57]

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[52] *Ho. Jour.*, 1820–21, p. 16.

[53] *Ho. Jour.*, 1820–21, p. 299.

[54] *Western Sun*, February 3, 1821.

[55] *Western Sun*, March 24, 1821.

[56] *Western Sun*, March 31. 1821.

[57] *Centinel*, February 17, 1821. It was asserted by the friends of the Bank that it would have paid all debts had the mill not burned. It was the largest manufacturing establishment in the state.

The cashier of the Bank, E. Boudinot, resigned in May.[58] He was succeeded by Valentine Bradley, who served till October and was succeeded by Samuel Jacobs, the cashier ot the Brookville branch. Jacobs gave up the position at once and was followed by Carter Beamon. The investigation went on from week to week, and the impatient stockholders grew more impatient. May 31, they were astonished by the announcement that the directors had voted a ten per cent dividend[59] for the last six months on all paid up stock; and this at a time when the bank was known to be insolvent. The sentiment of the people was well expressed by Richard Daniel, at a banquet given in honor of General Harrison who was then visiting the Old Post. He proposed this toast: "The State Bank of Indiana, more corruption than money."

At the June meeting[60] of the directors, President Brown informed the stockholders that the Bank was insolvent. He further reported that the chief cause of its failure was its close alliance with the "Steam Mill" venture. The promoters of this concern, one of the first of its kind in Indiana, were the officers of the Bank, and were charged with embezzling funds of the Bank to the amount of $91,000. A committee at once waited on the "Steam Mill" company to see if it could pay any part of its debt. Judge Parke promised to turn over all his property to the Bank. He owed, he said, only a few other debts. Other members of the "Steam Mill" company, and nearly all were stockholders of the Bank, gave no assurance. Mr. Parke assured the committee that if the debt was nearly as much as represented, the "Steam Mill" company could never pay it. It was then resolved to close up the affairs of the Bank as rapidly as possible. Those owing the Bank were allowed to surrender their stock, if they had any, and receive a corresponding credit on their indebtedness; in other words the worthless stock was cashed at par with other people's money. It was further resolved not to jeopardize business by calling in loans too rapidly; it was ordered that not more than twelve per cent be collected annually. The former president, Nathaniel Ewing, and cashier, Elias Boudinot, were censured for betraying the Bank by drawing false bills of exchange on members of the "Steam Mill" company. Lastly, it was agreed to compromise with creditors and thus save the directors from loss.

This report was first printed in the *Louisville Public Advertiser*,

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58 *Sun*, June 2, 1821; also *Centinel*, June 2, 1821.

59 *Western Sun*, June 16, 1821.

60 *Western Sun*, June 23, 1821. See also letter of Brown to Crawford. *Am. Sta. Pa*, *Fin.*, III, 737

and for that reason the failure was known in the eastern part of the state before it was known in Vincennes.[61]

The Corydon branch at once took measures to protect itself. A meeting of its officers was called April 27, 1821. D. C. Lane, State Treasurer, was president. Joseph Merrill, Davis Floyd, John Tipton, R. C. Boon, and Dennis Pennington were some of its directors. They protested against the parent Bank issuing any more notes on them.[62]

Realizing that the state was involved, Governor Jennings called an extraordinary session of the legislature, to meet early in November.[63] The state had borrowed $20,000 from the Bank, for which the Bank held state bonds.[64] Expecting to pay this debt from current revenues, the state had accepted Bank notes in payment of taxes. The Governor was now unable to pay principal or interest, or any other expenses of the state, with the money in the treasury. The Madison Bank refused the Governor a loan on the basis of the three per cent fund; in fact that bank was now about to go out of business.[65]

In obedience to a joint resolution [66] of the legislature, passed December 1821, D. C. Lane, State Treasurer, reported that he had tendered the branch bank at Vevay $7,081, on December 20; on the 22d, he had tendered the branch at Brookville $12,216; on the 27th, he had tendered $448 to the Corydon branch, and two days later he had offered the latter $1,455 more. In all he had tendered $21,200, and the Bank had refused it. This was offered in the Bank's own paper. A short time afterward, Treasurer Lane went to Vincennes and counted down to the cashier of the Bank $10,000 in its own currency, and asked for state bonds in equal amounts. The cashier answered that the state owed the Bank nothing, and that the Bank had none of the state's bonds. He had already turned these over to the Secretary of the Treasury of the United States, W. H. Crawford, as collateral security.[67]

Before the legislature adjourned, in 1821, it ordered the Circuit Court of Knox county to issue a *quo warranto* writ against the bank.

[61] *Western Sun*, July 28, 1821.

[62] *Western Sun*, June 20, 1821.

[63] *Sen. Jour.*, 1821, pp. 11 and 147.

[64] *Sen. Jour.*, 1821, November 28.

[65] *Western Sun*, December 29, 1821.

[66] *Sen. Jour.*, 1821.

[67] *Sen. Jour.*, 1821, p. 147. *Western Sun*, January 19, 1822. In *Am. Sta. Pa., Fin.*, IV, 244, is found all the correspondence between Crawford and the Bank. Crawford says the deposits were put there at the request of Governor Jennings. The Governor charges Crawford with depositing after he knew the Bank was insolvent. There is no doubt that Governor Jennings vouched for the Bank both in 1818 and in 1819. It seems also that Crawford feared to offend the Indiana men by refusing.

At a meeting of the directors, early in the year 1822, a dividend of forty per cent was voted and also $3,500 to Nathaniel Ewing for services as president.[68]

As soon as the Secretary of the Treasury learned that the Bank was insolvent, he sent an agent, who met the board of directors and made arrangements for payment of debts due the United States. The directors turned over what securities they had at hand and also the real estate belonging to the Bank. The deed to the real estate was so imperfectly executed that it took a suit in the supreme court to ascertain whether the directors had actually made the transfer or not.

Among other securities given to the United States Government were bonds of the state aggregating $32,750. As soon as Governor Jennings learned that the state bonds had come into the hands of the United States Government he protested to the Secretary of the Treasury. Not receiving any answer, Governor Jennings called a special session of the legislature to advise him what to do in the matter. The state had received in taxes nearly the sum of $30,000 in Bank currency, which was worthless if not credited on the state's bonds.[69]

On March 2, 1822, the Secretary of the Treasury returned these bonds to the Bank to be redeemed in the worthless paper the state had received for taxes. All the affairs between the state and the federal government were amicably settled, and the tax-payers of the state were saved about $30,000, a full year's taxes.

The report of the Bank to the Governor for January, 1822, is interesting. The nominal capital stock of the Bank and all the branches was $129,363; $30,000 each for the branches, and $39,363 for the parent bank. The Bank had $30 in specie and $3,218 in other currency. The debts owing to it totaled $184,733, of which the "Steam Mill" owed $116,284, and different directors $17,333. On its board of directors at the time were Davis Brown, president of the Bank, postmaster of the borough, and a member of the legislature; Wilson Lagow; Nathaniel Ewing, former president of the Bank, United States pension agent for the state, and agent for the "Steam Mill;" John D. Hay; Elias McNamee, city councilman for many years; Arthur Patterson, a leading merchant; William Burtch, a merchant and importer; Samuel Tomlinson, dry-goods merchant; Robert Buntin, Clerk of the Circuit Court; Dennis Sayre, over whose grocery store the Bank was located; George

[68] *Western Sun*, March 16, 1822.

[69] *United States Papers*, 2nd Session, 17th Congress, V; also *Western Sun*, April 6, 1822.

Ewing; and George R. C. Sullivan, ex-postmaster, and member of the legislature.

The Corydon branch had $4,053 in specie, $13,897 in notes in circulation, $3,590 on deposit with $42,007 debts. On its board are many names well known in early Indiana history: A. Brandon, Dennis Pennington, R. C. Boon, John Depauw, Davis Floyd, Joshua Wilson, John Tipton, Joseph Merrill, James Kirkpatrick, Jordan Vigus, and Benjamin Adams.[70]

The Brookville branch reported paid in capital $14,009; deposits $8,630; debts owing to it $95,319. Its directors were John Test, Enoch D. John, William H. Eads, James Noble—United States Senator, Robert John, John Allen, Nathaniel Gallion, Joseph Brackenridge, John Jacobs, James Backhouse, and Noah Noble, who was later governor of the state. Vevay had specie to the amount of $1,997; capital $4,651; paper in circulation $23,783; debts owing to it $72,287.

Comment on this kind of banking is not necessary. Some of these men were dishonest—embezzlers; the forty per cent dividend was outright theft; but it was just as certain that, taken as a whole, these directors were the leading men of the state. They soon realized that the Bank was a failure. The members of the new board, elected on the first Monday in March, 1822, were nearly all of Brookville. William Eads headed the committee to wind up the affairs of the bank. He gathered up what was left in the way of furniture and securities, and prepared to meet the creditors, the circuit court, and the Secretary of the Treasury.

Senator James Noble undertook to settle the difficulty between the Bank and the United States.[71] In place of the state bonds, which were returned to the Bank, he accepted private notes and mortgages. The Bank had $168,453 of United States money on deposit. The property of the "Steam Mill," and the property of Judge Parke and others in Vincennes, passed to the United States, together with a large number of lots in Brookville. The amount of real estate shows what the Brookville stockholders lost in the Vincennes Bank.

At the June term of the Circuit Court of Knox county a *quo warranto* suit brought the Bank to an end. The jury found that the Bank had violated its charter in several particulars, and the judge,

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[70] *Western Sun*, January 12, 1822.

[71] *Am. Sta. Pa., Fin.*, V, 104, ff. Congress investigated the alleged "Financial Mismanagement" of Secretary Crawford but did not criticise anyone. The report of this investigation shows the attempt of Crawford to build up a political machine to control the Congressional caucus. He would have controlled Indiana had the Vincennes Bank not failed.

in overruling a motion in arrest of judgment, pronounced it a clear case of violation of charter.[72]

On appeal to the state supreme court,[73] Judges Scott and Holman affirmed the decision in so far as it related to the charter, but reversed it in so far as it related to the property of the Bank, so that the property reverted to the original donor. The Bank creditors were left entirely without remedy, and the debtors to the Bank were discharged.[74]

Echoes of the failure of the Bank are met with frequently in the political literature of the time. When State Treasurer Lane was succeeded by Samuel Merrill the former insisted on turning over the state funds in the form of these old Bank notes. A *mandamus* suit was necessary to decide the question.[75] When Governor Jennings went to Congress, he called for the papers concerning the Bank, and attempted to make out a case of collusion between the Bank and the Secretary of the Treasury.[76] The House of Representatives called for the papers, but the investigation resulted in nothing but additional disgrace and humiliation to the Bank officers and directors. The Madison Bank was cited to show what honest men could have done.[77] Governor Hendricks, who succeeded Governor Jennings, took advantage of his annual message to read the state a lecture on "wildcat" banking. Vincennes never regained in state politics the prestige that was lost in this unfortunate affair.

This study of Indiana's first Bank shows, as could just as well be shown by a study of the first banks of Ohio, Kentucky, or Illinois, that the economic and political, as well as the moral laws governing banking were not well understood. There were large numbers of men who thought "wildcat" banking morally justifiable. The economic demands for a bank were either unknown or unheeded, and banks, like railroads and canals, were established where wealth and business interests could not sustain them. Moreover, Jeffersonian and Jacksonian democracy taught that government should interfere as little as possible in the business affairs of men. Bankers, like merchants, manufacturers, or farmers should be left to carry

[72] *Western Sun*, July 13, 1822. See *Circuit Court Records* at Vincennes under the same date.

[73] *Blackford's Reports*.

[74] *Western Sun*, November 22, 1823.

[75] Merrill *vs.* Lane, *Blackford's Reports*.

[76] *Am. Sta. Pa., Fin.*, V, 104.

[77] For a similar experience in Michigan, see Judge Thomas M. Cooley's "State Bank Issues in Michigan," I, (*Publications Michigan Political Science Association*). A good contemporary view is given by William M. Gouge in his *Short History of Paper Money and Banking in the U. S.* (Philadelphia, 1833), Part II, ch. xiv.

on their business in the ways that seemed to them best or most profitable. Lastly, there was no publicity given to the business. The few newspapers then in circulation had no adequate means of getting information concerning the banks in time to warn the people. Under such circumstances dishonest men could ply their trade with great success.

III

POPULAR IDEAS OF BANKING IN 1834

The second period in Indiana banking begins with the charter of a new State Bank in 1834.[1] The agitation for a state bank began as soon as the election of 1832 settled the fate of the Second Bank of the United States. The State Bank of 1834 was the heir in Indiana of this United States Bank whose charter expired in 1836. It was favored and upheld by the Clay party in the state. Why the state always supported Jackson, and at the same time favored the United States Bank, a high tariff, and internal improvements is one of the unexplained facts of Indiana politics of this period. The State Bank was not, however, an issue in the state election of 1832. After it was ascertained that Clay was defeated and that the Second Bank of the United States would not be rechartered, speculation began as to what would take its place.

This question was prominent in the local politics of other states besides Indiana. The Kentucky legislature endeavored to charter a state bank; but the bill, after safely passing the House of Representatives was defeated in the Senate, where a bill to charter a Louisville bank with $2,000,000 capital took its place and became a law. A like situation developed in Ohio, where local politicians were able to defeat a charter for a state bank, and substitute charters for the Franklin, and the Commercial Bank of Cincinnati, each with $1,000,000 capital. So strongly, however, was Governor Lucas of Ohio, in favor of a state bank that in his next message to the legislature, he recommended a state bank with branches in all sections of the state.[2]

The capital invested in the Second Bank of the United States had brought in big dividends and there was a rush in all the states to get stock in favored banks. In almost every state we read of politicians busy with legislatures, seeking bank charters, or the coveted position of commissioner to sell stocks and organize banks. There was much foreign capital available for investment in stocks. That legislators feared these foreign capitalists is evidenced by the widespread efforts to keep stock out of their hands. In the State

[1] Dewey (*State Banking Before the Civil War*, p. 43), says this was an extension of the earlier charter. This is an error. The charter of the earlier bank was annulled in 1822 by the Knox county, Indiana, Circuit Court.

[2] *Indiana Democrat*, February 13, 1833. This was published in Indianapolis and was the organ of the Jackson men. It is referred to hereafter as *Democrat*.

Bank of Indiana chartered in 1834, no foreigner could be a director, and hence not a president of the bank or of any of its branches. If enough stock was subscribed by citizens of the state, no one else could be a subscriber. To aid the citizens, the state arranged to lend them money to make subscriptions.[3] In the charter of the Bank of the State of Indiana, granted in 1855, it was enacted that foreigners could not vote their stock in stockholders' meetings; all directors had to be citizens of the state; and if a director moved from the state his office was vacated. In the same charter it was provided that if citizens should subscribe all the stock, others could not subscribe.[4] The Free Banking Act of 1852 made no such discriminations.

There was also a fear that the control of banks would drift into the hands of the few, so that there was scarcely a charter that did not specify restrictions on the amount of subscriptions by individuals and especially by foreign subscribers. Each of our state bank charters discriminated against the large holder,—first by cutting down his subscriptions if there was an oversubscription, and secondly, by refusing to let him vote in stockholders' meetings in proportion to his stock. In the charter of 1834, the holder of four shares had four votes, but above that number the holder had one vote for every two shares up to thirty shares; from thirty to ninety shares one vote for every four shares; from ninety up to one-hundred and fifty, one vote for every six shares; above one hundred and fifty, one vote for every ten shares; and it was further provided that no stockholder should have more than one hundred votes. In the charter of 1855, one vote for each share was permitted up to fifty shares; from fifty to one hundred shares one vote for every five shares; and above one hundred shares one vote for every ten shares. This form of restriction was placed in the charter of the First Bank of the United States by Hamilton and copied in nearly all later charters, both state and national.

Experience had taught the people that the chief difficulty with banks was that they tried to do business on insufficient capital. There was little specie in the country, and what there was could not easily be got hold of for banking capital. Not over one twentieth of the capital of the First Bank of the United States was paid in specie. That bank began business when $400,000 of its ten millions of capital stock was paid in. The same plan was followed in the Second Bank of the United States. Even the United States government borrowed from the First Bank the money to pay its own

[3] *Laws of Indiana*, 1834, ch. vii.

[4] *Ibid.*, ch. iii.

subscription. The bank itself, not having any specie to lend, merely passed a $2,000,000 credit on its books to the United States in return for a foreign draft in its favor. If the federal government could so far disregard business morals as to collect a premium on $2,000,000 where not a dollar was involved, it is easy to suppose that private speculators would go much further. The plan was simple. The speculator subscribed for stock, borrowed the money from the bank at six per cent, and if the bank failed no harm was done to the subscriber. It was merely a matter of bookkeeping; no money changed hands. If the bank succeeded, the interest on the loan was six per cent, and the dividend on the stock often as high as ten per cent. Here was a clear gain without any investment. Gradually the state came to require by law that more capital be paid in, and that the bank make more of an effort to maintain specie payments. All Indiana charters required specie payments by the bank and the Free Banking Act required that the bank of issue keep on hand a reserve of at least twelve and one-half per cent of its circulation.[5] The Charter of 1834 provided for $80,000 of specie to be paid in before the bank was opened; $30,000 by the subscribers, and $50,000 by the state.[6] The Charter of 1855 required only $2,000 to be paid in, and specie was not called for.[7] The Free Banking Act of 1852 required at least $50,000 of capital stock in each bank. After the states had done their best, it was still true that the majority of banks, before the Civil War, did business with less than one-half their capital paid in.

It was believed that the stock should be held locally. It was generally felt either that a bank could be run to the detriment of the community and for the exclusive benefit of stockholders, or that it could be conducted in the interests of the community; though in the latter case it might not pay such large dividends. One of the common complaints against the Second United States Bank was that much of its stock was held by foreigners, and that every distribution of profits took a large amount of specie out of the country. The same argument held with reference to local neighborhoods, cities, and states. Nearly all early charters had provisions against one man holding more than a limited amount of stock. The charter of the Hartford (Conn.) Bank forbade anyone owning more than thirty shares. Not more than half of the stock of the Commonwealth Bank of Massachusetts was ever to be in the hands of one person. A New York law made subscribers take oath that

[5] *Laws of Indiana*, 1852.
[6] *Laws of Indiana*, 1834.
[7] *Laws of Indiana*, 1855.

they were paying for their stock with their own money. The general law of Pennsylvania provided that no one should subscribe for more than two shares on the first day, four on the second day, and six on the third. A Maryland law limited subscribers to twenty shares at one subscription. In all the states, effort was made to distribute the stock as widely as possible, but in almost every case the law was evaded. It has already been noted that Indiana borrowed money in 1834 to lend to her citizens to enable them to buy stock. The same provision was retained in the law of 1855, but the commissioners having the subscriptions in charge manipulated the books so that only a few favorites were allowed to subscribe all the stock.

Another common practice at this time was for the state to subscribe a part, or all, of the stock. Scarcely a bank was chartered by the United States, or by any state, without a provision that the government issuing the charter should take a part or the whole of its capital stock. This was not due to a scarcity of capital, for there was plenty of money seeking investment in banking. It was primarily due to a belief that such investments were profitable; and when banks were well managed this was so. Pennsylvania, in 1813, had an annual income from her bank stock of $200,000. Many other states had large incomes from this source. The State Bank of Indiana could have paid the ordinary expenses of the state from its profits during the period from 1834 to 1857. As another reason for this investment, it was believed that if the state wished to borrow money, it could do it more readily from a bank that was partly under state control. Again, it gave the state some control over the bank's affairs and this was considered salutary. Lastly, it was valuable to the legislator individually; it suited his vanity to be connected with banks, handle bank stock, and elect bank presidents.

IV

THE SECOND STATE BANK OF INDIANA, 1834–1859

Chartering the Bank, 1834

Soon after the October election in 1832, a movement was started to reorganize the old Farmers and Mechanics' Bank of Madison, Indiana. This bank had always borne a good reputation, and the character of its officers [1] assured it a good standing among business men. John Sering was a member of its board of directors and J. F. D. Lanier was its cashier. A new set of bank note plates was struck, and every arrangement made to take the tide of opportunity at its flood. There was in Indiana no branch of the Second Bank of the United States; nevertheless its currency and power reached and controlled the state through the branches at Cincinnati and Louisville.

Early in the session of 1832, a bill for a state bank charter was introduced in the Indiana legislature. The report on this bill by the Senate committee, of which John Ewing [2] was chairman, is the best exposition of the various views of the legislature on the subject of banking. In this report, which was dated January 1, 1833, Mr. Ewing suggested five plans by which a circulating medium might be secured:

1. The legislature might memorialize the Congress of the United States to recharter a national bank.
2. Congress might be induced to issue a national currency and apportion it among the states according to population.
3. The legislature might issue a state currency predicated upon the proceeds of canals, school lands, the Michigan Road, and salt springs, and managed by a board of commissioners.
4. The legislature might order an issue of treasury notes bearing five per cent interest.
5. The legislature might organize a partnership bank—state and people.

Mr. Ewing then discussed these plans in detail. Concerning the first, he spoke of the widespread need of more money in the state. The population was rapidly growing. Commerce was car-

[1] These were Victor King, president; John Vawter, John Sering, John Woodburn, and Milton Stapp, directors; J. F. D. Lanier, cashier. *Democrat*, October 13, 1832.

[2] John Ewing was born in Ireland; came to Vincennes and engaged in mercantile pursuits; represented his county in the House in 1819 and in the Senate from 1825 to 1835, and from 1842 to 1844. He also served in the twenty-third and twenty-fifth Congresses.

ried on with distant cities, and required large capital. Business was active and increasing, but was hampered for lack of a circulating medium. This medium, he thought, could best be obtained by rechartering the United States Bank. The second plan, he opposed on the ground that a state currency might easily and advantageously be created, and would be more apt to remain in the state and more freely respond to local needs, than a national currency. The lands recently granted to the state might easily be funded for $500,000, and state bonds might be sold in the East for $500,000 more in specie. These bonds could run for fifty years. This would give a capital of $1,000,000 on which $2,000,000 in notes might safely be circulated. A state bank, he thought, was to be preferred to a corporate bank for several reasons. Its gains, which would be large, would accrue to the people themselves. If stock was sold, it would drift into the hands of a wealthy class, perhaps outside the state, who would manage the bank with attention solely to its money-making or dividend-paying power. As a state bank, it would be a unit in council, and would have a single purpose which would be to serve the state and people. Its directors should be elected annually and changed every two years. Means would have to be provided, of course, to prevent its getting into politics or creating an aristocracy. The fourth plan, which involved an issue of treasury notes, he asserted should be looked upon as a last resort. Our state is now out of debt and such issues would be bills of credit, the issue of which the state constitution forbids. The state constitution prohibited the incorporation of banking companies, but allowed the establishment of a state bank with branches. The fifth plan, which was to establish a co-partnership bank, the state subscribing a part of the stock, needed, Mr. Ewing thought, no considerable discussion. The evil effects of a co-partnership bank had already been experienced in this state. The First State Bank almost destroyed credit, endangered the validity of contracts, and so lessened the confidence of man in man that ordinary business was seriously deranged. Moreover, it injured the credit of the state, and gave to its citizens a weakened reputation for financial integrity. Mr. Ewing thought it the duty of the state to guard against the repetition of such a calamity, and oppose every possible bar to such an issue of "Owl Creek" currency. Finally, he said, the committee believed a national paper currency preferable to any state emissions. A national bank was thought better than a state bank on account of its wider power, its national affiliation, and its greater uniformity.[3]

[3] This report is given in the *Indiana Journal*, January 2, 1833. The *Indiana Journal* was published at Indianapolis, and was the organ of the Whigs.

In general, the committee agreed with Mr. Ewing. They favored a national bank with state branches, state controlled; and recommended that Indiana organize a branch, and by issuing state five per cent bonds buy $800,000 of this national currency. Out of the dividends, they estimated, the five per cent on the loan could be paid, and the surplus would go far toward the establishment of free primary schools throughout the state.

At the same time there was a bill before the Senate to charter a co-partnership bank with nine branches.[4] If any branch failed to pay six per cent it was to be closed. The state was to take one-half of the stock, which was to be non-taxable, and the charter was to run twenty-seven years. A bill similar to Farrington's passed the House of Representatives January 18, by a vote of 42 to 28.[5] There were now three bank bills before the Senate.

The Committee Bill was not discussed. James Raridan of Wayne county, one of the ablest members, spoke on the Farrington Bill.[6] His objections to it were that the interest on $800,000 would take $40,000 out of the state annually. "However you may figure," he concluded, "the people must finally pay every cent of this enormous tribute." It would become the basis of a political machine that would not only control elections and political preferments, but by adroit management of its loans would monopolize business. Its directors and stockholders would rule the state. Its patrons and debtors, a devoted army, would rule at the polls. It could make or break a merchant at its pleasure. Furthermore, the speaker did not consider the division of capital just. It should be divided according to the commercial needs of the districts; but as the matter stood the First, or Whitewater, district with an annual commerce of over $300,000 and the Sixth with $100,000 would get the same capital. The bill provided, further, that the names of all borrowers should be concealed. This provision, he said, would prevent one person from knowing another's financial standing and would ruin credit and confidence. Worst of all, the bill would divide the people into two classes. The farmer and the laborer had no need of banks, and would derive no advantage from them. The gain would all go to the moneyed men, to the merchants.

While this debate was going on the committee reported the House Bill, and it was lost in the Senate by a tie vote, 13 to 13. The Senate then resumed the discussion of the Farrington Bill.

[4] *Indiana Journal*, January 5, 1833.

[5] *Indiana Journal*, January 19, 1833. Also, *Journal of the House of Representatives*, 1832, p. 435.

[6] *Indiana Journal*, January 26, 1833; his speech is given entire. It is analyzed here, not because of the soundness of its doctrines, but because it is a typical argument on the question.

Every senator spoke at length. The speeches were largely summaries of those made in Congress on the Recharter Bill of 1832. There was great excitement throughout the state, and there was an overwhelming sentiment, it seems, in favor of chartering a bank. Calvin Fletcher sat for the Indianapolis district. His constituents were almost a unit in demanding a bank, but he was opposed and resigned rather than vote.[7] A motion to postpone action till the following session prevailed by a vote of 14 to 13. The Jackson men, seemingly, were as much dejected by the defeat as the Clay men. The *Indiana Democrat* supported the measure and criticised Senator Fletcher for leaving his post of duty and not supporting the charter when he knew his constituents favored it.[8]

These three bills are worthy of attention as a reflection of the popular views on banking. The Committee Bill provided for the Bank of the State of Indiana, to be located at Indianapolis, with power vested in the first directors to establish five branches in whatever counties they thought best. The $1,600,000 capital was to be divided into shares of $50 each, and one-half was to be furnished by the state, the other half by individuals. Seven directors for the parent bank were to be elected annually by the legislature, who were to choose six directors for each branch. The individual stockholders were to elect six directors for the parent bank and seven each for the branches. Non-residents were not to vote in stockholders' meetings. Each director must own at least ten shares, and no one could sit as director in two branches. The stock was non-taxable; six per cent was made the legal rate of interest; the charter was to run twenty-seven years, and the state auditor and treasurer were to visit and inspect both bank and branches.

The House Bill resembled the Senate Bill very much. The capital stock was the same, and the location and number of branches were to be the same; unpaid stock, however, was to be secured by a mortgage, and stock could not be given as security on a loan. Each branch was a separate corporation; specie payment was necessary, but the branches were not mutually responsible. No municipal corporation could borrow over $5,000 and no state, or county, officer could be a director in the bank. The profits were to go to education. As passed by the House, this bill provided for thirteen directors, five chosen by the state legislature, and eight by the stockholders; and the minimum capital for each branch was to be $50,000, instead of $80,000.[9]

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[7] *Indiana Journal*, February 2, 1833.

[8] *Democrat*, June 15, 1833 (editorial).

[9] The Farrington Bill is printed in the *Indiana Journal*, February 16, 1838; the House Bill in the issue of February 23; and the Ewing or Committee Bill in the issue of March 9.

The general necessity of a bank was conceded. There was some objection to enacting a state monopoly, and the experience with the old Vincennes Bank made men hesitate to charter another state bank. But on the whole the people were strongly in favor of a state bank and were deeply disappointed at the failure of the Senate to enact a charter.

The bank question contested with that of Internal Improvement for the chief place in the campaign of 1833.[10] This campaign began as soon as the legislature adjourned its winter session. Many urged that the Governor call a special session; but it was argued effectively that the same men who had failed once to pass a charter would fail again, and that the state would be put to needless expense. An editorial in the *Democrat* [11] directed that the support of a bank be made the central point in the creed of every candidate for the legislature. "We believe," said the editor, "that a great majority of the people want a bank, but that there is a certain class of low politicians who are making an effort to defeat it. Especially do we hear of such attempts forming in the eastern part of the state. The people want a safe and permanent bank, and it should be established." These "low politicians" mentioned by the editor were of two classes—first, those who preferred "wildcat" banking and coveted a job as bank commissioner, or were hanging back that they might be taken care of; secondly, the Jacksonian hard-money men, who wished no money to circulate except specie.

The legislature that met in December, 1833, lost little time in getting together on a bank charter.[12] Governor Noble set forth in his message [13] the general demand for a bank. Both Houses disclosed strong bank majorities; and since in the year's discussion by the people, the main points of the bill had been settled, there remained little to do except enact the people's will on the subject. A bill was before the House for discussion on the sixth of January. It passed the House by a majority of 48 to 23; and the Senate by eighteen to eleven.

The provisions of this charter [14] show that it was carefully drawn. It shows no trace of any interests contrary to the public welfare. The state was divided into ten districts as nearly equal as possible and the directors were to establish a branch in each district. The directors were given power to locate an eleventh and a twelfth branch as soon as the commercial situation seemed

[10] *Indiana Journal*, May 4, 1833.
[11] *Democrat*, June 15, 1833.
[12] *Indiana Journal*, January 1, 1834.
[13] *Ho. Jour.*, 1833, p. 10.
[14] *Laws of Indiana*, 1834, ch. vii.

to demand it. The head office was to be at Indianapolis, but there was no parent bank. The branches were on an equality, and the Indianapolis branch was not to enjoy any prestige nor exert any undue influence over the other branches. This charter forbade the Bank's dealing at all in real estate. The provision worked to the advantage of the Bank, for the people had more faith in a bank that did not deal in real estate, as a result of their experience with the Second Bank of the United States, which had acquired a bad reputation because of its unsatisfactory dealings in real estate. It was to be a strictly specie-paying institution, and if at any time, it refused to redeem its notes in specie it was to forfeit its charter, a provision which was later disregarded in a critical period of its life.[15] This provision in its charter put it in a class with the best banks in our history, and clearly set it off from the "wildcat" brood then springing up in all the surrounding states.

The rate of discount was fixed at six per cent, and each share was to pay into the educational fund twelve and one-half cents annually in lieu of a state tax. This exemption from taxation was taken away by the amendment of 1841, and the Bank was made subject to the usual levies. A provision that must have dampened the ardor of several members made all state officers ineligible to any position in the Bank. It was to issue no notes under five dollars; but this limitation was removed in 1841, and the Bank was thereafter allowed to issue notes as low as one dollar. Under the amendment the Bank had to pay to the state one per cent on all small notes issued. There was mutual responsibility, but notes were to be redeemed by the branch issuing them. A complex scheme of management was worked out for the Bank. The president was elected by the legislature for a term of five years at a salary of from one thousand to one thousand five hundred dollars. For the State Bank the legislature chose four directors, and each branch one. These constituted what was known as the Bank Board. This Board had full power over the branches, and could make examination, personally, or require a report of any branch without a day's notice. The Bank Board in its turn made an annual report to the legislature. The Bank Board appointed three directors yearly for each branch, and the stockholders chose from seven to ten more. These branch boards elected presidents and cashiers for the branches. None of these officers could hold state offices while on the bank boards; nor could any stockholder give his stock as security for a loan; nor could a president, cashier, or director, endorse for anyone or for each other. The duties of

[15] See below, page 258.

all the officers were definitely stated, and any violation, even the least, was made a felony. The Bank Board prescribed a uniform system of accounting. A trial balance had to be made every month, and a complete settlement semi-annually. Each branch was personally inspected every half year by a member of the state Bank Board.

The capital of the Bank was placed at $1,600,000, later raised to $2,500,000 by an amendment adopted March 1, 1836. One-half of the entire capital stock was subscribed by the state. Each branch was to have an equal part of the capital, i. e., $160,000, at first, and after the amendment of 1836, $250,000. The policy in organizing was to distribute the stock as widely as possible, and for this purpose the state arranged to lend money on real estate mortgages to subscribers of bank stock. To carry out this provision of the charter and pay for its own subscriptions the state borrowed in the East $1,300,000. The charter was to run twenty-five years, expiring January 1, 1859. The state constitution, of its own force, added some features to the charter. It forbade anything but a state bank with branches, not more in number than one in every three counties. The capital was to be subscribed in those counties, and no branch could open until the sum of $30,000 in specie was paid in.

One cannot fail to note the great care displayed in the charter to make the Bank safe, and its circulation sound. All the arts known to "swindling bankers" [16] were guarded against. As indicated above, the notes were signed by the local cashier and the central president. There was mutual responsibility among the branches, but not a division of profits, each branch retaining all it earned. The Bank Board might limit the loans of any branch to one and one-fourth times the paid in capital; and might call for reports monthly or oftener, or take control, and close a branch permanently. It might take funds from one branch, when they were not being used, and transfer them to another in need of money. No branch might have more debts due it than twice its capital; later this limit was raised to two and one-half times. A subscriber had to pay $18.75 in cash on each $50 share. The state furnished the balance, $31.25, and took freehold security, double the value of the loan. These loans to subscribers were to run from twenty to thirty years. All money earned by the state stock, above the five per cent interest on the bonds, was to go into the hands of the Commissioners of the Sinking Fund, by whom it was to be lent on freehold security.

[16] The reference is to an act of 1815 in which private bankers are called "swindling bankers."

Organizing the Bank

It was impossible at this time to concentrate the trade of Indiana in one center as was done in Ohio at Cincinnati, in Kentucky at Louisville, and in New York at New York City.[17] The White Water valley traded to Cincinnati. The trade of the southern part of the state flowed to the Ohio, but one could not say whether Madison, New Albany, or Evansville would secure the larger portion. New Orleans was the final market,[18] and boatmen shipped indifferently from a dozen river-board ports—Charleston, Leavenworth, and Troy sharing the trade with their larger rivals. Back from the river small centers of population and business, and especially of politics, were growing up at Brookville, Lexington, Salem, Bedford, Bono, Paoli, and Princeton. Vincennes, Terre Haute, Lafayette, and Logansport were the Wabash towns. Crawfordsville, the "town in the big flat woods," was the greatest land market in the United States. There was little commerce at this time at Indianapolis, while Muncietown, Andersontown, Delphi, Peru, and Wabash were blooming out from struggling villages into pretentious county seats. Seven out of ten towns chosen as locations of the branches of the Bank were on the borders of the state; only six of the ten contained over two thousand people each. The population of the state was about 500,000. There were about 900 merchants resident in the state, and perhaps an equal number of nonresident traders operating on the Ohio and Wabash.

On the Ohio river the busy pork-packing season was in November and December.[19] Drovers traveled through the neighboring counties and bought up large droves of hogs. These were butchered on the river-board as soon as cold weather set in. These products were shipped to New Orleans in the early winter before the ice blocked the Ohio. Thus there was a good demand for money in that section in the fall. The produce of the Wabash was gathered in flat-boats from the smaller streams. The boatmen had to wait for the thaw in the spring, when the ice was gone, and there was plenty of water. This required capital in February and March, and the produce was realized on by June 1.[20] What little lake trade there was came in midsummer. At this time the farmers of the interior were buying up hogs and cattle to fatten for the fall market.

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[17] *Indiana Journal*, February 22, 1834.

[18] Lanier, *Sketch of Life of J. F. D. Lanier*, p. 17.

[19] *Indiana Journal*, February 22, 1834.

[20] Wm. F. Harding, "The State Bank of Indiana,' a thirty-six page article in the ***Journal of Political Economy***, December, 1895.

On January 30, the legislature chose Samuel Merrill, pension agent for the state, president of the Bank for a term of five years, over John Sering and Gamaliel Taylor, the opposing candidates. Calvin Fletcher and S. W. Norris of Marion county, L. H. Scott of Vigo, and Robert Morrison of Wayne, were chosen directors for four-year terms, one retiring annually.[21] On March 1, notice was given by James M. Ray, cashier of the State Bank, that books would be opened immediately in all counties for subscription—the books to be opened by three commissioners and kept open from 9 to 12 a. m. for thirty days. If too much stock was subscribed the over-subscription was to be removed, first by refusing the entire subscriptions of nonresidents, next by refusing that of corporations, and, finally, by cutting down all subscriptions to $500 each, after which the remainder were to be reduced in proportion. Subscribers must pay in at least $30,000 in specie for each branch; but they could borrow the balance from the state on nineteen years time. This notice was printed in all the newspapers of the state.

By May 10, all stock in the Indianapolis and Lawrenceburgh branches was taken, and a meeting of directors was called for May 20, at which time all the branches had made returns showing full subscriptions. The Commissioners of the Canal Fund, whose duty it was to borrow money for the construction of internal improvements, had failed up to this time to get a loan for the state. Nevertheless, the Bank Board ordered the stockholders of each branch to meet and elect eight directors. In stockholders' meetings proxies of nonresidents were allowed up to one-hundred by a single person. There were 3,200 shares in each bank. Each branch elected one director on the state board.

At a previous meeting of the Bank Board, February 13, the branches had been located.[22] The First was to be at Indianapolis, for Marion, Johnson, Shelby, Hancock, Madison, Hamilton, Boone, and Hendricks counties; and as directors for this branch the state Bank Board chose J. P. Drake, Samuel Herriott, and Alexander Worth. Hervey Bates and B. F. Morris were elected by the branch directors for president and cashier respectively. The Second Branch, for Dearborn, Franklin, Ripley, Switzerland, and Decatur counties was situated at Lawrenceburg; the state directors were Omer Tousey, Jesse Hunt and Pinckney James. Omer Tousey became president, Enoch D. John, cashier, and W. Thomas Camp-

[21] *Indiana Journal*, February 1, 1834.

[22] *Indiana Journal*, February 22, 1834. Also *Journal of the Indiana State Senate*, 1834, p. 59, referred to hereafter as *Sen. Jour.* Also *Bank Reports*, I, p. 1. These annual reports were made by the cashier of the State Bank, to the legislature, and were due in November. J. M. Ray was cashier during the entire life of the bank.

[6—29048]

bell, clerk. The Third Branch was at Richmond. Achilles Williams, Lot Bloomfield, and Newton Claypool were the state directors, with Achilles Williams, president, Elijah Coffin, cashier, and Noah Leeds, clerk. This branch was to serve Union, Fayette, Rush, Wayne, Henry, Delaware, and Randolph counties. The Fourth Branch, for Jefferson, Jennings, Scott, Bartholomew, and Jackson counties, was at Madison; and the state directors were William Dutton, Robert Branham, and Williamson Dunn, with J. F. D. Lanier, president, and John Sering, cashier. The Fifth Branch, for Floyd, Harrison, Washington, Crawford, and Clark counties was located at New Albany; the state directors were J. S. Simonson, Isaac Stewart, and Somerville Edwards; Mason C. Fitch was president and J. R. Shields, cashier. The Sixth Branch, at Evansville, for Posey, Vanderburgh, Perry, Spencer, and Warrick counties, was organized with Francis Amory, Jr., John A. Brackenridge, and John Mitchell, state directors; John Mitchell, president, and John Douglass, cashier. The Seventh Branch, with Samuel Emison, John Wise, and John Law state directors for Knox, Sullivan, Daviess, Gibson, Pike, and Dubois counties was at Vincennes; and was in charge of D. S. Bonner, president, and John Ross, cashier. The Eighth Branch, for Orange, Lawrence, Monroe, Morgan, Martin, and Greene counties, was established at Bedford, and had Moses Fell, William McLane, and Pleasant Parks for state directors, with William McLane, president, D. R. Dunihue, cashier, and John Brown, clerk. At Terre Haute the Ninth Branch was organized, for Vigo, Clay, Owen, Putnam, Parke, and Vermillion counties; Asoph Hill, James Townsend, and Robert Hoggatt were chosen state directors, with Demos Deming president, and A. B. Fontaine, cashier. The Tenth Branch was organized at Lafayette for Tippecanoe, Fountain, Montgomery, Warren, Carroll, and Clinton counties, with J. W. Powers, Thomas Benbridge, and I. S. Hanna, directors on the part of the state, and Thomas T. Benbridge, president. The cashier, if it had any, was not named in the report. The state directors were ordered to locate the Eleventh Branch, after the lapse of a year, for the counties of Adams, Grant, Huntington, Wabash, Miami, Allen, LaGrange, Elkhart, and the unorganized territory. Still another, the Twelfth, was to be opened in the country north of the Wabash river. The law provided that the directors should choose one of their own number president.

A loan of a half million was effected by the loan agents of the state, the Fund Commissioners, August 6, and Governor Noble set November 19, as the day for the Bank to open its doors for business.

The total cost of organization had been $614.45, and this amount was more than offset by the premium received on the bonds issued.

A study of the list of officers will show that the Bank was in good hands. Its president, Samuel Merrill, had had considerable experience in "financiering." He spent most of his life in the state's service. He was state treasurer, from 1823 to 1835, coming to Indianapolis in 1825. Before this time he had served three terms in the state House of Representatives. In the cause of temperance, of anti-slavery, and of education he was a leader.

J. F. D. Lanier, president of the Madison Branch, came to be one of the greatest promoters and stock brokers of his time. He came of a distinguished Huguenot family of North Carolina. He was educated for the law and practiced at Madison, where he was connected with the Farmers and Mechanics' Bank of that city. His service as clerk to the state legislature for several years gave him a wide acquaintance over the state. In 1850 he joined Winslow of Madison in forming the banking firm of Winslow, Lanier & Co. of New York. It was this firm that furnished Governor Morton money to run the state during the Civil War, after the legislature had refused to make appropriations.

Hugh McCulloch, of Ft. Wayne, was the most distinguished man of the group, and his biography is inseparable from the financial history of the nation. He was the most distinguished banker of his day. He succeeded Fessenden as secretary of the treasury, March, 1865. As controller of the currency before this, he had established the National Banking System. To him more than any other single man is due the honor of financing the Civil War.

The Bank [23] was prosperous from the start. Men had subscribed for its stock deliberately and there was little evidence of speculation. Taken as a whole its officers were beyond criticism. The Whig party controlled the state and kept Merrill at the head of the Bank till 1843. Then his place was taken by a worthy successor, Judge James Morrison, who held office till the Whigs again gained control, ten years later, and placed Ebenezer Dumont in charge. These men by the policy they established, placed the Bank on a firm foundation in the confidence of the people.[24]

The Panic of 1837

The Bank passed through two severe trials. The first of these grew out of the Internal Improvement activity which began in 1836. While both the Bank and the Internal Improvements were

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[23] *Bank Reports*, II (1835), p. 1 ff.

[24] Harding, *The State Bank of Indiana*, p. 12.

closely allied ventures of the state, their affairs were kept separate as far as possible. The Improvement officials kept their funds in the Bank and frequently overdrew their accounts. When the state failed in its payments, in 1839, the Bank was involved by one of these overdrafts to the amount of $650,000, which seriously crippled it. In 1836 the Fund Commissioners of the state had been authorized to sell bonds and procure for the Bank $1,000,000 more of capital. On the advice of Dr. Coe, Mr. Samuel Merrill delivered these bonds to a firm of brokers in New York, in which Dr. Coe was interested, and all were lost but $20,000. There was a great demand at the time for loans and, depending on the extra capital, the Bank had discounted heavily. The failure to secure the extra capital, coupled with the failure of the state, came near breaking the Bank, and caused several branches to stop discounting for the time and call in all their loans. The state came to its aid in 1840 and issued bank scrip to the amount of $722,640, which it gave the Bank to pay the overdraft.

The second trial of the Bank's strength came in the Panic of 1837. Its deposits had risen rapidly. The United States deposit was $1,062,238 in 1835, and the next year it rose to $2,267,489. In 1837, however, the United States deposit dropped sharply to $576,277 and disappeared entirely by 1840. President Jackson's Specie Circular, of July 6, 1836, also helped to weaken the Bank at this period by forcing the government land offices to refuse all kinds of bank notes. Its "quick" liabilities Nov. 26, 1836, were: public deposits, $2,276,357; individual deposits, $431,703; notes in circulation, $1,927,050; capital stock, $1,585,481; assets, specie, not given but about $1,000,000; discounts $3,176,613; currency, $1,204,737.

It was well that the three years of experience had taught the people the value of the Bank. The stages which reached Indianapolis on Thursday evening, May 20, 1837, from Lawrenceburg and Madison, brought the news that all the eastern banks, including the old Bank of the United States, had suspended specie payment. The news was as sudden as it was unexpected. The situation was grave. If the Bank suspended specie payment it would forfeit its charter. If it did not suspend, it would be broken and thus ruin the business of the state. The Bank Board was fortunately in session, and, in spite of the law immediately ordered all branches to stop paying specie.[25] The most dangerous creditor of the bank was the National Government, which had $1,500,000 in specie on deposit. Mr. Lanier was posted off at once with $80,000

[25] *Indiana Journal*, May 20, 1837.

in gold to see what terms could be made with the Secretary of the Treasury, Woodbury. Lanier went by boat to Wheeling, thence by stage to Frederick, thence by the Baltimore and Ohio railroad to Washington. His mission was entirely successful. Of all the banks then possessing government deposits, the Indiana Bank was the only one that offered, or paid any specie. The Secretary allowed the deposit to remain till drawn in the regular course of business.[26] It is also very creditable to the Bank that its bills were regularly received by creditors of the nation. Nearly every bank in the West and Southwest broke under this strain, and also many in the East. The Indiana Bank, alone, west of the Alleghanies, did not fail. The Whigs attributed the general disaster to Jackson's war on the Bank of the United States aided and aggravated by the specie circular.[27]

The citizens of Indianapolis helped the local situation by approving in a public meeting the action of the Bank Board. The merchants of Indianapolis showed their faith in the Bank and its directors by giving notice promptly that they would receive State Bank notes of all branches at par and by expressing in another resolution full confidence in the Bank. In its turn the Bank Board issued an address to the people of the state calling attention to the fact that the Bank must, in self defense, close its doors against specie payment. Agents were in the state from the East who would take away specie by the wagon load, by means of the Bank's own currency. The Bank had on deposit in the eastern banks $1,000,000 in its own notes which could all be used to draw from the various banks the $1,000,000 in specie which was in their vaults. The branches would continue to receive the paper currency at par and cancel all indebtedness. The people were warned not to sacrifice their money. The people preserved their confidence and the Bank preserved their money. The suspension was not forced but was the result of due deliberation. The Bank reported, and actually had, plenty of specie. A committee of the legislature made a thorough investigation and approved its conduct.

The credit of the Bank notes was not seriously injured by the suspension, and President Merrill immediately set to work to arrange with other banks for a resumption of specie payment. A meeting of bankers from all parts of the country was called for April, 1838. John Lanier was again called on to represent the Indiana Bank. The bankers met in New York, and Lanier sur-

[26] Lanier, *Life of Lanier*, p. 15.

[27] *Indiana Journal*, May 6, 1837. "Indiana, in 1837, had the largest amount of circulation and of specie in proportion to its capital, of any state in the Union." George Tucker, *The Theory of Money and Banks*, etc. (Boston, 1839.)

prised the eastern members by making a proposal, with which Gallatin concurred, in favor of immediate resumption of specie payment. He succeeded in his mission and set August 13, 1838, as the day on which the banks were to begin again the payment of specie. But the banks still feared the specie would all be gathered in the East, and on November 19, 1839, the State Bank again closed its specie vaults, not to reopen them until ordered to do so by the legislature, June 15, 1842. The Bank never defaulted again. No other state in the Union passed through this period with its currency so little deranged.

There was much criticism of the Bank during this period of suspension. The Bank notes were at a discount of about five per cent outside the state. This was an especial hardship on merchants. One of the most lucrative fields of the Bank's activity was the purchase and sale of exchange. Bills on New Orleans were bought from shippers in the fall and winter. When these were about to mature, Lanier would go to New Orleans and cash them, using the proceeds in buying exchange on New York and other eastern cities. These bills were sold to Indiana merchants buying in the East and thus the Bank turned its money at least three times a year. The discount on these bills, due largely to depreciated currency, was from eight to fifteen per cent on each transaction. During the Panic, the Bank made ten to fifteen per cent clear profits.[28] It took advantage of its freedom from specie payment and expanded its note circulation from thirty to forty per cent.

In the meantime the Bank Board had established branches in other cities. The Eleventh was located in Ft. Wayne, November 25, 1835.[29] It was in this bank that one of Indiana's most distinguished sons, Hugh McCullough, received his training. At the February meeting of 1838 [30] the Bank Board voted to open three more branches. The opening, however, was to be deferred till specie payment was resumed. The Twelfth was situated at South Bend and opened November 3, 1838, with T. W. Bray, president, and Horatio Chapin, cashier. The legislature authorized a Thirteenth, which was located at Michigan City, and a Fourteenth which was to be at Logansport. A Fifteenth was later voted to be opened at Rushville and a Sixteenth at Crawfordsville, but

[28] Lanier, *Life of Lanier*, p. 17.

[29] *Documentary Journal of the Legislature*, 1835, p. 8. In this are regularly printed the reports of the various state officers. It is the best documentary source of the state's history. Hereafter referred to as *Doc. Jour.* These *Journals* are not always paged. None are indexed and only a few have tables of contents.

[30] *Doc. Jour.*, 1838, Bank Report.

the last three were never opened. The Logansport Branch was kept out by the opposition of Lafayette, [31] since the opposing vote of a single branch would prevent the establishment of a new one.

During the sessions of the state legislature, there was much spirited, and even angry, discussion of the Bank. A report by Samuel Judah,[32] January 1, 1839, expresses the opposition. Banking, said the report, was to be considered a mere trade, like merchandising, open to all men. At Common Law anyone had a right to bank. The only restraints were the natural ones—a lack of capital, and a lack of credit, or both. The practice of restrictive banking came from England and was fostered by the chartered banks. The report answered the argument that the state constitution prohibited private banking, by saying that the Tenth Article, which was said to do so, was reported by James Noble whose brother, Noah, had soon become interested in a private bank at Brookville; and that Judge Benjamin Parke, a member of the convention of 1816, had helped to organize the "Steam Mill" company of Vincennes—a banking company that issued notes. The report considered the New York bank plan best[33] because it would give three very desirable results. It would be a guarantee that the one who issued the note had something back of it; it would give a steady demand for bonds that are now all but worthless on the market; and it would give more money for circulation.

At the time when the enemies of the Bank were attacking it in the legislature, President Merrill in his annual report[34] October 31, 1839, said: "The failure of the $1,000,000 of extra capital is making money scarce and depressing prices. The Bank has had to curtail its loans to the extent of $730,000 in thirty days. It has too many useless officers and directors. State regulations also hamper the actions of the Bank. We would open the Thirteenth, Fourteenth and Fifteenth branches, but the state cannot get capital for its part of the stock. Politicians are injuring the Bank by catering to its enemies. In many cases worthless directors get on the bank boards only to insure to themselves a loan from the Bank. Long time loans ought to be avoided especially to merchants and speculators. The state has made a net profit on its Bank stock of $391,334 up to 1839." Following the suggestion of President

[31] *Doc. Jour.*, 1838, Bank Report.

[32] *Doc. Jour.*, 1838, No. 13. The author of this report was born in New York City in 1798, but spent practically all his life in Vincennes. He was one of the best lawyers of the state. He served in the state House of Representatives six terms, being speaker in 1840.

[33] For an explanation of this plan, see below, page 271, ff.

[34] *Doc. Jour.*, 1839. Here as usual Merrill speaks more as an agent of the state than as an agent of the Bank.

Merrill it became the policy of the Bank to lessen its discounts to merchants and to give more assistance to exporters. The report[35] of 1840 showed loans to merchants of $1,032,136, to farmers of $600,310, to manufacturers of $610,754, to exporters of $771,376. A comparison of the above with the report of 1841[36] will show the result of this new policy. Loans to exporters in 1841 were $1,111,747; to merchants $982,602.

Another source of worry to the bankers during these years was the unequal demand for money at different seasons of the year. An inspection of the books shows that loans and circulation fluctuated about $1,000,000 each with the season. During March and April, discounts ran over $4,000,000, while they rarely ran higher than $3,000,000 from August to October.[37] Lending more to exporters and farmers, it was thought, would tend to equalize business.

The report of November, 1840, shows that directors had borrowed from the Bank $430,802; other stockholders, $907,797; thus a total of $1,338,599 of its outstanding debts was against its own stockholders. All other loans amounted to only $2,339,819.[38] It was to this condition that President Merrill alluded when he said many officers of the Bank sought the positions only to enable themselves to borrow money. If we add to this amount the $692,433 owed by the state and a suspended debt of over half a million, we realize what a burden the bank was carrying. It had in suit for collection at this time also about $200,000, most of which had to be collected from sureties. The legislature of 1841, to satisfy both itself and the people, appointed N. B. Palmer to make a thorough investigation of the Bank. His long and detailed report[39] of the investigation is, in general, creditable to the Bank and is incidentally a convincing witness of the ravages of the panic and the general distress of the people. Three quarters of a million dollars of the Bank's loans were tied up by protest or suit. The Bank was so crippled in resources that it was unable to furnish an adequate circulation. A contracting currency is one of the gravest wrongs that can be inflicted on a debtor class of people. The bankers recognized the injustice, but seemingly were helpless to prevent it.

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[35] *Doc. Jour.*, 1840, Bank Report.

[36] *Doc. Jour.*, 1841, p. 109.

[37] *Doc. Jour.*, 1840, p. 95.

[38] *Doc. Jour.*, 1840, p. 94.

[39] *Doc. Jour.*, 1842, p. 85. Nathan B. Palmer, the author of the report, had just finished a six years term as treasurer of state. He found the Terre Haute cashier, Aaron B. Fontaine, a defaulter to the extent of $9,500. Fontaine fled to Texas. So far as I have found, it was the only case of embezzlement in the whole career of the Bank.

This, however, was the ebb in the Bank's career. Recuperation was as rapid as demoralization had been. Its large suspended debt was nearly all collected, and from this point onward the prosperity of the Bank was steady. The flood of gold in 1849–50 brought life to all avenues of business, and the "hard times" of 1837–43 were speedily forgotten.

The Constitutional Convention of 1851 was dominated by the Jeffersonian spirit; so that a clause in the new Constitution forbade the state ever again going into corporate business. The same party that had dominated the convention passed a free banking law in 1852. These adverse laws to some extent interrupted the prosperity of the State Bank, but the independent banks never successfully challenged its leadership, and few of them ever achieved any success. The state invested $1,390,000 in State Bank stock; of this amount $510,000 was lent on long time real estate securities. The dividends on state stock and on stock paid for by the state, and the interest on mortgage loans were to constitute a sinking fund to be in the hands of the Board of Commissioners of the Sinking Fund.[40] This was an ex-officio board made up of the same men as the State Bank board. The sinking fund was set aside strictly to redeem the bonds sold for bank capital. The Act of Congress, June 23, 1836, placed also in the hands of the state a large amount of the Surplus Revenue of the nation. One-half of this revenue was placed in this fund and distributed according to population to the counties, to be lent out by an agent appointed by the legislature.

Looking back over the whole history of the State Bank of Indiana, one is compelled to say that the Bank was successful. Its success is the more striking because it stands against the sordid background of "wildcat" banking. Its career fell largely in that most unhappy period of our history called the Panic Era of 1837, and it surely had little in its favor as far as the era was concerned. It was, fortunately, well on its feet when this panic prostrated business throughout the United States. Although it did not earn large dividends during that period, it protected itself better and took better care of its customers than any other bank in the West and did equally as well as any bank in the nation. It had scarcely weathered the panic when it found itself a creditor of a failing state to the extent of over one-third of its capital stock. The sinister hand of party politics is seen here and there though never deadly except in the Constitutional Convention of 1851 and in the

[40] *Laws of Indiana*, 1834, ch. vii.

Free Banking Law of 1852. One is tempted to reflect that Jeffersonian politics and *laissez-faire* economics never won a more regrettable victory than when they overthrew the State Bank.[41]

[41] See Charles A. Conant's *A History of Modern Banks of Issue* (4th Ed., N. Y., 1909), p. 386; A. M. Davis's *Origin of the National Banking System* (Senate Doc. No. 582, 61st Congress, 2nd Sess.) For a similar experience see Charles Hunter Garnett's *State Banks of Issue* (University of Illinois, 1898).

V

ATTITUDE OF THE CONSTITUTIONAL CONVENTION OF 1850

While the commercial interests maintained a firm faith in the integrity of the State Bank, there gradually grew up a sentiment of opposition. The reasons for this sentiment were not clearly defined, yet the sentiment was strong enough to control the legislature and especially did it dominate the Constitutional Convention of 1850–51. Of those who sat in the eighteenth session of the legislature—the one that enacted the State Bank charter—four members of the House, David Kilgore, George F. Moore, Thomas Smith, and William Steele; and five members of the Senate, John Beard, Othniel Clark, Ezekiel D. Logan, Alexander F. Morrison, and Zachariah Tannehill, sat in the Convention of 1850. Of the senators, Clark, Morrison, and Tannehill supported the charter;[1] Beard opposed, and Logan did not go on record. When a proposition to extend the State Bank charter was before the Convention of 1850 only one of these, Othniel Clark, voted for it.[2]

The "hard money" Democrats, who in 1834 had been only an insignificant minority, had increased in numbers till they held the balance of power in 1850. These men, however, were not inflationists. The strong current of public opinion opposed to the State Bank came from the inflationists—the men who wanted more money in circulation. There is no better place to learn the opinion of the people of that decade on banking than in the Debates of this Convention. The bank question had been one of the main issues before the people, and there is no doubt that the delegates represented the people correctly. Few, if any, of the delegates were skilled enough as politicians to conceal in their public speeches their own private opinions, and the great majority of them had no motive other than to express the will of their constituents. The following pages are intended to set forth both the individual views of the members, and their interpretation of public opinion.

On October 21, Mr. Abel Pepper of Ohio County offered the following resolution to the Convention: "That from and after the expiration of the present charter of the State Bank of Indiana all connections between the state and banks shall cease."[3]

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[1] *Sen. Jour.*, 1833, p. 254.

[2] *Debates of the Constitutional Convention of Indiana, 1850-51*, p. 1995. These *Debates* are printed in two large volumes, paged consecutively. This work is referred to hereafter as *Debates*. The discussion here given is based entirely on the *Debates*. Where specific reference is not given, any fact may be found readily by use of the excellent index of that work.

[3] *Debates*, p. 134.

Mr. Pepper was a merchant of Rising Sun. Merchants, as a class, were notoriously opposed to the State Bank. The policy of the Bank for the last ten years had been to refuse loans to merchants for the carrying on of their ordinary business. The traders and farmers were just as notoriously in favor of the State Bank for the reason that the Bank had favored them in lending them money to buy stock to fatten, or to buy up produce for shipment. Mr. Pepper, moreover, was a Jacksonian office holder, and his attitude toward all political questions was colored by Jackson's views.

On October 24, James Rariden reopened the bank question by offering a resolution providing for incorporation under a general law and requiring that no bank be incorporated without making the stockholders individually liable to the full amount of their stock. A proviso also extended the State Bank charter until January 1, 1865, since the bonds for its capital were not payable till that time.[4]

Mr. Rariden had been in public life for a quarter of a century. He had represented his county in both branches of the state legislature and twice had sat for his district in congress. By profession he was a lawyer, and rode the circuit in the old fashion, along with Senator O. H. Smith and Judge Eggleston. He was a native of Kentucky, whence he moved to Brookville, thence to Salisbury, and finally to Cambridge City, where he died in 1856.[5] He was the outspoken champion of the State Bank. As soon as he had taken his seat, Mr. Lockhart of Evansville introduced the following resolution: "That in the opinion of this convention the interests of the people and the honor of the state demand that a provision be inserted in the Constitution prohibiting the Legislature from incorporating any bank or banking institution in this state."

On October 25, Mr. Pepper's resolution came up for discussion, and he addressed the Convention. He said that this was a question about which there should be no division of opinion among *Republicans.*[6] The doctrines of the separation of church and state, and the separation of government and banks were equally *Republican* in their character. This was, in his opinion, the most important question to be decided in this convention. He was in favor of separating state and banks and was opposed to what was

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[4] *Debates*, p. 215.

[5] O. H. Smith, *Early Indiana Trials and Sketches*, p. 164. This is a volume of reminiscences by Senator O. H. Smith, usually referred to as Smith's *Sketches*. It was published in Cincinnati in 1858.

[6] A rather interesting illustration to show that the term Republican was still applied to the old Democratic party of Jackson and Jefferson.

usually called "Free Banking". He wished it understood that individually he was opposed to all banks of issue, but was persuaded that the people of his district, as well as those of the whole state, were not yet ready to give up a paper currency.

If they were to have banks he wished the state to have as much control over them as she then had over the State Bank. The state was no more able to engage in banking than it was to engage in other forms of business. A state had to act through an agent, and every business man knew that business could not be well handled by an agent. It could be said that the Bank had worked well, and that the men then connected with it were capable and honest, but would they live forever and could others be found to take their places? Men think in herds and they go mad in herds. History is full of South Sea Bubbles which have ruined whole communities. Moneyed institutions more than anything else have led to delusions. There was no evil more to be dreaded, except war and pestilence, than a connection between government and banking. The constitution of the United States had forbidden state banking, and he sincerely deprecated extending the special favors of banking to any group of men.[7]

At the close of this speech, Daniel Reed, a delegate from Bloomington representing Monroe and Brown counties, asked leave to read to the Convention "The words of a man of as remarkable sagacity as ever lived", and he proceeded to read some paragraphs from Jackson's "Farewell Address". These were the well known passages in which Jackson assured his countrymen that eternal vigilance was the price of liberty; that the concentration of the money power in a single hand was dangerous to the freedom of a nation, as was abundantly shown by the Second Bank of the United States; that these same intriguers, driven from the field of the national government, were then intrenching themselves in the states; that the paper money system and its associates—monopoly and exclusive privilege—were deep-rooted and it would require all the people's efforts to eradicate them; and that gold and silver were the only constitutional currency.[8] Immediately after this Mr. Rariden called for the "song of Moses after the Israelites crossed the Red Sea." saying "it would be equally appropriate and much better composition." But nevertheless the appeal to the "Sage of the Hermitage" was well timed, for the convention was controlled by his disciples.

November 5, Allen Hamilton, a former president of the Branch

[7] *Debates*, p. 220.

[8] *Debates*, p. 221.

Bank, of Ft. Wayne, presented a report from the committee on currency and banking. It was a minority report, and a short discussion at this point showed that a majority of the committee could agree on nothing and that all its reports would be minority reports.[9]

The struggle between the bank factions was renewed when the provision for preventing the state from borrowing money was reported. Without thinking that it would prevent the establishment of a state bank many of the delegates came, pledged to a provision making it unconstitutional thereafter for the state to contract a debt. The vote [10] on this question stood 111 to 6, thanks to the experience of internal improvement days. In the article of the Constitution relating to the legislature, Mr. Walpole introduced a section providing that no president, director, or agent of a banking or railroad company should be eligible to a seat in either branch of the legislature. The debate on this section fills sixteen pages of record. It was lost by a vote 79 to 47.[11] On the same day that this vote was taken, Mr. Kelso offered a provision that no president, cashier, director, or other officer of any bank should be eligible to sit in the legislature. This carried to a third reading by a majority of 4, thus specifically showing the prejudice against bankers.[12]

January 1, 1851, while the Convention was considering Rights and Immunities, Mr. Reed of Monroe made a covert attack on state banks by a very plausible provision that the legislature should not grant to any citizen or class of citizens privileges and immunities which upon the same terms should not belong to all citizens.[13] Mr. Smith observed that this would prevent the recharter of the Bank and for that reason opposed it. Other propositions from time to time raised the bank question until the regular report of the committee brought up that question definitely. This report—Number 24—provided that "The business of banking shall be free to all, on such terms and restrictions as the legislature shall impose in general laws for such purpose, which shall be obligatory to all." [14] Samuel Hall of Princeton, at once moved to amend this so that the legislature might have power to charter a bank. The simple question now confronted the convention. The experience with Internal Improvements had been conclusive; but not so with the Bank. It was successful; it was ably managed; it had cost the State nothing, and had earned for it a neat sum. The Bank seemed to be a good thing, although the principle was bad.

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[9] *Debates*, p. 329.
[10] *Ibid.*, p. 681.
[11] *Ibid.*, p. 1221.
[12] *Ibid.*, p. 1222.
[13] *Ibid.*, p. 1393.
[14] *Ibid.*, p. 1414.

Mr. Rariden of Wayne, a champion of the Bank, addressed the convention in the first of a series of fifty set speeches on the bank question, by as many of the leading delegates. It was not, argued Mr. Rariden, a question of philosophy, but a question of what kind of bank, and what kind of currency, should be had right here in Indiana. If all banks should be forbidden in Indiana, the banks of Ohio, Kentucky, and other neighboring states, would supply all the currency. There could be no hope of a specie circulation. The circulation in use was then about $5,000,000, which was worth seven per cent; and if they abolished banks they would cause an annual loss to the citizens of the $350,000 interest on this amount. The community he represented was pledged to a paper currency. The State Bank had furnished this and had answered all other purposes for which it was created. It had made $870,000 for the school fund; it had paid a tax of $200,000 to the state; it had safely and without cost carried the merchants' money to the East and brought the stock buyers' money to the West. When it had charged only common interest for this exchange, it had been assailed as usurious. But whatever could be done, would be done by its enemies, to secure a system of free banks. It was the hope of certain men to have these founded on railroad stock. This combination, then, that according to Governor Wright's message paid little tax, would control the state. Gentlemen had said they would not embark in free banking unless the hands of the state were tied so that it might not interfere, but he did not want to try the experiment without leaving the state at liberty to enter the field and drive the free banks out if they should prove bad, as he thought they would.

David M. Dobson, representing Owen and Greene counties, followed Mr. Rariden. He asked where all this noise about free banks had come from, and answered by saying that some twenty odd years before all the states had engaged in extensive works of internal improvement and there had been issued upwards of $200,000,000 in state bonds. Many states had failed. The bondholders had tried to get Congress to assume these debts. Failing there, they appeared here now, and asked to do our banking for us. Indiana, he said, had $7,000,000 in bonds outstanding, and drawing five per cent interest. Members had told us that if we should allow banking on these bonds, they would come home, and the interest on them would be paid in our midst. But, queried Mr. Dobson, where would our people get the money to buy $7,000,000 worth of bonds? There was only $1,500,000 specie in the state. It would turn out that these foreigners would deposit these bonds as bank capital and would continue to draw five per cent on them; that at the same time they would issue on them $7,000,000 in currency, which would earn from seven to ten per cent; that then these kind-hearted bondholders would draw from twelve to seventeen per cent on their investment, and that the citizens of Indiana would pay the bill. That there would be free banks he considered as settled; but he wanted people to see whence the demand came. He did not want the bondholders to feel that they had pulled the wool over everybody's eyes.

When the discussion was resumed on January 3, Mr. Allen Hamilton of Ft. Wayne spoke. It seemed certain, he thought, that the people of Indiana wanted a paper money circulation which could be easily converted into specie. The first question to decide was, whether we were to have one bank, or many. The committee on currency and banking were in favor of many banks. A minority favored a state bank with branches in which the state would have no stock except trust funds, and over which the state would have control as it did at that time. His next inquiry was, would these two kinds of banks work well together. He was of the opinion that they would, and that the leading business men would connect themselves with both. The greatest complaint against the present State Bank was lack of capital. Since the state did not have sufficient capital to bank on, it must attract outside capital into the business. This currency must be received by everybody in the state, or it would not circulate freely and command confidence. He granted that the present State Bank was a monopoly; that the branches had too much power; and that they had used it selfishly to prevent the establishment of other branches. But just as surely would the free banks be monopolized by the foreign bondholders. There was then about $7,000,000 in circulation in Indiana, one-half of which was furnished by the State Bank. This field not utilized by the State Bank, private banks should occupy.

In the afternoon, John B. Niles of LaPorte, addressed the convention. He desired to see the plan of free banking adopted exclusively. If they should combine the two he feared the State Bank would be too strong. He was not an enemy of the State Bank, he said, and did not want to see its capital withdrawn, but he did want to see it pass into private hands just as that of the old banks of New York had done. A government should attempt nothing which could be accomplished with equal benefit to the public by individuals. At that day he could see no more necessity for the state's engaging in banking than for its engaging in buying produce. In reference to this question of banking he perceived there were four parties. One party was opposed to all banking as unsound and pernicious; another was in favor of the present State Bank; a third was in favor of free banking; a fourth was in favor of a combination of the two. In regard to the first, he held that bank bills and bills of exchange were a great improvement over specie, both by reason of security and the ease of transference. Illinois had forbidden banking, and yet the secretary of an insurance company, chartered in Wisconsin, had issued and circulated $1,000,000 of its notes in Chicago. As to the second, the State Bank was a monopoly, and monopolies should be created only on the grounds of absolute necessity. They are inconsistent with equal rights. The Bank had been successful in Indiana; but such banks had failed elsewhere. It had made the school fund $1,000,000, but it had lost an equal amount in an unfortunate bond deal. He was in favor of a system of banking that would combine freedom with absolute security to the bondholder. He would not limit the security, but leave that to the discretion of the legislature. At that time, state bonds would do, but in a short time he hoped we would have no more bonds outstanding. He was opposed to real estate mortgages, because real estate should not be mortgaged, and because prices of real estate fluctuated too much. The state should control the securities and also the issuing of notes. The specie in the vaults would come and go at the bidding of the banker, and would be no security. He proposed that the banker should deposit with a state officer ample security for the bill-holder and that all bills should be countersigned by the same state officer.

Judge Niles was one of the best men in the convention. Born in the East, he was a graduate of Dartmouth, a lawyer by profession, and a teacher of chemistry as a diversion. His ideas were incorporated in the Free Bank Law of 1852.

James G. Read of Clark county followed Mr. Niles, with a bitter denunciation of the State Bank for showing favoritism to stockholders and brokers; for refusing to lend money to farmers and mechanics; and for selfishness in refusing to establish new branches—the one at Logansport having been denied by the single vote of the Lafayette Branch. At the close of his address he submitted some resolutions embodying his views: (1) The legislature shall grant no special charter; let banking be done under general laws. (2) The legislature shall never allow a suspension of specie payment. (3) Stockholders shall be liable for debts to the full amount of their stock. (4) In case of insolvency the bill-holder shall be a preferred creditor. These were the general features of the New York free banking law, which was the ideal of the free bank party.

Christian C. Nave, a delegate from Hendricks county, spoke favoring a state bank. His picture of what would happen under a free banking law was almost prophetic. If they should allow the legislature to adopt a free banking bill, he declared, it would do nothing more than bring upon the people of this state an odious issue of irresponsible currency. The free banks would issue all the paper they could and put it into circulation. Each would be responsible only for its own issues, and the moment you traveled out of the town in which the bank was situated, your money would depreciate, for it would be to the interest of the banks in the neighboring towns that it should depreciate. A man with such money could not travel out of the state without being "shaved" at every turn. Further, if there should be a run on the bank, and the little specie in the vault should be used up, there would be nothing to do but close the bank. This, then, would be the history of free banking.

Mr. Nave was a member of the Danville bar and one ot the leading criminal lawyers of the West. He had served his state in an official way since 1834, sitting in the legislature five terms. He was an east Tennesseean by birth and a graduate of Washington College.

Dr. Othniel Clark of Lafayette next addressed the convention. He observed that his people were more interested in banking than in any other question before the convention. He favored free banks, and opposed equally those who favored no banks and those who favored state banks. His people opposed the present Bank because the business of the state had outgrown it. There could not have been a better system, when it was established, but that day was forever past. Also his people were not satisfied, because, though the state claimed control over the present Bank, it did not have it, for the state elected four state directors and the Bank thirteen. For each branch, the state chose three, and the local stockholders seven. Lastly, his people complained that, where the produce of the country was collected for shipment, there no one could borrow money except dealers and merchants who were stockholders. And if others should succeed in getting a loan, they had to pay on the dot, while the stockholders could have their time extended. The state should have no more interest in banks than to protect the billholder. All else must be left to the exigencies of commerce.

Horace Carter of Montgomery summed up in twelve propositions a long speech against moneyed institutions, in general: (1) The legislature may charter a bank with branches. (2) The state shall not be a partner farther than the investment of trust funds. (3) The auditor of state shall register and countersign all notes before they are put in circulation. (4) The billholder shall be a preferred creditor in case of insolvency. (5) The stockholders shall be responsible, proportionately, for all debts. (6) There shall be no suspension of specie payments. (7) The capital shall not exceed $5,000,000. (8) The branches shall not issue currency, more than dollar for dollar for securities deposited. (9) The stock shall be taxed as other property. (10) The branches shall be mutually responsible. (11) The legislature shall retain a supervising control. (12) The charter of the present bank shall not be extended.

Edward R. May, representing DeKalb and Steuben counties, observed that Mr. Niles had shown, conclusively, that they should not have a state bank, and Mr. Rariden had made it equally clear that they should not have free banks. The only alternative, no banks at all, would suit him very well; and he moved an amendment, that banks be forbidden entirely. This was lost by a vote of 89 to 43[15], showing that the "state bank", "free banks", and "no banks", forces were about equal. Following this, the section providing for a state bank only was voted down.

George G. Shoup of Franklin county then submitted the free bank proposition and the discussion opened again. Judge James W. Borden of Ft. Wayne proposed that the legislature be compelled to take a referendum vote of the people on any banking law or bank charter before it should go into effect in the state.

January 4, 1851, Judge Horace P. Biddle of Logansport spoke at length in favor of free banks. The speech was the most scholarly delivered up to that time. He pointed out the great evils of an unregulated paper currency. His contention was that gold and silver should be the only money, or measure of value. An issue of paper would have the effect of raising prices and defrauding the creditors. Likewise, when such a bank failed, or called in its circulation, it lowered prices, or values, and defrauded the debtor. The State Bank, he said, had in its vaults $1,250,000 in specie, on which it floated a circulation of $4,000,000, the excess of which, over the specie, was so much inflation and rested on pure faith.

[15] *Debates*, p. 1445.

Such a banking system was wrong. If the people were to make a run on this Bank, it would fail as it had done in 1838. Failing, however, was not the greatest wrong banks could do a community. Their power of inflation made it possible for them to run prices up or down, and so rob the people at their pleasure. The Panic of 1837 was due to paper issues on the specie deposited in the "pet banks." On an average, every specie dollar had eight paper dollars based on it. On a debt contracted in 1836 and paid in 1842, the debtor paid at least double. On a debt contracted in 1830 and paid in 1836, the creditor received only half value. The system, then, that he favored, was one administered by a state officer, under which all people could bank who would deposit securities in state or United States stocks with the state comptroller to secure every dollar of paper issued. No bill should be issued except as signed by the state officers.

Daniel Kelso of Switzerland county followed Judge Biddle and spoke in favor of a state bank. He would support it, not because he favored it personally, for he opposed all banks, but because his constituents did. Dr. Clark of Lafayette had praised free banks, because they would give a wider circulation, and immediately afterward Judge Biddle had praised them because they would curtail circulation. If the first were true, observed the speaker, and they needed a wider circulation then their free bankers would have to find at least $5,000,000 to buy up bonds, and, after that should be done, whence would come the specie for redemption? And would the state always have to remain in debt just to provide capital for free bankers? Five million dollars of bonds would mean $300,000 of interest annually with no possible gain to the people. If they were to have free banks for the purpose of restricting inflation, he would like to inform Judge Biddle that the Indiana circulation had not fluctuated nearly so widely as that of New York under free banks. He should be glad to have this whole matter of selecting a banking system referred to the people by a referendum. He felt sure they would not favor free banks.

Robert Dale Owen of New Harmony favored placing a restrictive clause in the constitution and leaving all else to the legislature. He was opposed to granting any concession to one man that, on the same terms, could not be granted to any other. Such a power, and the Second Bank of the United States was one, might at any time join with the executive power of the government and rob the people. What, he asked, if President Jackson had joined Biddle, would have become of self-government in the United States?

Alexander C. Stevenson of Putnam county pointed out what he considered the most serious defects of free banks. First, they would not be located at the places where they should be. Personal, and not public reasons, would prevail in selecting locations. Secondly, the best thing in connection with the present State Bank was the mutual responsibility of its branches. That had kept up its branches at various times and had saved it and the people from a great loss. Such a thing could not apply to free banks. Thirdly, the strong banks at advantageous points of commerce would have it in their power at any time to break a small interior bank by buying up its notes and making a run on it.

Delegate Reed of Monroe county was strongly opposed to all forms of paper money. Of all the means invented for cheating the laborer, paper money, he thought, was the most effective. Its circulation was indefensible upon any grounds of economy. It enabled the few to fix the value of property and exercise a tyranny more potent than any despot. Its stock argument was that we had to use it as long as our neighbors did. In the Ohio Convention the committee had reported against paper money, but had recommended its use because Indiana was using it. Under this system, with fewer causes for commercial embarrassment than any other nation, we had suffered most from commercial convulsions. Every ten or twenty years we had run the cycle of expansion, contraction, and explosion. Such money was not needed. The commerce between England and America, amounting to $200,000,000 annually, was carried on with $2,000,000 of specie and bills of exchange. Wealth was the result of labor, yet the laborer was paid in paper money and thus robbed. Mr. Reed was in favor of those principles, printed so often in Democratic platforms in this state, that he needed only to refer to them. First, no connection between government and banks; second, a gradual return from a paper money system to specie; third, no grant of exclusive charters and privileges, to banks, by special legislation. He would not bind the legislature further, nor enjoin further duty upon it.

Mr. Reed was followed by his colleague, William C. Foster Sr. His views were directly opposed to Reed's. Mr. Foster advocated a state bank in which the state should hold all the stock. It was his opinion that a large majority of the people of his county (Monroe), preferred a state bank. The premiums earned by the peoples' money should revert to the people, and be applied on their taxes. This, he urged, was Whig doctrine, as opposed to the Democratic free bank doctrine.

Thomas A. Hendricks of Shelby county spoke next. He favored a state bank, if any bank at all had to be established. He observed that the whole system of paper money was a tax on labor, produce, and commerce, and the only reason for having a paper currency in Indiana, was that it would be better to have our own system here under control, than to get our currency from the neighboring states. As far as the argument that free banks would put our people on a common level was concerned, it was certainly true. None of them would have any power. The free banks would be controlled by the bondholders of New York, London, and Amsterdam. Indiana bonds had been bought up by these speculators at from fifteen to fifty cents on the dollar, and if this scheme prevailed they would rise to par. The speech of Mr. Hendricks did him honor and bespoke his great ability. His work in the convention made him a congressman before the year ended. Mr. Hendricks was a nephew of the second governor of Indiana. His family came from Pennsylvania. In 1822 his parents came to Shelby county, settling where Shelbyville is now. The father was an office-holder under Jackson. Mr. Hendricks was well educated, a rising member of the Shelbyville bar, and now, at the age of thirty-one, began a public career that made him famous in the state and nation.

Jacob P. Chapman, sitting for Marion county, spoke approvingly of the New York system of banking, but especially deprecated the necessity of issuing paper money by any power. He was personally hostile, he said, to all systems of paper money banking such as had existed in this country. He did not believe in the necessity, or propriety, of making every bank a manufactory of paper money, and in this feature, he had long conceived, lay the chief evil of American banking. No other country tolerated such a monstrosity, nor was it at all necessary to legitimate banking, which consisted solely in the borrowing and the lending of credit.

Hiram Allen, representing Carroll and Clinton counties, spoke for free banks. General Robert H. Milroy denominated himself a "progressive Democrat," and was constitutionally opposed to all schemes of chartered banking. He doubted if any real Democrat could support a state bank. John B. Howe of LaGrange county favored the free banking system for the reason that, thereby we should soonest have no banks at all, and return to a specie circulation. Cromwell W. Barbour of Vigo county thought it absolutely necessary that a state should have ample currency. Pork would have brought twenty-five cents more on the hundred, that year, if the State Bank could have furnished sufficient currency; 180,000 hogs would be packed in the Wabash Valley that season and the failure of currency, he declared, would cost the people $75,000. It meant just so much money out of the pockets of the farmers. Alexander F. Morrison of Marion county who was a member of the assembly in 1834, and then supported the Bank charter, favored free banking in 1850, but would not tie the hands of the legislature too much.

The discussion was continued for some days by Robert Dale Owen of New Harmony, Mr. Maguire of Indianapolis, Mr. Smith of Ripley, Schuyler Colfax of St. Joseph, Wm. M. Dunn of Madison, William L. Holman of Dearborn, and others. This contest between free bank and state bank men was the longest and most spirited of any during the session. At times the convention was out of the control of its president, and, on one occasion, President Carr dismissed it in the face of a vote not to adjourn. Members referred to one another as thieves and robbers. But this was only the froth of interest and prejudice scattered here and there over the usually dignified addresses. The long discussion reveals sharply the opinions of the people in regard to the Bank. The chief objections to the State Bank were: (1) It had failed to supply enough currency. (2) It had been partial in lending money to its stockholders, and it had also favored farmers and stock buyers as against merchants. (3) It had refused its assent to the location of new branches, when business clearly demanded them. (4) It had suspended specie payment twice, and had not resumed payment the last time till the state forced it. (5) It had used its power as a monopoly and had almost defied the state government. (6) As all sound banks must do, it had made enemies of the large numbers of those who wanted credit and could not give sufficient security.

On the other hand the teachings of Jackson were against paper currency, state banks, and monopolies. Many Whigs were opposed to paper money and voted against the Bank, and some Democrats, like Hendricks, favored it. The demand for more money is always popular and crept out in nearly every speech in favor of free banks. It is to be pointed out that the conditions of business, and the needs of the day, had more to do with forming the opinion of the convention than an intelligent, statesmanlike understanding of banking.

The results of these constitutional labors were expressed in fourteen sections, a summary of which is here given: [16]

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[16] Constitution of Indiana, adopted 1851.

Article I. (Bill of Rights.)

Section 23. The General Assembly shall not grant to any citizen or class of citizens privileges or immunities which, upon the same terms, shall not equally belong to all citizens.

Article X.

Section 5. No law shall authorize any debt to be contracted on behalf of the state except in the following cases: casual deficits, to pay interest on state debt, to repel invasion, or suppress insurrection.

Article XI. (Banking.)

Section 1. The General Assembly shall not have power to incorporate a bank of issue except on the following terms:

Sec. 2. It shall be a general banking law.

Sec. 3. A state officer shall register and countersign all paper bills, and shall require ample collateral security for its redemption.

Sec. 4. The General Assembly shall have power to charter a bank with branches without collateral security.

Sec. 5. The branches shall be mutually responsible.

Sec. 6. Stockholders shall be liable for double their stock.

Sec. 7. All bills shall be redeemed in specie.

Sec. 8. Holders of notes shall be preferred creditors.

Sec. 9. No usury shall be allowed.

Sec. 10. No charter shall extend more than twenty years.

Sec. 11. The state may invest trust funds.

Sec. 12. The state shall not be a stockholder.

The Constitution was adopted by a majority of 86,000. It is safe to infer that it expressed the opinion of the people. This combination between the state bank, and the free banking parties will appear frequently in later state legislation.

VI

THE FREE BANKS OF 1852

The thirty-sixth session of the General Assembly met December 1, 1851. The new constitution had been in operation one month, when on January 3, 1852, William Z. Stewart of Cass county moved that a select committee of one from each judicial district be appointed to report a free, or general, banking bill. The speaker, John W. Davis, a democrat of Carlisle, Sullivan county, appointed Mr. Stewart, James F. Suit of Clinton county, William H. English of Scott county, John L. King of Jefferson county, Robert Dale Owen of Posey county, William B. Black of Boone county, Junius Beeson of Rush county, Robert M. Hudson of Vigo county, Thomas Stanfield of St. Joseph county, Joseph W. Dobson of Owen county, Zimri Reynolds of Grant county, Isaac D. G. Nelson of Allen county, and Hiram A. Hart of Ripley county.[1]

On January 12, chairman John W. Spencer of Ohio and Switzerland counties presented the report of the regular committee on banks. This was in response to a resolution of the House to inquire into the necessity of enacting a general banking law. A majority of the committee favored such an act, and recommended the following restrictions: (1) All issues of currency were to be secured by an equal amount of United States, or state stocks, and all banks were required to keep on hand in specie twenty-five per cent of their note circulation. (2) Two-thirds of the securities might consist of stock, one-third, of real estate mortgages. (3) A slight discrimination should be made in favor of Indiana bonds. (4) No bank should have less than $25,000 capital. The committee asked that this report be referred to the select committee on banking.[2]

February 9, 1852, Mr. Stewart of the select committee reported a bill for general banking.[3] It was similar to the New York banking law of 1838 but did not permit mortgages to be used as a basis for note issues, and it did allow bonds of other states to be so used. The bank notes were to be redeemable at all times in gold and silver. In the report accompanying the bill the committee expressed the opinion that a state bank with branches could not furnish adequate circulation. The conduct of the present bank, they continued, in refusing to establish new branches, was full

[1] *Ho. Jour.*, 1851, I, 340.
[2] *Ho. Jour.*, 1851, I, 425.
[3] *Ho. Jour.*, 1851, I, 803.

proof of this. Moreover, without collateral security, no billholder would be safe. It was folly to think that any banker was going to lock up one dollar in specie for every paper dollar he should issue. Incorporated banks usually kept on hand about one dollar in specie for three of circulation, and this ratio was entirely in their own hands. The conclusion was plain. History bore them out. The losses in the United States due to irresponsible banking were reckoned by hundreds of millions. No such disasters could occur under a properly guarded system of general banking. New York had been the first to try this. Her law was enacted in 1838. Time had cured some of its defects. At first, it had permitted any state stocks, equal to New York fives, to be deposited. It had also allowed one-half the deposits to be real estate mortgages. It had failed also, at first, to provide for the individual liability of the stockholders. Out of one hundred and four banks, opened under the New York law, with a capital of nearly $10,000,000, thirty-one had failed, with less than $1,500,000 capital.[4] These, when settled up, had paid seventy-six cents on the dollar and had caused a total loss of only about $300,000. This loss was small in comparison with the losses in Mississippi, Louisiana, and Arkansas under the state bank plan. But the New York convention had corrected the defects in the constitution of 1846. The current report from the New York Banking Department, issued by Millard Filmore, showed no further loss. Under the revised system, not one dollar had been lost. There could be no doubt as to which was the safe system for the billholder. New York then had $35,000,000 in circulation, $15,000,000 of which was issued by the free banks.

The legislature accepted the report as conclusive proof and on February 21,[5] it was engrossed by a vote of 50 to 32. The speaker recorded his vote in opposition. On the following Monday, after a fruitless effort at fillibustering, the bill passed by a vote of 51 to 30.

On the second reading of the bill in the Senate, W. E. Niblack of Vincennes offered an amendment requiring specie, instead of bonds, as security for the paper currency. This was defeated by a vote of 27 to 15.[6] The Senate committee tried to amend the bill so that banks could not issue notes under five dollars, but this, also, was lost. Mr. Niblack continued his effort to get a specie clause in the charter by moving to require every bank, at the call of the comptroller, to deposit specie for outstanding notes, but he was

[4] The committee might have added that in settling up these 31 banks over $900,000 par value Indiana bonds were sold at auction and brought less than 50 per cent. Dewey, *Banking Before the Civil War*, p. 340.

[5] *Ho. Jour.*, 1851, 1, 823.

[6] *Sen. Jour.*, 1851, p. 654.

again defeated by a vote of 26 to 15. An effort was made by Mr. Dawson to reduce the required capital stock from $50,000 to $25,000 and this failed. The bill was put on its passage April 30, and failed by a vote of 25 for and 20 against—lacking one of a constitutional majority. It was revived by a motion to reconsider, and on May 18, was passed by a vote of 27 to 18.[7] Party lines were not strictly drawn in passing the bill, but in general the Democrats favored and the Whigs opposed. Governor Wright approved the bill, but was not enthusiastic in its support. In the House it failed to get the support of the speaker, and in the Senate Judge Niblack of Vincennes opposed it, while a Whig, Joseph Marshall, voted for it in the Senate. The act was to take effect July 1, 1852.

The general features of the law have been indicated. The state auditor was to be comptroller, issue all bills, and keep all plates. Notes were to run from one dollar up to five hundred in the ordinary denominations. Not over one-fourth of the whole amount were to be less than five dollar notes, and the banks were not to handle notes less than five dollars issued outside the state. Notes were to be registered, counted, and countersigned by the auditor, who also stamped them "secured by the pledge of public stocks." Circulation was guaranteed by a deposit of United States, Indiana, or other state bonds equal to Indiana fives. The state was in nowise pledged to redeem the currency. Specie, equal in amount, to twelve per cent of the circulation had to be kept on hands by the banks, and specie payment must never be refused on penalty of having the bank closed at once. Reports were to be made semi-annually to the state auditor.[8]

The plan looked plausible, and its authors were proud of the law. There may have been some who were influenced by selfish motives, but the method of its passage cannot be criticised. By December 15, 1852, six months after the law went into force, the following banks had been organized, and are examples of the seventy-four that followed:[9]

Bank of Connersville, Connersville	Capital,	$400,000
State Stock Bank, Peru	Capital,	200,000
Indiana Stock Bank, Laporte	Capital,	50,000
The Plymouth Bank, Plymouth	Capital,	50,000
Government Stock Bank, Lafayette	Capital,	50,000
Gramercy Bank, Lafayette	Capital,	100,000
Public Stock Bank, Newport	Capital,	100,000

[7] *Sen. Jour.*, 1851, p. 1018.

[8] *Laws of Indiana*,. 1852.

[9] *Doc. Jour.*, 1853, p. 98.

Bank of North America, Newport	Capital,	$50,000
Prairie City Bank, Terre Haute	Capital,	200,000
Southern Bank of Indiana, Terre Haute	Capital,	100,000
Traders' Bank, Terre Haute	Capital,	100,000
Merchants' Bank, Terre Haute	Capital,	50,000
State Stock Bank, Logansport	Capital,	115,000
Wabash Valley Bank, Logansport	Capital,	200,000
Bank of Evansville, Evansville	Capital,	100,000
Total	Capital,	$1,865,000

These had deposited $910,000 worth of stocks face value, and had received currency to the amount of $800,000. They were only an earnest of the deluge.

The circulation of the United States was about $200,000,000. The amount necessary for the needs of Indiana was about $8,000,000. The State Bank had approximately $4,000,000 in circulation, and nonstate notes to an equal amount circulated in the state. There were outstanding bonds in the United States, available for banking purposes, to the amount of $275,000,000, and a limitation on the use of these as well as on the amount of currency was plainly necessary. There was also the fact that some of these banks were not intending their notes for Indiana circulation, but had lent the whole issue to traders in distant cities. Six of the banks were said to be doing a legitimate local business. Five had put their notes in circulation at New York. No notes had been issued to four of them at the date of the report, December 15, 1852.[10] Either Auditor Ellis felt that he had no authority under the law to restrain the establishment of banks, or else he had no inclination to do so. Governor Wright was inclined to think the latter was the case. In his message [11] of January 7, 1853, the Governor, for the first time, mentions the subject of free banking. Although he had signed the bill, he had not recommended it in any previous message. Like many others at that time, he recognized the insufficiency of the circulating medium, and the inability or refusal of the State Bank to meet this need. The Governor was, however, quick to see the failure of the new law. The restrictions were entirely inadequate. Already five banks, of the "Owl Creek" kind, with only a nominal existence, and a capital of $365,000, had been organized. These bankers, he thought, had no idea of redeeming their notes. The pledge of the state would give their notes circulation, and an un-

[10] *Doc. Jour.*, 1853, p. 150.

[11] *Sen. Jour.*, 1853.

natural expansion of the currency must result. At one time it would rob the creditor, at another time, the debtor. Under the present system, he thought, there could never be a sound currency. The speculator came to Indianapolis with a bundle of bonds under one arm and a roll of bank notes under the other. He deposited his bonds, that had cost him from fifteen to fifty cents on the dollar, and got for them Indiana currency, dollar for dollar, recommended by the state. Presumably he went to some obscure place and put them in circulation, but in reality he took them to New York. The Constitutional Convention and the legislature of 1851 had, in fact, invited the bondholders to bring their bonds to Indianapolis and cash them at par, and, perhaps, for a few years draw interest on both the bonds deposited and the currency received.

Early in the session of 1853 Mr. Humphreys, sitting for Greene and Owen counties, introduced a bill in the Senate prohibiting the state auditor from accepting any more applications for banks.[12] This bill received a favorable committee report, but was tabled by a vote of 23 to 20.[13] Later, a motion to amend the law, by repealing the whole statute of 1852, found only eleven supporters among the forty-six senators present. An amendment by John H. Sullivan of Jefferson county to place more restrictions on banking was lost. The Senate was about equally divided on the matter, but no action was taken.

The auditor's report[14] of July 1, 1854, shows that thirty-one new banks had been organized, making a total of forty-six. The capital stock was $6,148,837, with a circulation of $5,219,100, and specie on hand to the amount of $807,393.08. By December 15, 1854, the number of banks had risen to eighty-nine, with a nominal capital of $30,400,000 and with a total circulation of $9,299,574. Auditor Dunn might well begin his report by saying his duties had become "peculiarly important and laborious."

The natural result followed hard on this unnatural expansion of the currency. About May 1, 1854, a flurry in the money market started the trouble. The Crimean War in Europe changed the demand for American securities to a demand for American coin. Coin was at a premium, and brokers began to drain the Indiana banks to get coin for the eastern markets. Governor Wright had suspected the integrity of these banks from the first and, in 1854, had sent John S. Tarkington to a bank at Newport in Vermillion County to see if it would redeem its paper. As it was expressed

[12] *Sen. Jour.*, 1853, p. 136.
[13] *Sen. Jour.*, 1853, p. 151.
[14] *Doc. Jour.*, 1855, p. 313.

at the time, the bank "squatted." This test not only confirmed the Governor in his suspicion but started a run on the free banks of the state that never ceased. It was charged at the time that State Bank men furnished the Governor with all the bills he wanted on the free banks.[15]

On January 7, 1855, a convention of Indiana bankers met at Indianapolis for the purpose of classifying the different bank bills, but little could be done. The notes of a few banks were labeled "gilt edge" and nothing said of all the rest.[16]

The drain of coin continued. In February, 1856, a banking house was opened by Dunlevy, Haire & Co., in the Blake Block, Indianapolis, for the sole purpose of presenting bills to Indiana bankers and getting coin. The firm is said to have sent $2,000,000 in coin to the "gougers" of the "hog" city [17]—Cincinnati—during its first three months of operation. The good and the bad, the honest and the dishonest, were treated alike. Some banks had provided eastern exchange, but the demand was for coin. After this run had continued sixty days or more, Ohio, Indiana, and Illinois banks began to go down. The bonds on which the circulation of Indiana free banks rested declined on the markets from twenty to forty per cent. The auditor tried to stem this foolish run by sending out a circular stating that no preference would be shown for protested bills, and that bonds would not be sold till sixty days notice had been given in New York, London, and Paris. He offered to exchange bonds for free bank notes, dollar for dollar, if currency was tendered in $1,000 lots. Nothing would stop the panic.

During this bank-run the State Bank paid out over $2,500,000 in specie without lowering her specie deposit. Business could not be carried on under such conditions. One instance must suffice as an example of the violent fluctuations of the period. The circulation of the free banks in May, 1854, was $9,000,000. By December 15, $3,454,279 of circulation had been withdrawn. People lost all confidence in free banks, but still the auditor felt that a few amendments to the law would make it a good banking system.

In the midst of this panic in the money market the legislature met, January 4, 1855. Governor Wright again took up the cudgels for a sound currency.[18] He repeated his statement of two years before that the free bank law was a failure, and that the past events had shown clearly that the restrictions provided in that law were

[15] Berry R. Sulgrove, *History of Indianapolis*, p. 143.
[16] *Ibid.*, p. 222.
[17] *Ibid.*, p. 222.
[18] *Sen. Jour.*, 1855, p. 17, the governor's message. *Doc. Jour*, 1855, p. 82.

entirely insufficient to prevent the abuses of the banking privileges. It was to be regretted, he thought, that this matter had not been attended to during the last session. The country had over-traded, and the broker was now hunting gold to pay our bills in the East. It was fortunate that the broker came when he did, and stopped the mad career of inflation. We had issued, in less than six months, more than $6,000,000 of currency. Banks in many cases were organized not to accommodate the commercial public, but to enable the banker himself to borrow. Men with only enough credit to borrow money to buy a few thousand dollars stock had suddenly became bankers to the extent of millions. The plan is simple, explained the Governor, deposit a few bonds with the state, on which you continue to draw interest; the state will issue you face value in currency. Then take the currency and buy more bonds, often far below par, and repeat the performance. Banks are now passing this worthless stuff over their counters, and poor men have to accept it for wages—a money they can hardly use and dare not keep. The legislature would be wanting in its duty to an outraged people if it did not suppress the practice. The law itself is defective and the administration of it under auditor Dunn is equally bad. The Governor recommended a banking department with a board of bank commissioners.[19]. Our currency had been contracted $5,666,123 in twelve months—more than half the whole circulation had been called in. There was not only a depreciated currency issued by law but there was a more depreciated currency issued by railroads, plank roads, and insurance companies, without a shadow of law. Thousands of dollars of this latter kind had been thrown into circulation and left to work the ruin of commerce. The credit of the state, and the interests of the people, alike, demanded the abatement of the evil.

In fact, it appears, both from the message of Governor Wright, and from a report [20] of a joint investigating committee, that the auditor's office was badly managed. The committee charged imperfect bookkeeping in the banking department, and carelessness in the keeping of bonds and coupons; and still worse, they claimed that when the banker returned a part of his circulation to the auditor and demanded a like amount of his deposited bonds, he was given his best bonds while his poorest were retained by the auditor. The weakness in the auditor's office accounts, in large measure, for the failure of this law.

By January 25, 1855, there had been organized ninety-one free

[19] *Sen. Jour.*, 1855, p. 23.
[20] *Doc. Jour.*, 1855, p. 864.

banks with a total nominal capital of $9,502,330 and an outstanding circulation at the time of $4,581,833, backed by deposited bonds, whose par value was $4,941,515. The money of the state was never so deranged as when the thirty-eighth session of the general assembly met. As soon as H. E. Talbott became auditor, he stopped the issue of bills, but the cancellation went on and the consequent contraction of the circulating medium continued.[21]

The legislature, at once, took up the currency question. A bill reported by the banking committee repealing all laws on the subject was laid on the table without a vote, as also was a bill to stop the issue of bank notes under five dollars.[22] On January 30, a new free banking bill was introduced into the Senate and passed to third reading without a dissenting vote. The next day a bill for a bank with branches was passed to the same stage by the same vote. While the Free Bank Bill was being discussed by the Senate a similar bill was sent over from the House. This was referred to the committee on banking, who reported it back next morning for passage. After several amendments, the bill went to third reading by a vote of 36 to 12, and immediately, under a suspension of rules, passed by a vote of 43 to 6. The bill was vetoed by Governor Wright, who based his veto [23] on the grounds that the bill gave the auditor power to change the stocks deposited as security; that it devolved duties on the governor and treasurer of state, officers already overburdened; that it did not carry any remedy for the shameless frauds perpetrated by the free bankers; that it allowed speculators to buy up the depreciated bonds of any state or territory and cash them at the expense of the people of Indiana; that the bill made great effort to protect the billholders of broken banks but made no effort to keep banks from breaking; that "believing as I do in a gold and silver currency, I will not sign a bill that provides a less valuable one;" that an examination of the auditor's office, in which this bill vests so much discretionary power, would convince any man of its insecurity; and finally that "it is impossible to give the public confidence in any system, managed as the present one has been, and the sooner it is put into other hands, confident and faithful, or entirely wound up, the better it will be for the people and the character of the state, which has already suffered a loss which it will take years to retrieve."

Notwithstanding the Governor's arraignment, the bill received the support of thirty-six of the fifty senators. The legislature was

[21] *Doc. Jour.*, 1855, p. 934.
[22] *Sen. Jour.*, 1855, p. 172.
[23] *Sen. Jour.*, 1855, p. 721.

deeply disappointed in the disastrous failure of the law. Of course the system had in it all the weaknesses of banking systems not founded on liquid assets. But these weaknesses do not account for its quick and ruinous collapse. Had an efficient auditor administered the law and enforced it rigidly, such banks as those of Newport could not have been organized. The chief defect lay, not in the law, but in the officials who failed to enforce it.

VII

BANK OF THE STATE OF INDIANA—THE THIRD STATE BANK

The bill to charter a new state bank to be known as the Bank of the State of Indiana had a career in the general assembly very similar to that of the Free Bank Bill, though the opposition to it was more spirited and the lobby for it more powerful. It passed the Senate, February 24, 1855,[1] under the call of the previous question, by the close vote of 27 to 22. The minority joined in a bitter protest which they spread upon the journals.[2] After passing the House, the bill met with the Governor's veto. His principal objections were, that he had not had sufficient time to examine the bill; that the bank could issue unlimited paper; that the measure, which might almost ruin the state, was not discussed by the legislature; that the bill exempted the bank from most of the burdens of taxation; that the manner of subscribing its capital was unfair and invited corruption; that it could discount paper equal to three times its capital stock, plus three times its deposits; that its title, The Bank of the State of Indiana, was adopted to mislead people; that the state could have no control over it, under the charter, which was to run twenty years; and that the whole atmosphere of this bill, from its introduction to its last vote, was charged with uncertainty and a suspicion of corruption and unfairness. The Senate passed the bill over the veto by a vote of 30 to 20.[3]

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[1] *Sen. Jour.*, 1855, p. 551.

[2] *Sen. Jour.*, 1855, p. 562.

[3] The majority vote in the Senate on the four occasions is here given:

1. Passage of a Bill to Establish a Bank with Branches:—Alexander, Brown, Burke, Combs, Crane, Cravens, Crouse, Drew, Ensey, Freeland, Griggs, Harris, Helm, Jackson of Tipton, Meeker, Parker, Reynolds, Richardson of St. Joseph, Shields, Spann, Suit, Tarkington, Weston, Williams, Wilson, Witherow, Woods;—27 in all.

2. Passage of Free Bank Bill:—Alexander, Anthony, Brookshire, Brown, Burke, Chapman, Combs, Crane, Cravens, Crouse, Drew, Ensey, Freeland, Glazebrook, Griggs, Harris, Hawthorn, Helm, Hendry, Hosbrook, Jackson of Madison, Jackson of Tipton, Knightley, Mansfield, Mathes, Meeker, Parker, Reynolds, Richardson of St. Joseph, Richardson of Spencer, Robinson, Rugg, Sage, Shook, Spann, Suit, Tarkington, Vandeventer, Weston, Williams, Wilson, Witherow, Woods;—43 in all.

3. Passage of the Free Bank Bill over the veto:—Alexander, Anthony, Brown, Burke, Chapman, Combs, Crane, Cravens, Crouse, Drew, Ensey, Freeland, Griggs, Harris, Hawthorn, Helm, Hendrick, Hosbrook, Jackson, Knightley, Meeker, Parker, Reynolds, Richardson of St. Joseph, Robinson, Rugg, Sage, Spann, Suit, Tarkington, Vandeventer, Weston, Williams, Wilson, Witherow, Woods;—36 in all.

4. Passage over the veto of a Bill to Establish a Bank with Branches:—Alexander, Anthony, Brown, Burke, Combs. Cravens, Crane, Crouse, Drew, Ensey, Freeland, Griggs, Harris, Helm, Hostetler, Jackson of Tipton, Meeker, Parker, Reynolds, Richardson of St. Joseph, Robinson Shields, Spann, Suit, Tarkington, Weston, Williams, Wilson, Witherow, Woods:—30 in all.

These are the facts around which was woven one of the most noted legislative scandals of the state's history.

The smallest majority was that on the first passage of the bill to charter the Bank of the State of Indiana. All of the 27 senators who supported this bill also supported the Free Bank bill. It was an allied majority that ruled the assembly. The vote is the more surprising because the bills provide for entirely distinct systems of banking. The Bank of the State of Indiana is, as the Governor pointed out, a misnomer. It was not a state bank, but one of the worst forms of an unrestricted bank. The only guaranty of its integrity was its mutual liability and the character of its stockholders and officers. The work of the legislature was a case of what one member called:

> "Tickle me Tommy, do! do! do!
> You tickle me, and I'll tickle you."

In order to understand the situation it is necessary at this point to go back and explore, hastily, one of the dark alleys of Indiana politics. The stock of the State Bank in 1855 was worth about 75, with a par value of 50. The state owned at least $1,000,000 worth of this stock. The surplus fund of the State Bank contained another $1,000,000 still, to be sure, in the Bank but soon to be turned over to the state. Moreover the state owed a bonded debt for her bank stock of $1,390,000, par, but the bonds could be bought at ten per cent discount in New York. As early as 1854, there was activity on this account among the political scavengers of the state.[4] The State Bank was to stop discounting and begin calling in its circulation, January 1, 1855, and the job of winding up its affairs was a very desirable one to legislative lobbyists. Some of the State Bank directors were called to Madison in 1854 to hear a proposal to renew its charter. The price asked for this service was $200,000. At the August session of the State Bank Board, General E. D. Taylor, President of the branch at Michigan City, proposed with the aid of Judge Thomas L. Smith, a lawyer of New Albany and the attorney for the branch at that place, to get a new charter. The cost, he thought, would be about $10,000. The cashier of the State Bank, J. M. Ray secretary of the board, broke up the deal by flatly refusing to aid in corrupting the legislature.

[4] *Bank Frauds*, p. 41. This document of the legislative session of 1857 contains the evidence heard by, and the findings of, a joint committee appointed at the suggestion of Governor Wright to investigate the chartering of the Bank of the State of Indiana. The report contains the testimony of most of the lobbyists and of members of the session of 1855. It has a good index.

Up to this point the lobbyists had intended to work with the State Bank officials in obtaining a new charter, but being unsuccessful in making this alliance, they faced about and began laying plans in a different direction. Their next scheme was to charter a new state bank, relocate the branches, and transfer the state stock in the old bank to the stockholders of the new one. For this purpose, Judge Smith, the author of this new scheme and the leader of the lobby from now on, drew a bill purporting to be a copy of the old charter,[5] but having a few changes in order to make it conform to the new constitution and to the experience of the last twenty years. The first of these changes was that the state stock be purchased by the new bank at a fair appraisement. This appraisement was to be made by commissioners, elected by the present legislature. In payment for this stock, state bonds might be surrendered to the state at par, although as mentioned above these bonds were worth only 90 on the market.

Section 79 of this bill,[6] called the "percussion clause," contained the "joker" that cost the people of Indiana a half million dollars. This section followed the corresponding one of the old charter, except for two innocent looking changes. Books for stock subscription were to be opened *between* nine and twelve a. m. instead of *from* nine *to* twelve, and the phrase "for the subscription of the *requisite* amount of stock" was inserted. To make these changes look more harmless, all the old provisions for scaling down surplus subscriptions and for cutting out corporate subscriptions, and the preference for the subscriptions of citizens and residents of the districts were retained.

The bill[7] as it was introduced provided for three grafts. The first consisted in selling the State Bank stock at a price to be named by the lobby and paid for with bonds bought at 90 and turned in at 100. This met with the most violent opposition and had to be dropped later.

The second was in locating the branches, in which the new board of bank commissioners had full power. This board of commissioners, named in the second section of the bill, was composed of Thomas L. Smith of New Albany; Andrew L. Osborn of Laporte, who was one of the best known lawyers of the state, had been born at New Haven (Conn.), had come to the West in 1835, and had served his county five terms in the legislature; Jehu T. Elliott of New Castle, who was a Hoosier by birth, was an office-holder con-

[5] *Bank Frauds*, p. 340.
[6] *Laws of Indiana*, ch. iii, sec. 79.
[7] *Laws of Indiana*, 1855, ch. iii.

tinually from 1835 to 1871, first as clerk of the legislature, then in the Senate, then on the circuit bench, and then on the supreme bench; Addison L. Roach of Rockville, who was born in Tennessee in 1817, had come to Bloomington in 1828, was graduated, 1836, from the State University, was for a long time one of its trustees, studied law with General Tighlman Howard at Rockville, served in the legislature, sat on the state supreme bench, and became the law partner of Joseph E. McDonald; and John D. Defrees of Indianapolis, who by birth was also a Tennesseean, was a lawyer of South Bend, editor of the Indianapolis Journal, 1846 to 1854, a state senator, chairman of the Whig State Central Committee in 1854 and of the Republican State Central Committee in 1856—a public officer for nearly half a century. It is not necessary to comment further on the personnel of this board. All were prominent men and all had been highly honored by the people in an official way. There was no excuse for their crime. They were to get their pay for lobbying by selling the locations of the branch banks. It would have been within their power to establish the first branch out at Bridgeport instead of at Indianapolis, but the stockholders would pay heavily rather than have the bank located at Bridgeport. The commissioners were also empowered to appoint two sub-commissioners to open the books for each branch and receive subscriptions.

The third opportunity for graft was in subscribing the stock of the bank. The law directed that the sub-commissioners should open the books to receive subscriptions *between* nine and twelve o'clock. The commissioners were careful to appoint sub-commissioners who would allow no one to subscribe except those recommended by the lobbyists. The charter was worth $500,000, at a fair estimate, basing the estimate on the dividend paying power of the old Bank.

A brief review of the "openings" will show that the lobbyists were not disappointed in their hopes in this regard. The subscription books of the Indianapolis branch were opened by W. H. Talbott and John S. Spann at the office of the Illinois Central Railroad, and kept open from 11:50 till 12:00 o'clock. Mr. Talbott had the list of subscribers already made out and during this ten minutes merely copied the names on the stock subscription list.

The books at Richmond were opened by B. F. Murphy of Middletown assisted by Miles Murphy. Mr. Murphy came into the Huntington House at Richmond at 9:10, and spoke to Mr. Phinneas Kent. The two left the house at once, and at 9:15 the commissioner boarded a train which had waited for him fifteen minutes.

At Laporte, one of the sub-commissioners and lobbyists opened the books, stepped from behind the counter, and subscribed for $60,000—a controlling interest—and then invited the public to come up and subscribe. At New Albany, Augustus Bradley and Captain Henry Turner failed to open the books at all. At Bedford when M. A. Malott, former president of the branch bank there, opened the books, he was handed a list of subscriptions which Colonel John L. Menaugh of Salem had brought up that morning. Malott transferred the list to his subscription paper and then announced that the books were closed. The books were open five minutes.

At Evansville, there was some trouble. W. C. DePauw came down in May to find suitable sub-commissioners. He arranged with William Baker and John Ingle to open the books for subscriptions. It was agreed among them that Evansville people might subscribe 400 shares and that DePauw should have the remaining 1,600 shares of the capital of the branch bank. But when it came time to open the books the sub-commissioners refused to follow their instruction, whereupon Mr. DePauw ordered them to send their resignations to Judge Smith at New Albany. This was done and a new "opening" was advertised to take place May 23, 1856. Colonel Drew and Dr. Hutchinson were the new sub-commissioners, and the "opening" took place in bedroom number six of Colonel Drew's hotel "The Pavilion." The "opening" lasted from 9:00 o'clock to 9:10, the Colonel and the Doctor being the only ones present.

At Rushville, A. W. Hibbard wanted to subscribe $65,000 worth of stock. He was refused permission by the sub-commissioners, who allowed John L. Robinson to subscribe the entire 2,000 shares for himself, Bright, and others. The books were then closed, having been open less than ten minutes. At Madison, the sub-commissioners were, at least, more sensible, if not more legal in their proceedings. They did not open the books to the public at all, but privately made out the subscription list and sent it off to Indianapolis to the commissioners.

The public fared no better at any of the other branch openings, but enough has been said to show with what persistence and effrontery the lobbyists pursued their advantage under the law. The sub-commissioners were usually allowed to subscribe from twenty to forty shares as a reward for their services, although in some cases they took much more. A large number of the lobbyists were thus taken care of on the board of commissioners and on the nineteen boards of sub-commissioners. The remainder got their part of the spoils through unfair subscriptions; and in some cases the commissioners also subscribed heavily for stock

At Jeffersonville, Judge Thomas L. Smith and Samuel Patterson subscribed for 1,185 shares, which were at once sold to the Ohio Insurance Company for a premium of $10,000. At Rushville, Michael G. Bright subscribed for 800 shares, and John L. Robinson for 400. At Madison, Bright and his partners took 2,000 shares, Bright alone getting 1,200, which they sold to Lanier & Co. of New York for $14,000 premium. At Vincennes, Samuel Patterson, Judge Roach, and J. H. Hager got control of the stock—1,300 shares—which they sold to the stockholders of the old Bank. At Evansville, the stock was allotted to Sam Patterson, Judge Thomas L. Smith, and a few others—the two named getting 600 shares each. The whole stock was sold at once to Mr. Rathbone, of the old Bank, for a premium of $10,500. At Bedford, W. C. DePauw and John S. Davis took the stock, DePauw getting the lion's share. He sold the stock to E. F. Nixon for a large premium, $2,240 of which was paid in cash. At New Albany, the sub-commissioners advertised that the books would be opened at the county auditor's office. but the sub-commissioners seemed afraid of the crowd, and did not open them at any place. Two lists of subscriptions were sent in, one made up of men waiting at the auditor's office, the other made up by the sub-commissioners. To avoid a lawsuit the bank commissioners gave subscriptions to all. There were 156 subscribers, none for large amounts, except Victor A. Pepin, who represented the old Bank. At Plymouth, Colonel Taylor, Phinneas Kent, and A. L. Wheeler subscribed for the stock, which they sold to Walker, Baker, and Holbrook. At Terre Haute, the home of Dowling, 1,300 shares of the branch stock were taken by him and sold to the owners of the old Bank for $10,000 premium. At Lafayette, the stock was subscribed for by a group of smaller lobbyists and members of the assembly, who sold out to Moses Fowler. At Logansport, the stock fell into the hands of F. Keyes, Graham Fitch, and M. G. Bright, to the amount of 1,450 shares, all of which they sold at once. At Laporte, the stock was subscribed for by D. Garland Rose and General Taylor—600 shares each, which they held as an investment—the only case in which the stock was not immediately transferred. At Fort Wayne, the stock was subscribed for by a number of men, most of whom sold directly to the principal stockholders of the old Bank. At Lawrenceburg, the stock fell part and parcel into the hands of M. G. Bright; and it cost not only

$10,000 to get the location, but cost Elihu Bursam $10,000 as a premium to get Bright to part with his 1,200 shares of stock. At Muncie, the stock was taken by local subscribers. They had to raise a fund of $6,000 to secure the location. For this fund each subscriber agreed to pay six per cent extra on his stock.

Richmond was the scene of one of the most shameful deals. An outsider had to open the books, and 1,775 shares out of the 2,000, capital stock, had to be allotted to Phinneas M. Kent of New Albany (the home of Judge Smith and John S. Davis). However, Editor Kent had no notion of banking among the Quakers, and immedaitely sold out to the old Bank, but the evidence only says "for a premium."

At Indianapolis, the controlling interest was subscribed for by the great philanthropist, W. C. DePauw. He subscribed 1,010 shares, which he sold to the Touceys of the Lawrenceburg Bank, and William R. McKeen of the Terre Haute Bank for $17,300, a premium of thirty per cent.

The lobbyists had subscribed for 22,782 shares. Before the banks were organized they had sold more than 18,000 of these. The balance of the 38,000 shares of capital stock was taken largely by associates of the lobbyists in blocks of fifty and one hundred shares. These latter subscriptions brought very small premiums and many of the subscribers defaulted on their first payment, which was only $2 per share. DePauw could sell his Indianapolis stock at 130 because he had 1,010 out of 2,000 shares. Others could not sell Indianapolis stock at all, except to DePauw, because he had control and would sell no stock unless he sold all. The premium on the large holdings aggregated $150,000.

There were numerous "little folks" that had to be cared for. A sub-commissioner usually got to subscribe 40 shares of stock worth about $300 premium. The prices offered for the votes of assemblymen ranged from 10 shares up to 40,[8] and all these had to be accommodated with subscriptions at the openings. William G. Coffin came up from Parke County to help his friend Judge Roach, and subscribed fifty shares, just for fear the stock might not all be taken. Ashbel P. Willard, governor elect, ran up from his home in New Albany to visit the legislature and see how his neighbor, Judge Smith, was prospering. He happened to meet

[8] In offering shares as compensation, only permission to subscribe at the opening was implied. Thus, when Editor Brown of the Sentinel was offered 500 shares, all that was meant was the right to subscribe these. On these he would be required to pay $1,000 in cash. This amount could be borrowed on the stock at the old Bank. If the subscriber got a fair premium—about 15 per cent—his 500 shares would net him $3,750, or $7.50 per share. On this basis the entire capital stock brought a premium of $285,000.

the chairman of the bank committee after it had held an all night session and had succeeded in getting the "percussion clause" out. Mr. Willard told the chairman that would never do. The chairman at once reconvened his committee and reinserted the "percussion." Jonathan S. Harvey of Indianapolis was a law partner of Mr. Newcomb, a member, and naturally visited the legislature often. He got interested in the bank measure and subscribed for one hundred shares which he sold to DePauw for $500 premium. Captain Austin M. Puett was a brother-in-law of Governor Wright, and a friend of Judge Roach. It was thought Captain Puett might get the Governor to favor the bill. If Mr. Puett could do this Judge Roach promised to let him subscribe 100 shares, but failing to convince the Governor, he did not get any subscription, although he worked for the lobby throughout the session. John Hunt, a cousin of the Governor, came up from Richmond with the intention of fighting the bill. In fact he had a bill of his own to present. While he was waiting to see the Governor, he was met by Captain Puett and taken over to the Bates House, the lobby headquarters. Here he was introduced to Judge Smith and Judge Roach, by whom he was induced to engage in banking. He spent four or five weeks laboring in behalf of the lobby, only to be refused a subscription at the openings. There were Ransom W. Aiken of Bloomington, the banker who failed when the war took the edge off his Missouri stocks; James Dick, to whom the lobby took a fancy when he came up to see his friend Samuel Judah, and asked him to assist Judah in opening the subscription books at Vincennes; and a great many others of lesser note.

Almost anything was promised to anybody who, it was thought, could exert an influence. Samuel H. Buskirk, member of the house from Monroe county, was promised a branch at Bloomington; J. J. Alexander, a senator, was promised a branch in his home town, Gosport; John Hunt of Madison, member of the house, was promised all the stock he wanted; James McCurry, a representative of Putnam county, was to have a subscription of 400 shares; Senator Samuel I. Anthony was given 30 shares in the Laporte bank which he sold to Rose for $50; Amzi L. Wheeler, a representative, supported the bill and took 1,060 shares of stock in the Plymouth branch which he sold for $7,000 premium; Senator Harris Reynolds of Fountain county supported the charter and subscribed for a few shares in the Lafayette branch; Austin H. Brown, editor of the *Indianapolis Sentinel*, was offered 500 shares for his support; Swan Brookshire, a senator for Montgomery county, was promised a branch at Crawfordsville, but he refused his support; M. W. Shields of Jackson county voted *aye* and Judge Smith allotted him 100 shares in the Jeffersonville branch; Senator David Crane of Floyd county supported the bill and received a subscription in the New Albany branch; and Solomon Meredith, a member from Wayne county, was promised, by both Roach and Smith, the location of a branch at Cambridge City. No one was safe from approach. Open attempts at bribery were made on such a veteran member as David Kilgore of Muncie.

Several lawsuits followed the organization of the Bank, but the real merits of the case, with the state as a party, were never brought before the Supreme Court. Nor would it, presumably, have availed anything. Courts naturally hesitate to question the integrity of a coördinate branch of the government.

No further changes in the bank laws were made till the law of 1874 was enacted, under which the state banks of today operate. The National law of 1863 as amended in 1866 stopped all state banks from issuing currency, and effectually put an end to experiments in banking, though it has not solved the greater question of the inflation and contraction of the currency.

VIII

CONCLUSION

The new Bank of the State of Indiana gathered itself together after the storm and began to do a careful, conservative banking business. The people soon came to look upon the whole winter campaign as a war among highwaymen, in which, for the moment, the lobbyists had got the upper hand of the Old Bank men.

Hugh McCulloch of Fort Wayne was elected president, and James M. Ray, cashier. Branches were established at Lima, Laporte, Plymouth, South Bend, Fort Wayne, Lafayette, Logansport, Indianapolis, Richmond, Connersville, Rushville, Madison, Jeffersonville, New Albany, Bedford, Vincennes, Terre Haute, Muncie, and Lawrenceburg. The Bank opened with $197,903 paid-in capital, and $35,497 in specie, an average for each branch of $10,000 capital and less than $2,000 in specie. It was on a level with the worst "wildcat" banks in all its essential features save two. Its branches were mutually responsible, and it was in the hands of the most capable business men in Indiana. Its president was one of the three or four greatest American financiers. The Bank prospered until overwhelmed by the National Bank system. Under an act of the state legislature of 1865, it closed up its business. Nearly all the branches became National banks. Its last report for the year 1864 shows how the National currency was affecting its circulation. At the close of 1862, it had $5,000,000 in circulation, and at the close of 1864 only $1,500,000.

One of the arguments used by the advocates of the Bank Charter of 1834 was that the dividends of the Bank would pay the ordinary expenses of the state. A comparison of the statistics in the appendix will show that the dividends ran low during the decade from 1838 to 1848. During a part of this time it had to suspend specie payments and curtail discounts, especially on eastern bills, on which the Bank made most money. The dividends from 1843–5 inclusive ran low, because over $700,000 of the Bank's money was tied up in suspended debts. Again in 1852 the state's expenses ran high, on account of the State Constitutional Convention of 1850. It must also be kept in mind that during this latter period the Bank was piling up in its vaults a surplus of over $1,000,000, besides carrying $300,000 of suspended debt. The dividends—after paying interest on the borrowed capital at five per cent—amounted to about $2,000,000 for the twenty-one years. Add to this amount a surplus of $1,434,000, a suspended debt of $216,000, which was practically all collected, and banking property worth $100,000, and the total earnings of the Bank for the twenty-one years were about three and three-fourths millions. The ordinary expenses of the state for the same period were about $1,800,000, or just about one-half of the dividends.

A criticism of the Bank, frequently heard from the beginning and growing more frequent throughout the twenty years, was that it failed to supply an adequate currency for the growing commerce of the state. That this criticism was just, will be seen by comparing the capital stock, discounts, and circulation statistics in the Appendix with the number of polls, acres of land assessed, and the total valuation of state property. The wealth of the state mounted by regular steps, while the capital of the Bank, its circulation, and its discounts never appreciably increased. In 1836 the circulation was $2,000,000, when the polls numbered 75,000, the acres taxed numbered 5,000,000, and the total property was valued at $67,000,000. In 1854 the circulation was only $3,500,000 when the polls were 160,000, the acres 20,000,000, and the taxables near $300,000,000. This comparison needs no further comment. The disparity worked a great hardship and injustice on the debtor class, and this class formed a large majority of the people.

But it must be admitted that the whole question of our circulation was not in the hands of the Bank. There were other factors controlling it, over which the Bank had no power. It must be kept in mind that this was a state bank and that the state could have increased its capital at almost any time when the legislature would secure the money. Its capital was fixed by the law, and the relation between capital and loans was also fixed by law. The criticism applies more to the state than to the Bank Board. Between 1834 and 1838, the state borrowed about $10,000,000 in the East, and disbursed it in the state. In 1839 the state issued $1,500,000 treasury notes to meet cash obligations to contractors on the public works. In 1840, it threw into circulation $722,640 of bank scrip to pay the state's overdrafts by the canal commissioners. In the year 1853, the free banks issued about $6,000,000 of paper. All these factors made the question of the state's circulating medium a complex one, while the medium itself, it must be noted, was a very poor one.

In conclusion, it may be said that the State Bank of Indiana was the best in the West. Alone among western banks it weathered the Panic of 1837, though it had to suspend specie payments. Not only were its officers superior bankers, but some of them rose to high levels as statesmen and patriots. The Mexican War found Indiana without funds. The State Bank furnished them freely and liberally, and before they were demanded. Again, when the Civil War found us with empty treasury and no tax levy, it was one of these same bankers who furnished the state with funds. Such men as Hugh McCulloch, J. F. D. Lanier, John Sering, David S. Bonner, George W. Rathbone, Demos Deming, Calvin Fletcher, J. M. Ray, Samuel Merrill, James Morrison, Ebenezer Dumont, Horatio Chapin, Samuel Hanna, W. R. McKeen, Mason C. Fitch, James Winslow, Omer Toucey, Hervey Bates, to mention only a few, were not merely ordinary bankers. They were the founders of the commerce of a commonwealth.

APPENDIX I

A Table of Statistics Showing the State Taxes, Polls, Acres Assessed, and State Debt, from 1835 to 1859.

Year.	State Taxes.	Polls.	Acres Assessed.	State Debt.
1835	$49,407 67	77,041	5,210,735	$10,336 15
1836	51,279 05	75,318	5,485,363	22,395 96
1837	64,437 23	82,921	6,185,714	*
1838	164,633 08	89,837	7,129,959	†23,471 53
1839	161,182 26	95,231	7,475,320	10,064,000 00
1840	145,196 20	100,166	8,273,120	12,873,509 00
1841	166,802 90	103,746	10,187,764	15,088,146 00
1842	393,916 32	107,876	13,646,128	....
1843	213,716 66	121,919	14,674,599	15,128,000 00
1844	208,015 86	118,334	14,368,570	12,512,000 00
1845	256,136 90	118,746	16,144,569	16,462,080 00
1846	273,687 60	127,095	16,533,811	16,661,250 00
1847	355,491 19	129,857	16,654,961	15,791,040 00
1848	429,476 56	136,265	16,623,091	7,087,270 00
1849	432,283 78	143,720	16,883,570	6,769,012 50
1850	455,630 02	149,986	17,025,109	6,667,522 50
1851	502,583 66	153,143	17,099,812	7,047,765 00
1852	496,360 70	153,421	....	7,697,055 00
1853	546,385 58	164,992	18,363,856	7,926,880 00
1854	563,513 19	171,736	20,463,416	7,829,003 50
1855	444,218 89	178,877	19,599,936	7,773,473 00
1856	611,426 51	174,802	20,868,370	7,772,311 00
1857	654,431 33	185,193	21,510,601	7,771,073 00
1858	*55,057 28	199,602	21,918,059	7,771,011 00
1859	408,040 80	201,856	21,881,593	10,286,855 00

*No levy this year.
†Surplus.

APPENDIX II

A Table of Statistics Showing the State Expenses, Bank Dividends, Rate, Surplus, and Suspended Debt from 1835 to 1859.

Year.	State Expenses.	Bank Dividends.	Rate.*	Surplus.	Suspended Debt.
1835	$71,083 68	$15,000	9 %	$36,179	....
1836	60,705 16	63,600	9⅓%	93,133	....
1837	70,791 13	36,942	8 %	249,958	$154,757
1838	65,264 53	81,679	9⅔%	....	....
1839	91,640 88	....	....	....	....
1840	93,265 79	....	....	....	294,000
1841	89,630 16	118,871	9⅓%	220,827	84,932
1842	83,196 07	54,550	7 %	332,632	44,756
1843	92,305 38	†20,000	1 %	....	....
1844	93,368 73	42,098	7 %	....	....
1845	69,995 66	62,636	8 %	375,239	598,928
1846	69,136 59	67,724	8¼%	413,563	577,647
1847	90,762 67	69,425	8⅓%	453,444	460,115
1848	79,273 98	93,730	9½%	527,799	412,601
1849	74,470 19	99,979	9⅘%	607,992	323,783
1850	83,615 10	104,147	10 %	750,678	270,213
1851	71,810 00	104,150	10 %	806,913	264,101
1852	159,414 68	104,150	10 %	908,926	207,803
1853	119,514 17	107,505	10 %	1,032,049	147,099
1854	65,931 72	150,505	12 %	1,108,955	180,600
1855	147,442 61	215,010	15 %	1,228,301	252,192
1856	59,522 68	279,513	18 %	1,265,202	304,388
1857	135,236 48	‡	....	1,434,006	261,104
1858	75,572 63	‡	....	599,595	139,410
1859	227,350 41	‡	....	¶	¶

*Five per cent is here deducted to cover interest on bonds. To get the income to a private investor add 5 per cent.

†Deficit.

‡Closed for division.

¶Divided.

APPENDIX III

A Table of Statistics Showing the Stock, Circulation, Discounts, and State Taxables from 1835 to 1859.

Year.	Stock.	Circulation.	Discounts.	State Taxables.
1835	$1,199,778 62	$1,393,035	$1,810,965 51	*$58,769
1836	1,585,481 51	1,927,050	3,176,613 10	78,589,061
1837	1,847,125 00	2,205,812	3,264,868 81	98,441,063
1838	2,216,700 00	2,951,795	3,679,200 79	97,058,004
1839	2,595,221 63	3,102,337	3,211,224 26	107,337,715
1840	2,670,803 13	2,835,902	3,617,248 54	91,756,019
1841	2,743,191 62	3,136,437	3,730,951 00	95,518,763
1842	2,727,532 14	1,828,371	2,460,506 91	109,173,610
1843	2,136,272 25	2,241,115	2,677,530 64	103,709,853
1844	2,104,928 96	2,979,212	2,834,421 80	116,237,965
1845	2,087,894 59	3,527,351	3,626,546 54	118,870,251
1846	2,083,824 37	3,336,533	3,018,743 57	122,649,554
1847	2,082,774 37	3,901,383	3,038,798 35	124,558,060
1848	2,082,910 59	3,552,210	3,438,944 47	128,960,986
1849	2,082,950 59	3,617,495	3,589,013 30	133,429,061
1850	2,083,007 44	3,548,267	4,124,886 44	137,443,565
1851	2,083,007 44	3,772,193	4,357,625 00	210,973,643
1852	2,083,007 44	3,907,371	4,249,994 43	218,563,809
1853	2,150,107 44	3,834,765	5,037,394 43	266,097,614
1854	2,150,083 44	2,835,148	4,198,585 45	290,418,148
1855	2,150,107 44	3,335,726	4,678,781 15	301,858,474
1856	2,150,107 44	3,381,806	4,690,635 71	306,797,819
1857	336,582 39	684,718	797,818 89	317,932,958
1858	....	339,789	287,028 90	318,204,964
1859	....	....	....	435,367,862

*For 1835 the value of the property assessed is not obtainable; the figures given represent the tax assessed on the property.

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Legislative Records. Under this title are included three series of volumes: (1) The Journal of the House of Representatives; (2) The Journal of the Senate; (3) The Documentary Journal. These were printed for the State by the public printer. Complete sets are to be found in the State Library at Indianapolis. Of the first two there is usually one volume each for each session of the Legislature. The third begins with 1836 and there is usually one volume for each year. The same caution must be used with these as was suggested in the use of the Laws. The dates on the backs, the numbers, the pagination, and the indexes are unreliable. The only way to be sure a thing is not in one of these volumes is to look it through. The House and Senate Journals contain the minutes of the sessions of those bodies, but beyond that no fixed rule of publication has been followed. The substance of a speech is sometimes given, and many valuable committee reports are included. The Journals invariably contain the Governor's message, and until the beginning of the Documentary Journal in 1836 they contain all the reports of the State officers that were made to the Legislature. The Documentary Journal contains the committee reports, the official reports, the reports of special investigations, and other valuable papers. In this journal are found the annual reports of the banks, as well as many special reports called for from time to time by the Legislature. The long and detailed report on the bank by Nathan Palmer in 1842, and the report of the Senate committee that investigated the "Bank Frauds" in 1857 are in this Journal also. Taken as a whole the volumes contain a vast amount of historical material. They constitute the best single source for state history.

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INDIANA UNIVERSITY STUDIES

16. SOME RESULTS FROM AN ICHTHYOLOGICAL RECONNAISSANCE OF COLOMBIA, SOUTH AMERICA.
By CARL H EIGENMANN

The 'University Studies' constitute a sub-series of the INDIANA UNIVERSITY BULLETIN *in which from time to time are published some of the contributions to knowledge made by instructors and advanced students of the University. At present not more than two or three such numbers are issued a year. The 'Studies' are continuously numbered, and, as needed, a title-page and table of contents will be issued, for binding them in volumes.*

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INDIANA UNIVERSITY STUDIES

No. 8 BLOOMINGTON, INDIANA SEPTEMBER, 1912

[Contributions from the Zoological Laboratory of Indiana University. No. 127.]

Some Results from An Ichthyological Reconnaissance of Colombia, South America

CARL H EIGENMANN

Colombia occupies the northwestern corner of South America. In extent of area it is about equal to that of the states, exclusive of Maine, lying east of the Mississippi and north of Tennessee and North Carolina. The southeastern part lies in the valleys of the Amazon and the Orinoco. Western Colombia, the part with which this paper is concerned, includes three large valleys extending north and south, whose boundaries are formed by four chains of the Cordilleras. In the eastern valley flows the Magdalena River, and in the central valley, the Cauca. These rivers unite and empty into the Caribbean Sea. In the western valley are two rivers, the Atrato, flowing northward into the Caribbean Sea, and the San Juan, southward into the Pacific Ocean. The height of the land between the Atrato and the San Juan is not much, if any, more than 300 feet above sea-level.

The eastern and central Cordilleras diverge from a common chain in southern Colombia. The eastern chain extends to the Caribbean Sea and forms an effective barrier between the faunas of the Amazon, the Orinoco and the Maracaibo basins on the east, and of the Magdalena basin on the west. (A branch chain, deflecting from the eastern one, extends through Venezuela. With this we are not concerned. Between it and the eastern range lies the basin of Lake Maracaibo.)

The fauna of the Magdalena basin has long been separated from that of the rest of South America and is bounded by this chain of the Cordilleras. The central Cordilleras, which reach the snow level in several places, form a barrier between the fauna of the Magdalena and that of the upper Cauca. But since this central range does not extend as far northward as the eastern and western chains, the faunas of the Cauca and of the Magdalena are enabled to unite north of it.

The Magdalena descends rapidly from its sources to Neiva (1442 feet) and Girardot (1036 feet). Except for a short stretch at Honda it is navigable below Girardot. The upper part of the Cauca, on the other hand, flows in an elevated valley, which, near the parallel of Girardot, at Cartago, has an elevation of over 3000 feet. It is navigable between Cali and Cartago. Below Cartago it rapidly descends 2500 feet to Boca de Nechi, and is not navigable in this stretch. The conditions in the Magdalena and Cauca, in the latitude of Girardot and Cartago, with a difference of about 2000 feet in elevation, are quite different.

The central and eastern Cordilleras unite in southern Colombia and, like the western chain, continue southward. In Ecuador the western chain and the united eastern and central chains are joined by cross ridges; in Peru they are again distinct, with an intervening valley drained by the Marañon and Ucayale. The western Cordilleras, though not as high as the central, form a more or less effective barrier between the Magdalena-Cauca on the east; and the Atrato-San Juan basins on the west. They are reduced in size toward the north and reach the coast at Cartagena in Mount Poupa. In the north the coastal lowlands of the Rio Sucio, a tributary of the Atrato, of the Sinu, and of the Dique of the Magdalena, may permit itermigration of fishes or may have permitted it recently. The western Cordilleras extend southward the entire length of the continent. North of Istmina, they form the watershed between the Atrato and the Magdalena Rivers, both of which empty into the Caribbean Sea. South of Istmina, they form the watershed and barrier between the Atlantic slope and the Pacific slope, except where the Patia River pierces them in southern Colombia, and where, in southern Chili, some of the Pacific slope streams have pierced them and drain reservoirs to the east of them. The coast Cordilleras are of particular interest. They begin some distance north of Buenaventura and extend northward into Panama. They overlap the western chain only a short distance (about 300 miles), leaving a trough open to the Atlantic and the Pacific between them and the western Cordilleras. Their watershed in places approaches to within a few hundred feet of the Pacific ocean. In places, as at Culebra, their summits are but a few hundred feet above the ocean level. In Central America, the north and south coast Cordilleras give place to chains extending east and west. At different points there seem to have been opportunities, at one time or another, for Atlantic slope species to cross over this chain to the Pacific slope and possibly, vice versa.

Several years ago, the author of this paper pointed out that, with a single exception, the nearest relatives of the Pacific slope fauna are found in the valley of the Magdalena. This single exception has been removed by the present expedition, for it was found that the Cetopsinae are abundant in the upper Magdalena and Cauca. No Amazonian genus that has found the eastern Cordilleras of Colombia an impassable barrier is found in any of the Pacific slope streams from Peru to Mexico. This probably means that no lowland fishes have crossed the Cordilleras south of Colombia. The importance of a survey of the fauna of the Magdalena is apparent.

The importance of the San Juan and the Atrato in the study of the fauna of the Atlantic and Pacific slopes of South America is self-evident to any one familiar with the physiographic features of these rivers. They flow in opposite directions in the same trough; the watershed separating some of their headwaters is insignificant, in elevation not much, if any, over 300 feet above sea level. The Atrato is a large stream, of apparently easy access to the fauna of the Magdalena, and the San Juan is the largest of the South American rivers flowing into the Pacific.

The main problem I endeavored to solve in Colombia is: What is the relation of the fauna of the San Juan to that of the Atrato; and what is the relation of the fauna of the Atrato to that of the Magdalena? Supplementary problems considered are: What is the nature of the fauna of the plains of Bogota; what is the relation of the fauna of the upper Cauca, above Cartago, to that of the upper Magdalena; what is the vertical distribution of the species in the Pacific slope streams as illustrated by the Rio Dagua?

As long ago as the year 1891, the author planned an expedition to Colombia.[1] Twenty-one years later, during January, February,

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[1] The following letter, in answer to one of inquiry, was received about that time:

U. S. Legation,
Bogota, March 29, 1892.

Prof. C. H. Eigenmann.

Dear Sir:

I am in receipt of your valued favor of the 22d ult. and have carefully noted its contents.

So far as I know, there are only two specimens or kinds of fish in this plain, or nearer it than the Magdalena River, some 80 miles away—that river is quite rich in fish, some of them very large.

The fish of this plain are the 'capitan' and the 'guapucha'—of the former you seem to know something. The latter is a little fellow not over two inches long—I think I can get you some specimens. Perhaps the better way would be to send them home by my wife in August, who could mail them to you from New York. You say in your letter that you send instructions on a separate sheet, but you failed to do so.

March, and part of April, 1912, I travelled through the northwestern part of Colombia collecting fishes for my monograph on the Characins, and for a study of the Panama problem.[2] Cartagena was the point of approach; thence the route taken led to Soplaviento on the Dique, and to Calamar on the Magdalena. From Calamar, the expedition went up the Magdalena River by steamer to La Dorado, collecting at various stopping places. From La Dorado, the route was by rail to the upper part of the Magdalena,

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The best way to pass from the Magdalena to the headwaters of the Orinoco and Amazon is by way of Bogota. Go up the Magdalena to Honda, thence three days by mule to Bogota, thence by a fair road, by mule some five days to the plains of the East. It is not a difficult journey if you are a fair rider. Mules cost on the average five dollars a day apiece. All expenses per day traveling by mule ought not to exceed twelve dollars a day—fifteen dollars is a sufficient estimate. Reduce the fifteen dollars to gold, and you have seven dollars and fifty cents a day in our money. If you should go to the plains, however, you would have to allow something for the outfit. One should take provisions, a bed, a tent, a hammock, spare beasts, two boys, etc., and all these things cost money. The thing is perfectly practicable, however, and can be done without much hardship. In fact, I am seriously thinking of going over to the plains myself in August or September if I can find a companion. Why don't you come down here in July, and possibly I can go with you, though I should not care to promise absolutely. If you come, provide yourself with winter clothing, including heavy flannels and heavy overcoat, for it is often very cold in Bogota. In addition you should have medium and light weight clothing, as a few hours of travel take you from cold to heat and vice versa. Alcohol is expensive, but I have failed to get exact prices. Living is cheap and poor. It doesn't cost much to keep soul and body together. Fare from the coast to Honda is about sixty-five dollars—thirty-two and one-half dollars in gold. The trip to the plains should not be undertaken in the months of March, April, May, October and November, on account of the rains.

I am no naturalist and so should not be of much service to you in that respect. But I am an old and good traveler on these roads and know how to get on and make time, and in that way should be of great assistance.

Bring plenty of quinine in two gr. pills, a good bowel remedy, some good cathartic, a bottle of ammonia for bedbugs, fleas, etc., a good colored blanket, two sheets, a small pillow, a hammock, a cork helmet, thin riding-gloves, a saddle (Whitman saddle to be preferred), bridle, saddle-bags (not too large), and whatever else you wish. Do not be afraid of bringing too much. What you don't need can be left in Bogota, and what you do need you will want dreadfully. It would be well to have a good revolver, about thirty-eight or forty-two caliber. The government does not allow the importation of rifles. If you need one for any reason, we could get one here, I think, for the trip. The country is a safe one and there will be no need of weapons. Life and property are rarely molested. There is no danger in making the trip above the ordinary dangers of traveling. The most to be feared is fever, malarial in its nature, and not dangerous. I have been in the worst climates here, but never was ill a day, though my wife caught the fever once on the Magdalena. The cardinal rules are, when you reach this coast—

1. Eat heartily of the best food you can get, avoiding, when possible, too much grease.
2. Keep your bowels open always.
3. Don't get frightened.

That's all. Please excuse so long and rambling a letter, and believe me,

Sincerely yours,

JOHN T. ABBOTT.

Begun Mch. 29, concluded Apr. 25, '92.

[2] The specific reasons for visiting this region will be more fully set forth in my final report on this expedition.

collections being made on the way at Honda. The upper part of the Magdalena was followed to Girardot, where extensive collections were made. From Girardot, the route led first over the western rim of the plain at an elevation of about 8800 feet to Bogota, on an elevated plain among the eastern Cordilleras; collections were made on the plain at Chapinero, north of Bogota, and at Madrid, near the western margin of the plains of Bogota. A return was made to Girardot, from which a pack train conveyed men and baggage via Chicoral to Quatro Esquinas, Ibagué, Toche, across the Quindio Pass of the central Cordilleras, at an elevation of 11200 feet, to Boquia, Piedra Moler and Cartago near the Cauca River. The Cauca, being too low for the regular steamers, the pack train was used through the Cauca valley via Paila, Buga La Grande, Buga to Cali, collections being made at Paila and at Cali.

By still another pack train the western Cordilleras were crossed. Near Cali the continental divide is at an elevation of 6000 feet. After collecting at Caldas (elevation of 3722 feet), the valley of the Dagua was descended by rail, collections being made at Cisnero (1046 feet), at Cordova (120 feet), and in tide water. Caldas is but forty-nine miles by rail from the coast town of Buenaventura; Cisnero, thirty-three miles; and Cordova, twelve miles.

From Buenaventura, on the Pacific coast of Colombia, a steamer was taken up the San Juan River to Puerto Negria; thence a dugout and a crew of Indians carried the expedition as far as Istmina; collections were made in both the latter places. From Istmina, after a ride of two hours up a little stream, and across the low continental divide (elevation 300 feet above sea level) the valley of the Atrato was entered near Tambo. By dugout the settlement of Raspadura was reached; thence the Raspadura River was followed into the Quibdo River, then the Quibdo River. Collections were made at Boca de Certegai and near the town of Quibdo, at the junction of the Quibdo River with the Atrato. From Quibdo, a specially chartered steamer was taken to Rio Sucio, where additional collections were made. From Sucio, a steamer carried the expedition back to the starting point at Cartagena. During the entire trip not a moment was lost from work on account of illness; but on the way down the Atrato malarial fever appeared and made the journey home unpleasant.

I cannot hope to have exhausted the fauna of this large area. But the large collections made will enable us to formulate properly, if not altogether to solve, the questions of the geographical dispersal and distribution of the fishes of western Colombia.

ACKNOWLEDGMENTS

The reconnaissance outlined above was made possible through the personal cooperation of President W. L. Bryan. The Trustees of the University gave me leave of absence for the purpose of the trip. The entire expenses of the expedition were assumed by the Carnegie Museum on my return.

The first series, including types and uniques of all the fishes collected by me, belongs to the Carnegie Museum; the second series, to Indiana University. The numerous duplicates belong to the Carnegie Museum, and will be distributed, as exchanges, to other museums.

Everywhere along the line of travel, I met with the most courteous cooperation on the part of citizens of Colombia, and on the part of others traveling, or temporarily in residence. Among those that deserve special mention are:

Mr. W. E. H. Diekin, Mr. Thomas Miller, Mr. Harry D. Cutbill, Dr. Felipe Zapata, and Dr. R. A. Salas, of the railroads of Colombia; all of whom furnished me with free transportation. Mr. Henri Banneau, a commercial traveler from Paris, who was familiar with all the traveled parts of South America, became enthusiastic over the fishing. Under his guidance the boat crew on the steamer up the Magdalena secured valuable material. At Honda and about Bogota, he himself entered actively into the work of collecting; and between Calamar and Bogota, he relieved me entirely of the vexatious handling of my baggage. Mr. L. M. Monsanto, of New York, kindly acted as interpreter during the earlier part of the journey. Brother Apolinar Maria, at Bogota, secured me guides to the best fishing places. Mr. Edward H. Mason, of Cali, helped in various ways, both before and after I landed in Colombia. Mr. J. A. Mayolo, of Buenaventura, and the steamship company he represents, granted me special favors; I am further indebted to Mr. Mayolo for letters of introduction, and other courtesies. Others deserving special mention are Manuel Estan, of Caldas; Rodolfo Arriaga and Antonio Asprilla, of Istmina; Ciceron Angel, of Quibdo; and Miguel Soto, Captain of the Neiva. Manuel Gonzales acted as servant and general assistant on the latter part of the trip. After my return he made extensive collections at Puerto Berrio and at Apulo. These have been acquired by Indiana University.

COMPLETE ITINERARY WITH ELEVATIONS AND DISTANCES

Dec. 20, 1911, left Bloomington; Dec. 23, left New Orleans; Dec. 28, reached Panama; Jan. 2, 1912, left Panama; Jan. 3, reached Cartagena; Jan. 8-10, collected at Cartagena; Jan. 11, left Cartagena, 7 A.M., reached Soplaviento, 10 A.M.; Jan. 11-13, collected at Soplaviento; Jan. 13, left for Cartagena, 2 P.M.; Jan. 14-15, at Cartagena; Jan. 16, left for Calamar, 7 A.M.; Jan. 17-18, collected at Calamar; Jan. 19, left Calamar on steamship Neiva, 5 A.M.; Jan. 20, reached Magangué, 3.30 A.M.; mouth of Cauca shortly after noon, collected at Barbosa; Jan. 21, reached El Banco, 9 A.M., tied up against the bank for the night; Jan. 22, reached Bodega Central, tied up at Canaletal for the night; Jan. 23, reached Puerto Wilches, 9 A.M., tied up at Peñas Blancas above Bodega Gualan; Jan. 24, reached Puerto Berrio, stayed for the night, elevation 542 feet; Jan. 26, reached Buenavista;[3] Jan. 27, reached La Dorado,[4] 10 A.M., left 5 P.M. for Honda, elevation 682 feet; Jan. 28, fished in Bernal Creek, near Honda; Jan. 29, fished in Perico and Juarino, about 6 miles below Honda; Jan. 30, left for Beltran (774 feet elevation) on the upper Magdalena, took boat and reached rapids; Jan. 31, at the rapids on the Magdalena; Feb. 1, reached Girardot, 4 P.M., elevation 1036 feet (R. R. Station has an elevation of 1066 feet); Feb. 2, left for Bogota, 6 A.M., passed over an elevation of 8795 feet to Facatativa. (Reiss and Stübel give the elevation of this latter place as 8462 feet; the Colombian National R. R. map gives 8573 feet); Feb. 3, spent the day at the Museum and the American Legation at Bogota, elevation 8564 feet, (Monserrate, behind Bogota, 10463 feet); Feb. 4, collected at Chapinero; Feb. 5, collected in Zerrezuela River. Madrid, elevation 8429 feet; Feb. 6, reached the falls of Tequendama, upper edge, 7741 (Reiss and Stübel), lower edge 7249 (Gros); Feb. 7,

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[3] My notes state that we tied up at shallows for the night either between Puerto Berrio and Buenavista, or between the latter place and La Dorado. I am inclined to think that we spent a night at each of the two places, though I do not definitely remember.

[4] The steamship company's rate sheet is based on the following distances in leguas, kindly furnished by the purser of the SS. Neiva. The legua is 3.1 + miles. Barranquilla to Sitionnero, 6.25; Remolino, 8; Girarda, 13; Piñon, 18; Ceno, 20; Calamar, 21.50; Bija San Juan, 24; Heredia, 26.50; Tenerife, 32; Jesus del Rio, 34; Zambrano, 36.50; Facamocho, 44; Magangué, 53; Banco, 83; La Gloria, 94.50; Gamana, 102; Rodega Central, 107; Badillo, 113; Boca de Rosario, 119; Puerto Wilches, 130; Sagamosa, 132; Bodega Gualan, 137.25; Carare, 147; Puerto Berrio, 162; Nare, 172.50; Buenos Aires, 179; Buenavista, 185.25; La Dorado, 196.75.

packed specimens; Feb. 8, left for Girardot, 7.30 A.M., arrived, 4 P.M.; Feb. 9-11, collected at Girardot; Feb. 12, started for Ibagué. 3 P.M., reached Chicoral, 9 P.M.; Feb. 13, reached Cuatro Esquinas on Rio Gualandai, 11 A.M., collected here, elevation of 1566 feet; Feb. 14, left for Ibagué, 7 A.M.; Feb. 15, collected at Ibagué, elevation 4250 feet; Feb. 16, left, 8 A.M., stopped at Moral, 4 P.M.; Feb. 17, reached Toche at noon, and collected; Feb. 18, reached Volcancito, 4 P.M.; Feb. 19, crossed the Quindio Pass, elevation 11200 feet; Feb. 19, reached Salento, 11 A.M., elevation 6510 feet; reached Boquia, elevation 5725 feet, 1 P.M., and collected in the Rio Quindio; Feb. 20, reached Filandia, 12.30 P.M., and Balsa, 6 P.M.; Feb. 21, reached Piedra Moler, 11.30 A.M., collected; Feb. 22, reached Cartago, noon, and collected, elevation 3012 feet; Feb. 23, collected at Cartago; Feb. 24, started for Cali, delayed at Saragosa; Feb. 25, reached Paila, 6.30 P.M., 31.25 miles from Cartago; Feb. 26, fished till noon, left, 2 P.M., and reached Buga La Grande, 40.75 miles from Cartago; Feb. 27, reached Buga, 64.75 miles from Cartago; Feb. 28, reached La Torre on the Cauca; Feb. 29, reached Cali, about 106.75 miles from Cartago, elevation 3312 feet; Manuel goes to the Cauca to fish; Mch. 1, fished in Cauca River; Mch. 2, fished in Rio Cali, and a small brook; Mch. 3, left for Caldas, 7 A.M., arrived, 7.30 P.M.; Mch. 4, collected at Caldas, elevation 3722 feet, 49 miles from Buenaventura; Mch. 5, collected at Cisnero in Rios Dagua and Pepita, elevation 1046 feet, 33 miles from Buenaventura; Mch. 6, Manuel collected at Cordova, elevation 120 feet, 12 miles from Buenaventura; Mch. 7-8, reached Buenaventura; Mch. 9-10, reached mouth of Rio Dagua; Mch. 11-12, left Buenaventura; Mch. 13, left for Rio San Juan early; Mch. 14, arrived at Puerto Negria, after dark; Mch. 15, fished at Puerto Negria; Mch. 16, left Puerto Negria, 11 A.M., spent night on island La Cruce; Mch. 17, reached Depulcito for the night; Mch. 18, reached Istmina, 5 P.M., fished at night; Mch. 19-20, fished at Istmina; Mch. 21, left Istmina, 7 A.M., stopped at Tambo for lunch, and reached Raspadura; Mch. 22, fished at Raspadura, left, 4 P.M.; Mch. 23, fished near Boca Sertegai Serpide; stayed over night at Manangro; Mch. 24, rained, left, 11 A.M.; Mch. 25, reached Quibdo at noon, fished in afternoon; Mch. 26, fished at Quibdo; Mch. 27, left Quibdo, 4 P.M.; Mch. 29, reached Rio Sucio, 10 P.M.; Mch. 30, fished at Rio Sucio, left, 10 P.M.; Mch. 31, reached the sawmill on the lower Atrato; April 2, reached Cartagena, 1 P.M.; April 6, left on Steamship Alemania, 4 P.M.; April 15, reached New York.

The names of most of the localities mentioned may readily be located on any good map. However, as the best maps of Colombia are but indifferent, the following latitudes and longitudes, determined by Stübel & Reiss are of interest:

	Latitude.	*Longitude.*
Cartagena........	10° 25′ 23″ [5]	
Barranguilla	10° 58′ 42″	70° 51′ 0″
Honda	5° 11′ 6″	74° 42′ 15″
Ambalima	4° 46′ 26″	74° 42′ 15″
Bogota	4° 36′ 11″	74° 1′ 45″
Ibagué	4° 24′ 17″	75° 6′
Neiva	2° 55′ 44″	74° 58′ 30″
Cartago	4° 45′ 12″	75° 52′ 30″
Buga	3° 54′ 5″	76° 10′ 45″
Cali	3° 27′ 10″	76° 23′ 30″
Popayan	2° 26′ 35″	76° 24′ 45″

[5] About 5° 2 north S. & R.

Descriptions of Genera and Species

XYLIPHIUS gen. nov.

A genus of Bunocephalinae. Mouth inferior; lower lip with a series of antrorse fringe-like papillae, screening the mouth. Not greatly expanded at the shoulder, the width at the pectoral spine equal to its distance from the snout. Eyes minute, distant from snout as far as the interocular space. Anterior nares not quite marginal. Hitherto the Aspredinidae have not been recorded from Colombia.

1. **Xili hius magdalenæ** sp. nov.

Head to gill-opening 5 in the length; depth 7; D. 5; A. 7.

Head about as wide as long; eyes minute, about half the diameter of posterior nares, maxillary barbel not quite reaching pectoral; about 20 labial papillae. Coracoid processes 2 in the intercoracoid space. Distance from snout to dorsal 2.33 in the length; ventrals just reaching anal; pectoral spine short, as long as its distance from the barbel, four strong hooks on its posterior margin, the spine prolonged in a soft tip reaching nearly to middle of ventrals. Caudal obliquely truncate. Head without distinct ridges; skin slightly warty except on belly.

Light brown; tips of all the fins light.

Type, 32 mm.; Girardot, C.M. No. 4829.

2. **Bunocephalus colombianus** sp. nov.

Head to gill-opening 5.5; depth 6.5-7.5; D. 5; A. 8, in type, 9 in cotype; snout 1.5 in interorbital; distance of dorsal from snout, $2\frac{1}{6}$-$2\frac{1}{3}$ in length; maxillary barbels extending beyond base of pectorals; coracoid process 1.5-1.6 in the space between its tips; pectoral spine strong, curved, several small hooks along its posterior margin, its filiform prolongation reaching the ventrals; caudal margin rounded; tail subcylindrical; tail, and body to the dorsal, with numerous warts arranged in longitudinal series, much smaller warts on belly and before dorsal; a strong occipital crest diverging forward to the eyes; width at base of pectorals 1.5-1.4 in distance from snout to dorsal.

Tips of all the fin rays light; upper caudal ray barred; ventrals and anal, anteriorly, mottled. General color black, with faint mottlings.

Type, 89 mm., Raspadura, C.M. No. 4828.

Paratype, 103 mm., Quibdo, I.U.M. No. 12687.

3. **Hemiancistrus mayoloi** sp. nov.

Head 3; depth 7.5; D. 8, its last ray minutely attached; A. $5\frac{1}{2}$; scutes 22 or 23; eye 4.5-5 in snout, 7.5-8 in head, 3 in interorbital; mandibular ramus 3 in interorbital; width of head 1.33 in its length, its depth 2.25.

Head and scutes without ridges; interopercle with over thirty-five spines, mostly strong, with recurved hooks, some of the marginal spines of anterior half in the form of long, curved bristles, the longest spines and bristles, in type, about one-fourth length of head, mostly shorter in paratypes. Six scutes between dorsal and adipose, 10 + 2 between anal and caudal; supraoccipital bordered by three plates, the first median scute forming most of the border. Head ventrad and abdomen naked.

Rays of all fins with spots which tend to form bars, especially on caudal.

For Mr. Mayolo, of Buenaventura, Colombia.

Type, 125 mm., Istmina, C.M. No. 4826.

Paratypes, five specimens, Istmina, C.M. No. 4827 a-b; I.U.M. No. 12688 a-c.

4. **Hemiancistrus daguæ** sp. nov.

Head 3-3.2; depth 7; D, 1.8 in eleven specimens, 1.9 in thirty-two specimens; A. 5; plates 24 or 25; width of head nearly equal to its length; eye 5.5-6.5 in snout, 9-10 in head, 2.5-3 in interorbital; mandibular ramus very little less than interorbital width.

Scutes without keels; occipital without keel, bordered by 3 plates; preopercular spines usually not completely revertible, longest spine 2.5 in head in a few specimens, usually shorter. Margin of head and preopercle without bristles. Last dorsal ray but feebly attached, tip of last ray sometimes reaching adipose; length of base of dorsal equal to its distance from the caudal or less. Pectoral ray reaching to the ventral or to near its middle; ventrals to the anal, or slightly beyond base of its last ray.

Very dark; rays of all the fins spotted, the spots on the dorsal and caudal rays smallest and most numerous; some specimens with the fin markings much fainter; the spots in the smallest specimens less numerous.

Type, 79 mm., Caldas C.M. No. 4842.

Paratypes, thirty-four specimens, largest 95 mm., Caldas C.M. No. 4843 a-g, I.U.M. No. 12698 a-g.

Paratypes, eight specimens, Cisnero, C.M. No. 4844 a-d, I.U.M. No. 12699 a-d.

5. **Lasiancistrus caucanus** sp. nov.

Head 2.75; depth 5; D. 8, its last ray but feebly attached to the adjoining scute; A. 5.5; scutes 24; seven scutes between dorsal and adipose, ten between anal and caudal; eye 5.5 in snout, 9 in head, 3.75 in interorbital; width of mandibular ramus 3.33 in interorbital; width of head 1.3 in its length, its depth 2.2. Head and scutes without ridges; interopercle with over twenty spines, the longest nearly one-third as long as head, anteriorly with long bristles, the longest bristle nearly as long as the longest spine; snout with bristles laterally, which may be very minute or as long as eye; supraoccipital bordered by three plates[6] which are about equally in the border. Pectoral spines extending beyond middle of ventrals Fins nearly black (adult), the caudal narrowly margined with lighter. Body very obscurely marbled. In young the fins, except caudal, with faint markings on the rays.

Type, 171 mm., Cartago, C.M. No. 4824.

Paratypes, eight, 105-175 mm., same place, C.M. No. 4825 a-d; I.U.M. No. 12683 a-d.

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[6] In one specimen by a single plate.

6. **Loricaria gymnogaster** Eigenmann and Vance sp. nov.

Head 4.8; depth 9.3; depth of head at base of occipital about half its greatest width, which is 1.25 in its length. Eye 3.5 in snout; 6.5 in head, 1.6 in interorbital; D. 1.7; A. 1.5. Scutes 18 + 12; width at base of last anal ray 4 in its distance from the caudal.

Lateral keels prominent; the occipital with a single short serrate keel on its posterior half; the two median plates following it, each with two serrate keels. The occipital bordered by three plates behind. The lateral plates of the nape each with a serrated keel. Orbit without a notch, its upper margin spinulose. Belly naked, in the adult, except for a few granules on the sides and in front of the anus, and sometimes on the breast; entirely naked in young. Lips fringed with papillae, the lower lip broad, with fringed papillae increasing in size to mouth. Three or four teeth on each side of the lower jaw, the same number in the upper jaw. Dorsal spine in adult equal to its distance from the anterior margin of the nares, the rays rapidly decreasing in height. Dorsal spine not so high in the young. Pectorals with the outer ray extending to the second third of the ventral, about equal to the head in length. Outer ventral ray thick, reaching about to the middle of the anal. Caudal emarginate, the lower ray but little produced, about twice as long as middle rays; the upper ray very greatly produced, more than twice the length of the rest of the fish. Five obscure dark cross-bands, the first across the nape, the second just behind the dorsal. In the small specimens the bands are more conspicuous and a narrower fifth band extends obliquely downward and forward from the base of the second and third dorsal rays. In the young the margins of the bands are frequently more intense than the center and a line behind the bands is frequently much lighter than the rest of the interspace. Dorsal uniformly spotted with faint quadrate spots. Caudal dusky at base and with two more or less distinct, dark bands, the last of which is at the margin, sometimes additional bands across the caudal lobes; the outer caudal rays barred. Anal with one or two faint cross-bands, both frequently above the middle of the fin. Ventral with three or four similar bands. Pectorals with more numerous and less regular bands.

Type, 182 mm. to base of caudal (upper caudal filament about 480 mm.). Apulo, I.U.M., No. 12691.

Paratypes, 7 specimens. Apulo, I.U.M., No. 12692.

Paratypes, 41 specimens. Girardot, C.M. No. 4839 a-j; I.U.M., No. 12693 a-j.

7. **Loricaria fimbriata** Eigenmann and Vance sp. nov.

Head 4.25; depth 10; dorsal 8; anal 6; lateral plates 20+10 or 11; eye 2.7 in snout, 5.3 in head, 1 – in interorbital. Width at last anal ray 5 in its distance from the caudal; width of head 1.4 in its length. Head moderately depressed, stigate occipital, with a pair of serrated keels, bordered by three plates. Plates of anterior part of body strigate and keeled. Lips broad, anterior with short, fleshy, marginal tentacles, the posterior papillose and with slender marginal fringes. A few granular plates along the middle of the belly, inconspicuous marginal plates at the sides. Lower surface otherwise naked. Pectoral truncate when opened, the outer ray not prolonged, reaching to the ventrals. Outer ventral ray slightly produced, the rest of the margin of the fin rounded. Dorsal truncate, the tips of the rays reaching equidistant when the fin is depressed. Upper caudal filament about equal to distance from snout to dorsal. Dorsal rays, each with about seven obscure spots. Caudal with narrow undulating bars of black and white. Pectorals colored like the dorsal, ventrals dusky, anal hyaline. Five obscure cross bands in the type. Five teeth in the upper jaw, eight in the lower.

Type, 114 mm. over all. Length to base of caudal, 84 mm. Boca de Certegai C.M., No. 3808.

Paratypes, 2 specimens, the largest 52 mm. over all. Bernal Creek C.M., No. 3809; I.U.M., No. 12714. The paratype differs from the type in having seven obscure cross bands. The caudal blackish at base and at its margin. Ventrals with two cross bars. Lips simple, not fringed. About 3 teeth in the upper jaw and about 6 in the lower.

8. **Loricaria filamentosa seminuda** Eigenmann and Vance subspecies nov.

Loricaria filamentosa was described by Steidnachner from the lower Magdalena. I secured five specimens from Soplaviento. C.M. No. 3804 a-b; I.U.M. No. 12694 a-c, and one specimen from Calamar C.M. No. 3805.

The width of the body at base of last anal ray is contained 5-5.5 in its distance from the caudal. The anal buckler is made up of from 17-25 plates. The plates of the ventral surface form a complete armature, which is composed of the very wide lateral plates and two rows of median plates. Between the pectorals the median plates split up into a large number of small plates.

A single specimen from Girardot, C.M., No. 1307, measuring 182 mm. to base of caudal, differs from the above. The median plates of the ventral surface are much smaller, leaving a naked area between them and the lateral plates. In other respects this variety is like the typical specimens.

9. **Loricaria filamentosa latiura** Eigenmann and Vance subspecies nov.

Twelve specimens from Bocade Certegai C.M., No. 3806; I.U., No. 12695, differ from the typical *filamentosa* very notably in the width of the body and tail. The width at base of last anal ray is contained but four times in the distance of its base from the caudal. The anal buckler is, on an average, composed of fewer plates. The number usually runs from 14-18, but in one example reaches 25.

10. **Cyclopium chapmani** sp. nov.

Distinguished from all other species by the broad incisors of both upper and lower jaw combined with the presence of a small spine in the adipose. Found associated with *marmoratum*.

Head 4; depth 7-8; D. 7; A. 7; eye minute, scarcely distinguishable, about 10 in head; interocular less than distance between eye and posterior nares; nareal flap triangular, produced in a small barblet; barbel just reaching gill opening when laid straight back or a little shorter; pectoral about reaching middle of ventral, the spine with its filament equal to the length of the head; origin of ventrals nearer the tip of the snout than the dorsal, reaching half way to anal; anus three-fourths the distance, from origin of ventrals to anal; anal reaching little more than half way to caudal in the type, somewhat further in some of the paratypes; dorsal spine equals head less prenasal region, scarcely projecting beyond the rest of the rays; adipose scarcely evident, a distinct spine. Tips of the teeth of the outer rows of both premaxillary and mandible in the largest very broad, incisor-like, the middle ones of both jaws tending to become bilobed, the bilobed teeth in smaller specimens more numerous; distance between snout and dorsal 2.5 in the length; distance of last dorsal ray from caudal 5.66-6.5 in the length.

Nearly black, or marbled, or with a band behind the adipose, caudal with a dark median band.

Type, 75 mm. Boquia C.M. No. 4863.

Paratypes, five specimens Boquia. C.M. No. 4864 a-b, I.U.M. No. 12708 a-c.

This species differs from *homodon* in its feeble adipose spine, length of barbels, character of teeth and color.

11. **Cyclopium trifasciatum** sp. nov.

Distinguished from the other species of the genus by its low dorsal, short barbel, anterior and short ventrals, etc.

Head about 3.5; depth 6; D. 7; A. 7; interocular 4-5; distance between eye and posterior nares 3 in the head; nasal flap forming a nearly equilateral triangle in the adult, comparatively broader at the base in the young; barbel reaching to about opposite the end of the lips; pectorals very broad, with 12 rays, rounded, the outer ray slightly produced, about equal to length of head less prenasal space, the filament about reaching middle of the ventrals; the pectoral rays extending considerably beyond origin of ventrals; origin of ventrals considerably in front of the vertical from the front of the dorsal; outer ventral ray thickened but not prolonged beyond the line of the general margin of the fin, reaching about two-thirds to the anus; anal in the female rounded, in the male with a deep notch behind the second ray, the fifth and sixth rays prolonged and thickened, reaching base of caudal; caudal obliquely emarginate, the outer rays but slightly produced; adipose a short ridge, 5 in the length, terminating in a movable spine attached to the back by a thin membrane; dorsal low, the first ray scarcely produced, not reaching the tip of some of the posterior rays when depressed, 1.7-2 in the head; outer teeth of the premaxillary narrow spatulate, pointed in the young, those of the lower jaw bicuspid.

Very young yellow with a black band across the head, another across the back at the base of the dorsal, another across the anterior part of the adipose and the back just in front of it and another across the end of the caudal peduncle. The yellow interspaces reduced to light bands and gradually disappearing with age. A few of the smaller specimens without traces of bands. The light space between the last dark bands remains longest and is more conspicuous but this also becomes obscured and sometimes disappears; margin of caudal rusty, a submarginal dark band made up of spots, the base dusky, the space between the submarginal band and the base light. Dorsal faintly spotted.

Type, a male, 85 mm. Caldas. C.M. No. 4868.

Paratypes, forty-six, about 21-80 mm., mostly females. Caldas. C.M. No. 4869 a-n, I.U.M. No. 12711 a.n.

Paratypes, fifteen, the largest 84 mm. Cisnero. C.M. No. 4870 a-h, I.U. No. 12712 a-g.

12. **Cyclopium unifasciatum** sp. nov.

Allied to *C. trifasciatum*, differing in the length of barbels, the length of ventrals, the nature of the nasal barbels and the color.

Head 4, depth 6; D. 7; A. 7; interocular 3.5-4 in the head, nearly equal to the distance between eye and nares. Nasal flap broad, its outer angle prominent but not produced into a distinct barbel, its outer margin about equal to the interorbital; barbel not quite reaching gill opening; pectoral broad, its divided rays extending about to the ventrals, the filament about equal to the length of the head, extending beyond the base of the ventral; ventral short, lanceolate, its outer ray slightly produced, reaching three-fourths or more to the anus, its origin slightly in advance of the vertical from the front of the dorsal; anterior anal rays in the female extending slightly beyond the tip of the later ones when the fin is closed but not extending to the caudal, the anterior ones of the male not extending to the tip of the later ones, a broader membrane between the second and third ray in the male; outer rays of the caudal distinctly produced; adipose a low ridge 3.5 in the length, ending in a free, movable spine which is attached to the back by a thin membrane; dorsal low, the rays extending to about the same point when the fin is depressed, except the first one, which is slightly prolonged, not quite equal to the head in length; distance between dorsal and snout about 2 in the length; outer teeth of the premaxillary pointed, color very variable; lightest colored ones reddish yellow, with a few dark spots and marblings, the darker spots and color as a rule increasing with age; usually a light band, clear or marbeled, from the posterior portion of the spine of the adipose and the back of the caudal peduncle obliquely downward and forward; always a small black spot at the base of the spine. This spot conspicuous in the light colored individuals but merging with the dark color of the back in the darker individuals.

Type, a male, 57 mm. Caldas. C.M. No. 4871.

Paratypes, seventy, the largest a female, 68 mm. Caldas. C.M. No. 4872 a-p, I.U. No. 12713 a-p.

13. **Cyclopium ventrale** sp. nov.

Allied to *C. marmoratum*.

Head 4-4.33; depth 5 in male, 6 in female; D. 7; A. 6; interorbital a little over 4 in the head, less than distance between eyes and nares; nasal flap broad, its outer angle produced in a barblet, flap and barblet about equal to interocular; barbel not quite reaching gill opening or a very little beyond; pectoral broad, rounded, the divided rays not reaching ventral, its outer ray abruptly produced, 3.5-5 in the length, reaching to origin or third fifth of ventrals; origin of ventrals below the first or third dorsal ray; ventrals lancet shaped, reaching slightly beyond the anus in both the largest male and the largest female; anal short, lower in the male than in the female, the first and still more the second membrane wider than the rest, the last rays being crowded together, not notably prolonged; distance of last anal ray from caudal five and one-half to six in the length; adipose a low fold, about a third of the length, terminating in a small movable spine attached to the back by a membrane; dorsal very low, the first ray slightly produced, 1.5 to 1.25 in the head, the remaining rays subequal, the tip of the second usually not extending to the tips of some of the following ones, the second ray half the length of the head behind anterior nares; distance between dorsal and snout about 2.6 in the length; outer caudal rays produced, the fin otherwise lunate; outer teeth of the premaxillary slender, pointed, those of the lower jaw nearly equally bilobed.

Blackish, faintly marbled in adult, more distinctly so in the young; base of caudal dark, faint cross-marblings on the rest of the fin.

Type, a male 76 mm. over all, Caldas, C.M. No. 4866.

Paratype, a female 75 mm. over all and thirteen smaller specimens both male and female from Caldas in the Dagua and a small tributary C.M. No. 4867 a-g, I.U.M. No. 12170 a-g.

Paratypes, seven specimens, the largest 38 mm. Istmina, C.M. No. 4865, I.U.M. No. 12709.

This species associated with *C. trifasciatum* can readily be distinguished by the nasal barblet, the longer barbel, different ventral and position of the ventrals.

The small specimens from Istmina were taken from a minute rivulet. The contrast between the light and dark marbling is much greater than in the Caldas specimens. The nasal barbels are more prominent. Regan has recently described a *Cyclopium (cirratum)*[7] from Condoto. It is possible that this is *ventrale*, in which case the present species should go by the name, *C. cirratum*.

14. **Megalonema xanthum** sp. nov.

Head 3.75; depth 5.33; D. 7; A. 3.9; eye 5 in head, 1.25 in interocular, slightly nearer margin of opercle than to tip of snout.

Elongate; profile steep and nearly straight. Head covered with thin skin; occipital process narrow, not extending half way to dorsal, an interneural intervening between it and the dorsal; top of head with some reticulating canals; depth at base of occipital crest slightly more than snout and eye; head a little wider than deep; eye with a free, oval orbital rim; snout projecting, equal to orbital diameter, or two-thirds that. Teeth in very narrow bands, the upper band narrowed at middle, almost separated into two patches, without retral angles; teeth of upper jaw movable, slightly larger than those of lower jaw, which are a little firmer.

Fourteen rakers on the lower arch. Branchiostegal membrane free from the isthmus, overlapping mesially; maxillary barbel extending nearly

[7] Proc. Zoöl. Soc. London, 1912, 670.

to end of adipose (to caudal in some smaller examples); the mental barbels are disposed as two pairs, the outer extending past middle of ventrals (to base of last anal ray in some younger, the anterior pair past middle of pectorals (to ventrals in some younger).

First dorsal ray very high, greater than head and humeral process, the fin thence rapidly lower, the last ray about 4 in the first; adipose beginning at or before tip of last dorsal ray, reaching its maximum height above tips of ventrals, its base 2.5-2.6 in the length, its height nearly equal to two orbital diameters; caudal deeply forked, upper lobe the longer, 3.5 in the length; anal short, emarginate, tip of first branched ray extending past tip of last ray, equal to snout and eye. Ventrals very large, the outer rays very heavy, longer than head; pectorals broad, falcate, reaching ventrals in the young, not in the old.

Plumbeous, yellow in life.

Type, 202 mm., Girardot, C.M. No. 4822.

Paratypes, many specimens, Girardot, C.M. No. 4822 a-j; I.U.M. No. 12681 a-j.

Paratypes, many specimens, Apulo, I.U.M. No. 12682 a-z.

15. **Hemicetopsis othonops** sp. nov.

Allied to *plumbeus*.

Head 4.5; depth 4-5.5; D. 7; A. 26; V. 6 or 7; eye 6.5.

Subcylindrical, compressed backward. Mouth subterminal, the snout projecting; premaxillary with a series of small, conical teeth; mandible with two or three irregular series of similar teeth in front, a single regular series on sides; vomer with a single series of about 24 teeth, somewhat heavier than those of the jaws, conical. Gill-opening large, two-fifths of it above the upper ray of pectoral; distance between posterior nares about 1.5 in distance between the anterior. Pectoral pore large; lateral line simple, straight. Distance of dorsal from tip of snout a little more than 3 in the length; first dorsal ray distinctly higher than second, prolonged in a filament, the last ray less than half as high as second. Caudal forked, less than one-fourth of the length; anal rays gradually decreasing backward; inner ventral ray adnate for most of its length; filament of first pectoral ray nearly, or quite, reaching ventrals.

Plumbeous above, silvery on sides and below.

Type, 120 mm. Girardot, C.M. No. 4830.

Paratypes, twenty-seven specimens from Girardot, C.M. No. 4831 a-j; I.U.M. No. 12684 a-j.

Paratypes, thirty-eight specimens, Apulo, I.U.M. No. 12685 a-j.

Paratypes, three specimens, Cauca near Cali, C.M. No. 4832 a-b; I.U.M. No. 12686 a.

The Cetopsinæ have hitherto not been recorded from the Magdalena basin.

16. **Pygidium bogotense** sp. nov.

On the plains of Bogota, at an elevation of nearly nine thousand feet, there are known to occur two species of fishes, the "Capitan" Eremophilus and the "Guapucha" Grundulus[5]. Both were discovered by Humboldt. The guapucha has recently been redescribed as Ctenocharax by Regan. (Ann. and Mag. Nat. Hist. (7), xx, 402, 1907.)

I secured large series of both of these species, and, in addition, a new species of Pygidium. This species reaches a maximum length of 80 mm. To forestall the suggestion that this species may be the young of Eremophilus, I may say that I have specimens of equal length of both species.

Head 6; depth 6-9; D. 10; A. 9; eye 2.5 in the snout, 6 in the head, 1.66 in interorbital; width of head not quite equal to its length; upper pectoral ray not quite equal to length of head; origin of anal below end of dorsal, of dorsal above middle of ventrals, equidistant between tip of caudal and anterior edge of eye. Caudal very broad, shorter than head, rounded. Maxillary barbel not reaching beyond base of pectoral, usually shorter, nasal barbels to base of opercular spine.

Sides and back variously spotted.

Type, 75 mm., Chapinero. C.M. No. 4820.

Paratypes, two hundred thirty-nine specimens, same locality, C.M. No. 4821 a-z; I.U.M. No. 12679 a-z.

Paratypes, six specimens, Madrid, C.M. No. 4834 a-d; I.U.M. No. 12680 a-c.

17. **Pygidium caliense** sp. nov.

Head $4\frac{7}{8}$; depth 7; D. 8.5; A. 6.5; eye 3 in snout, 8 in head; interorbital equals distance from eye to nasal barbel; head nearly as wide as long. Upper pectoral ray prolonged in a filament, not quite as long as head. Origin of anal slightly in advance of end of dorsal; origin of dorsal over middle of ventrals, equidistant from tip of caudal and opercle; caudal rounded; maxillary barbel extending to end of opercular spines, nasal barbel an ocular diameter beyond the eye. Sides and back with small, round black spots. Type unique, 53 mm., Cali, C.M. No. 6819.

18. **Pygidium chapmani** sp. nov.

Head 5-5.75; depth 6-7.5; D. 10; A. 7-8; eye 4 in snout, 8 in head, 2.5 in interorbital in adult (2.5, 5.5, 2 in young), width of head equal to its length in the young, narrower in adult; upper pectoral ray about as

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[5] Regan has in several papers recorded other species as coming from Bogota. *Crenicichla geayi* is said to have been taken by Cutter near Bogota, *Pyrrhulina semifasciata*, and *Copeina eigenmanni* by Cutter at Bogota. These species were in all probability taken in the Orinoco valley at the base of the Andes east of Bogota and shipped to the British Museum from Bogota. They certainly were not taken in the elevated plains about Bogota. Several of the species recorded by Regan as having been taken by Leighton at Honda are under similar suspicion. It is to be hoped that Mr. Regan will give us complete lists of the species collected by Cutter and by Leighton, together with such records as may be in the possession of the British Museum. Such lists, even if other data are not authentic, will probably enable us to determine with a fair degree of accuracy the probable origin of the specimens.

long as the head; origin of anal below posterior part of dorsal; origin of dorsal over tip of ventrals, or sometimes middle of ventral in adult, a little further forward in young when it is equidistant from tip of caudal and opercle; caudal rounded. Maxillary barbel reaching just beyond base of pectoral, nasal barbel to near base or tip of opercular spines.

Smallest with a black lateral band, a series of spots developing, with growth, above and below it, the band itself breaking up into spots in specimens over sixty millimeters long. Oldest quite dark, with faint spots and mottlings.

Type, 106 mm., Boquia, C.M. No. 4817.

Paratypes, thirty-three specimens, Boquia, C.M. No. 4818 a-i; I.U.M. No. 12678 a-j.

19. **Pygidium banneaui** sp. nov.

Head 5.33-5.5; depth 5.5-7; D. 10; A. 7; eye 2-2.5 in snout, 5.5 in head, 2 in interorbital; width of head nearly equal to its length; upper pectoral ray prolonged in a filament, as long as head; origin of anal slightly in advance of end of dorsal; dorsal entirely posterior to ventrals, the first ray nearer tip of caudal than tip of snout by the entire length of the head or less; caudal emarginate; maxillary barbel reaching to near middle of pectoral, nasal to end of opercle.

Smallest with a black line from snout to middle of caudal, which in larger ones breaks up into spots, with additional spots appearing on back; in largest examples the sides and back are profusely spotted, the spots varying in size in different individuals.

Type, 44 mm., Bernal Creek, near Honda, C.M. No. 4815.

Paratypes, eighty-eight specimens from same place, C.M. No. 4816 a-z; I.U.M. No. 12677 a-z.

This species was very abundant in the fine gravel and under small stones.

For Mr. Henri Banneau, of Paris, France.

20. **Curimatus atratoensis** sp. nov.

Head 4.33; depth 3; D. 11; A. 9; scales 5.5-38-5; eye 1 in snout, 3.4 in head, 1.4 in interorbital.

Readily distinguished by the coloration. A conspicuous black band from snout through eye and opercles, along lateral line to end of middle caudal rays, bordered with light color above and below. Back dark, with dark zigzag lines between the rows of scales; two or three similar lines below lateral band, the second the most prominent, otherwise silvery below lateral band. A dorsal spot obliquely extending from front margin of the fin to its base at the fifth to seventh rays.

Type, 105 mm., Quibdo, C.M. No. 4814 a.

Paratypes, many specimens, Quibdo, C.M. No. 4833 a-j; I.U.M. No. 12676 a-k.

PARASTREMMA gen. nov.

A genus of the Rhoadsinae. General features of Astyanax.

Premaxillary with an outer series of two conical teeth, the seven to nine denticles of each tooth of the inner series of about equal size; maxillary with two similar serrate teeth and about fifteen conical teeth scattered along its entire margin; dentary with about six teeth similar to those of the inner premaxillary series, the outermost one much smaller followed on sides by six canines of which the first and last are small, the other four very large, recurved, on the elevated margin of the dentary. Lateral line complete; adipose fin well developed; origin of dorsal near middle of body.

21. **Parastremma sadina** sp. nov.

Description of the type.

Head 4.6; depth about 2.5; D. 11; A. 30; scales 11-61-10; eye 1 in snout, 3.5 in head, a little less than 2 in the interorbital.

Compressed; dorsal and ventral profiles equally arched, ventral and dorsal areas rounded; predorsal line in part naked, predorsal scales about 20. Head subconical, snout blunt, extending slightly beyond mouth; skull arched in cross section; frontal fontanel short, triangular, about twice as long as its width; occipital process bordered by about 5 scales on each side, extending about one-sixth the distance from its base to the dorsal; cheek triangular, entirely covered by the third suborbital; preopercle prolonged, rounded below; mouth large, maxillary-premaxillary border angulate, as long as snout and eye; maxillary slender, extending to or beyond suture between second and third suborbital. Dentition as described for the genus.

Gill-arches short, 6 + 8 rakers, the longest raker 4 in the eye.

Origin or dorsal midway between snout and caudal, the fin pointed, extending to midway between its end and middle of the adipose fin. Caudal lobes about 4 in the length; anal long, its origin on a vertical from the last dorsal ray, its second to sixth rays forming a slight lobe, thence graduated; ventrals not reaching anal; pectorals narrow, not reaching ventrals.

Scales cycloid, with few diverging striae; upper part of sides with scales regularly imbricate, below lateral line slightly less so; caudal naked; a series of very small scales along base of anal anteriorly; a large axillary scale; lateral line straight and complete.

A large subcircular spot on caudal peduncle; double humeral spots, vertically elongate, one across third and fourth, the other across tenth and eleventh scales of the lateral line; fins without black markings.

Type, 136 mm., Istmina, C.M. No. 4812.

Paratypes, twenty-two specimens, Istmina, C.M. No. 4813 a-e; I.U.M. No. 12675 a-f.

This species is locally known as "Sadina."

ACESTROCEPHALUS Eigenmann.

Hitherto known from a single specimen preserved in the Vienna museum. Allied to Oligosarcus, shaped like Acestrorhynchus.

Origin of dorsal about midway between snout and caudal. Anal long, its origin below posterior part of dorsal. Snout long, pointed; maxillary extending to below posterior margin of eye, or further, with a single series of recurved teeth along its entire margin, no canines; premaxillary with four canines, the first and last in a line with the irregular series of conical teeth, the second and third within the outer series (forming a second series); dentary with three canines, the third one in a line with a series of small, conical teeth, those in front of the canine separated from it by an interspace and smaller than those behind it which are retrorse; the two front canines form a second series in front of the series of minute, inner teeth. All the teeth conical. Palatines with a sharp ridge, but without teeth.

Scales ctenoid. Lateral line complete. No rakers on the upper part of the upper gill-arch.

22. **Acestrocephalus anomalus** (Steindachner).

Head 3.66; depth 4.2; D. 11; A. 35; scales 11-75-9; eye a little less than snout, 3.6 in the head, 1 in the interorbital.

Long and slender, the snout pointed; no depressions or humps in the profile; postventral area more or less compressed, the preventral area broadly rounded; dorsal areas rounded; no distinct median series of scales on back or belly.

Lower jaw included; fontanels well developed, narrow; third suborbital leaving a very wide naked area below, which gradually narrows upward. Many (33) flat, triangular, recurved teeth on the maxillary; premaxillary with four teeth between the first and second canines, three between the second and third, and two between the third and fourth, the first canine the largest; about nine small, conical teeth in the series behind the two anterior canines, twenty-five or more in the series following the third canine; canines of the lower jaw about equal to the largest of the upper jaw. Gillrakers very few, 2 + 4, no rakers on the upper three-fourths of the upper arch or the anterior half of the lower arch.

Dorsal pointed, equal to head less opercle; caudal about as long as the head; anal basis long, its margin nearly straight. Ventrals not reaching the anal, pectorals to the ventrals.

Scales all ctenoid, regularly placed; fins naked except a series of scales well separated from the scales of the sides, along base of anterior half of the anal; axillary scale well developed. Lateral line but slightly decurved, complete.

A narrow slivery band ending in a dark spot on the base of the caudal.

GENYCHARAX gen. nov.

A genus allied to the Tetragonopterinae on the one hand, and to Exodon on the other. Its mouth a duplicate of that of the Tarpon.

Origin of dorsal midway, or but slightly behind midway, between snout and caudal. Anal comparatively short, its origin behind the vertical from last dorsal ray. Pectorals not overlapping ventrals. Mouth large, oblique, the tip of the lower jaw entering the profile, the dentary teeth engaging the outer series of the premaxillary teeth. Maxillary very large. A few teeth in a single series on the upper part of the maxillary. Premaxillary with two series of teeth, those of the outer series numerous, small, forming a compact series directed forward and slightly upward. Teeth of the inner series much larger (not more than 6) and fewer, directed downward. Dentary with about 6 large, recurved teeth in the transverse series, the series continued on the sides by over 20 graduate, incurved teeth. Teeth all unicuspid, triangular.

Lateral line complete. Adipose fin well developed.

Type, the single known species.

23. **Genycharax tarpon** sp. nov.

Head 3.4; depth 2.75-3; D. 11; A. 23-25; scales 10 to 12-56 to 68-10 to 12. Eye equal to snout, 4 in the head; interorbital 3-3.5 in the head.

Elongate, subrhomboidal; profile depressed over the eyes. Ventral and predorsal regions rounded, without distinct median series of scales. Interorbital broad; frontal frontanel triangular, 1.5 in the parietal, as wide as latter at its posterior end. Maxillary extending beyond the second suborbital, to below the posterior edge of the head. Third suborbital in contact with the preopercle behind, leaving a wide naked area below. Four maxillary teeth; about sixteen teeth in front row of premaxillary, six in second row (one tooth between the outer ends of the two rows); about twenty-eight teeth in the dentary. Gill-rakers 6 + 11, the longest nearly half length of eye.

Dorsal small, its highest rays not reaching half-way to the caudal. Lower caudal lobe a little the longer, equal to head less opercle; anal rather low, but slightly emarginate, the tip of the highest ray reaching but little beyond the base of the lowest, somewhat beyond the middle of the fin. Ventrals not reaching the anal; frequently not beyond the anus. Pectorals sometimes reaching the ventrals, usually much shorter.

Fins all naked; only a sheath of one row of scales along base of anal anteriorly. Axillary scale well developed, but short. Scales all cycloid, not conspicuously regular in arrangement. Lateral line decurved to above last fourth of the pectorals, thence straight.

A plumbeous lateral band, slightly expanded upon the caudal peduncle, but only faintly, or not, continued on the caudal fin; a vertically elongate humeral spot; anal and caudal lobes yellow or orange.

Stomach very large, (distended with locusts) coecal, about seven large, pyloric coeca. Entire canal not quite equal to the total length. Air-bladders large, the anterior subcubical, one-half longer than the eye, about four-tenths the length of the conical, posterior bladder.

A game fish of the upper Cauca river.

Type, 174 mm., C.M. No. 4808, Cartago.

Paratypes, eleven specimens, Cartago, C.M. No. 4809 a-c; I.U.M. No. 12672 a-d.

Paratypes, three specimens, Paila, C.M. No. 4810 a-b; I.U.M. No. 12673 a.

Paratypes, eleven specimens, Cauca river at Cali, C.M. No. 4811 a-c; I.U.M. No. 12674 a-c.

GEPHYROCHARAX gen. nov.

Between Paragoniates and Hysteronotus, thus allying the Teragonopterinae with the Agoniatinae.

Premaxillary teeth in two distinct series, five teeth in the inner series. Second suborbital covering the entire cheek. Caudal without glandular scales, the lower caudal fulcra free and forming a peculiar spur in the male. Adipose fin present. Origin of dorsal nearer to caudal than the eye, considerably behind the vertical from origin of anal, pectorals large, overlapping the ventrals.

Evidently allied to Hysteronotus, from which it differs in the dentition, and the peculiar caudal. Represented by three species, two from the Atlantic, the other from the Pacific side of the western Cordilleras.

Type, *Gephyrocharax chocoensis* Eigenmann.

24. **Gephyrocharax chocoensis** sp. nov.

Head 4.66-5; depth 3-3.25; D. 10; A. 30; scales 6-42-4.5; eye .75 in snout, 3 in head, 1.2 in interorbital.

Compressed; ventral profile regularly arched; dorsal profile to dorsal much more gently arched, slightly depressed over the eye. Predorsal area rounded, having about seventeen scales not forming a regular series; preventral surface narrowly rounded, postventral trenchant; breast broad, but with median ridge. Frontals meeting in a sinuous suture; no frontal fontanel; parietal fontanel rhomboidal as in Hysteronotus. Third suborbital covering entire cheek. Maxillary-premaxillary border angulate, about $2\frac{1}{3}$ in length of head; maxillary with a single tooth; premaxillary with an outer series of four and an inner of five teeth; dentary with four or five large teeth, followed by abruptly minute teeth. Gill-rakers 4 + 11, all very short, those of the upper arch mere points.

Dorsal rounded or truncate, the highest ray extending little beyond tip of penultimate, not reaching the adipose; caudal forked, the lobes about equal, $3\frac{1}{2}$ in the length, lower fulcra in the male separate from the rest of the lower caudal lobe, stiff, lancet-shaped, anal beginning far in advance of the dorsal, the anterior rays high, but the fin not falcate, the anal very slightly emarginate. Ventrals small, not reaching anal; pectorals large, falcate, extending beyond origin of ventrals, 4 in the length.

Scales cycloid, those above lateral line and above posterior half of anal in regular, longitudinal series, those over the abdomen and above anal anteriorly in decurrent series; each scale with several divergent radii; axillary scale well developed; caudal sheath (♂) unique, two-pronged, at base of lower caudal lobe, the upper prong longer and broader, the lower forming a sheath for the detached fulcra; scales of sides continued to form a basal anal sheath; fins otherwise naked.

A silvery lateral band; a large black spot covers middle of caudal peduncle and base of middle caudal rays; anal dusky; dorsal dusky, but the anterior rays free from black pigment.

Stomach coecal, six pyloric coeca, the entire alimentary canal shorter than the entire fish.

Type, 53 mm., male, C.M. No. 4806 a, Istmina.

Paratypes, thirty-six specimens, largest 70 mm., Istmina, C.M. No. 4807 a-j; I.U.M. No. 12671 a-j.

25. **Gephyrocharax caucanus** sp. nov.

Head 5; depth 4; D. 10; A. 34; scales 5-44-5; eye equal to snout or to interorbital, 3.3 in head.

Compressed, much slenderer than in *chocoensis*, the eye smaller. Dorsal outline very little arched, the ventral much more so; predorsal area rounded, about 20 scales not arranged in a regular median series; preventral area narrowly rounded, postventral keeled but obscured in gravid females; breast narrow, with distinct median ridge; fontanel long, narrow; a minute frontal fontanel; third suborbital covering entire cheek; snout pointed, the lower jaw heavy; maxillary-premaxillary border angulate, about 2.5 in the head; no teeth on maxillary; premaxillary with three teeth in outer series, four teeth in the inner; mandible with three large teeth on each side followed by minute ones on the side.

Gill-rakers 5 + 11. Dorsal rounded, not nearly reaching adipose; caudal lobes about equal, 4.5 in the length, lower fulcra, in male, free, spinous; origin of dorsal about midway between middle of pectoral and caudal; anal slightly emarginate, its origin about midway between caudal and eye (its first ray in the male sometimes short, spinous, free [and erect?]). Ventrals reaching anus, pectorals to middle of ventrals, 4 in the length.

Scales thin, cycloid, easily lost; caudal naked, no caudal sheath in the males; scales of the sides continued on the anal rays at base.

Silvery, a bright lateral band ending in a spot on caudal peduncle and base of the middle rays; no humeral spot.

Type, 62 mm. ♀, Cartago, C.M. No. 4802.

Paratypes, thirty-six specimens, Cartago, C.M. No. 4803 a-j; I.U.M. No. 12668 a-j; fifteen specimens, Paila, C.M. No. 4804 a-e; I.U.M. No. 12669 a-e; seven specimens, Cali, C.M. No. 4805 a-c; I.U.M. No. 12670 a-d.

Evidently taken near the breeding season (March, 1912), mostly females.

This species differs notably from its Pacific slope relatives in its more elongate form, heavier lower jaw, more oblique mouth, etc.

26. **Gephyrocharax melanocheir** sp. nov.

Head 4.25; depth 3-3.3; D. 10; A. 31; scales 6-39 to 41-4 or 5; eye .75-.9 in snout, 3 in head, very little less than interorbital.

Very similar in shape and general appearance to *G. chocoensis*, the females are scarcely distinguishable but have distinct vertical humeral spot and the bases of the two first dorsal rays are dusky. The males are quite different from those of *G. chocoensis*, the bases of the two first dorsal rays are blackish, the pectorals instead of being falcate, as in *chocoensis*, have the tips of the second and sometimes of the third ray expanded, usually the tip of second ray is black, sometimes there are supplementary, smaller black dots near the larger; ocellus-like black tip.

Ten males from Bernal Creek have the black pectoral tip; only one of the three males from Soplaviento have the tip of the pectoral black; the pectorals in males are longer than in the other two species of the genus, sometimes quite reaching the anal, the lower modified fulcra of caudal are also different, the lower one of the two modified fulcra is slender and curved, its upturned tip only in contact with the tip of the heavier downcurved second fulcrum; the fulcra not covered with scales, but the scales at base of lower caudal lobe united and free from the caudal, leaving a pouch between them and the caudal.

Type, male, 44 mm., Bernal Creek, C.M. No. 4839.

Paratypes, nine males, fourteen females, largest 46 mm., Bernal Creek, C.M. No. 4840 a-f, I.U.M. No. 12696 a-f.

Paratypes, three males, four females, largest 48 mm., Soplaviento, C.M. No. 4841 a-e, I.U.M. No. 12697 a-c.

27. **Thoracocharax brevis** sp. nov.

Allied to *Th. maculatus* (Steind.) but much shorter.

Head 3.5; depth 1.6; D. 10; A. 31; 31 scales in a median series, eye 7 in snout, 3 in head, 1.4 in interorbital.

Outer row of permaxillary teeth consisting of a single tooth; three teeth on the maxillary, the proximal one much the largest.

Margin of pectoral disk black; a dark lateral band, fainter bands parallel to it along the rows of scales above and below it, the chromatophores on every second or third scale conspicuous, forming vertical series of spots.

Type, 47 mm. Raspadura, C.M. No. 4845.

28. **Thoracocharax magdalenæ** sp. nov.

Head 4; depth 1.66; D. 10; A. 34; 33 scales in a median series; eye 1 in snout, 3 in head, 1.4 in interorbital. Outer row of premaxillary teeth consisting of a single tooth; three or four teeth of nearly equal size along the maxillary, the last near its tip.

Margin of pectoral disk dusky, a narrow black spot along the back at the base of the dorsal; a dark lateral strip and fainter ones along the rows of scales above and below it; tip of dorsal narrowly black.

Type 50 mm., Girardot, C.M. No. 4846.

Paratype, 53 mm., Girardot, I.U.M. No. 12700.

29. **Characidium caucanum** sp. nov.

Characidium fasciatum was originally described from the Rio das Velhas in eastern Brazil. It has since been reported from Paraguay, the Essequibo, the Orinoco and from Canelos Ecuador. I found it abundant at Raspadura. I took no specimens of the genus Characidium except at

Raspadura and in the Cauca valley between Piedra Moler and Cali. Those from the Cauca valley represent new species.

Head 3.75-4; depth 3.3-3.5; D. 11; A. 8 or 9; lateral line 32 or 33; eye .66-1 in snout, 3.5-4.5 in the head, 1-1.3 in interorbital. Seven scales between dorsal and ventral.

Outer pectoral rays thickened; pectoral not reaching ventrals, ventrals to the anal in males. Males with a dark lateral band from snout to middle of caudal, back dark with fainter streaks; female lighter, its dark median band crossed by numerous bands which in the region of the anal extend entirely across the body.

Type, 51 mm., Cali, C.M. No. 4847.

Paratypes, thirty-two, Cali, C.M. No. 4848 a-j; I.U.M. No. 12701 a-j.

Paratypes, two, largest 63 mm., Piedra Moler, C.M. No. 4849; I.U.M. No. 12702.

Paratypes, two, largest 58 mm., Cartago, C.M. No. 4850; I.U.M. No. 12703.

30. **Characidium phoxocephalum** sp. nov.

Head 4; depth 4-4.3; D. 11 or 12; A. 8; lateral line 36; seven scales between dorsal and ventral. Eye equals snout, 4 in head, 1 in interorbital.

Snout pointed, mouth subterminal, maxillary reaching to below anterior edge of eye; outer rays of pectoral thickened, the eighth ray longest, reaching to within one scale of the ventrals; ventrals not quite to anal.

A dark band from snout to middle caudal rays, crossed by about ten bars; dark line along the upper parts of the scales of the back; base of dorsal hyaline, next a dark band, then a series of hyaline spots, tips dusky; anal similar to dorsal; margins of thickened pectoral rays dark.

Similar to *caucanum*, more slender, snout more pointed, scales in lateral series more numerous.

Type, 68 mm., a female, Paila, C.M. No. 4851.

Paratype, 63 mm., Paila, I.U.M. No. 12704.

31. **Gambusia nigroventralis** Eigenmann and Henn sp. nov.

Head 4.5-4.8; depth at origin or dorsal 4.5-5; depth of caudal peduncle about 6 in length to base of caudal and about 1.3 in head. Eye 2.2-2.5 in head; equal to interorbital width. Snout short and blunt, lower jaw not extending beyond upper; snout 1.5 in eye. Body depressed, profile arched.

D. 9; A. 9; P. 7; V. 6; scales 29-30 in lateral series; 8 in transverse series.

Origin of dorsal slightly in advance of the middle of the entire length, slightly posterior to anal origin. Ventral rays graduated, outer ones longest, barely reaching the vent. In males, the anal is a pointed sword-shaped organ, arising at the anterior third of the entire length. Its length is about 2.45 in the entire length of the fish.

The males of this species, in life are evidently highly colored. A bright band of pigment extends from the occiput to the dorsal. The tip of the caudal in both sexes is broadly banded with black. Basal portion of dorsal rays intensely pigmented, lighter outward. Body pigment, reticulated.

Posterior rays of male anal heavily pigmented, forming a conspicuous, bright black spot. In females, this is much less noticeable.

Type, a female, 26 mm., C.M. No. 4835.

Paratypes, ten males, 17-22 mm., ten females, 12-28 mm., C.M. No. 4836 a-e; I.U.M. No. 12689 a-f.

Rio San Juan at Istmina, Colombia.

32. **Heterandria colombianus** Eigenmann and Henn sp. nov.

Head 4.25-4.5; depth at origin of anal 3.5; depth of caudal peduncle 5.1-5.6 in length to base of caudal; caudal peduncle 1.2 in head. Eye 3 in head; interorbital width 3 in head.

D. 8; A. 9; P. 14; V. 6; scales 27-29 in horizontal or lateral line series; 8 in transverse series.

Body form slightly robust; snout broad and chin steep; profile oblique. Origin of the dorsal over last rays of the anal. In the single male, the anal fin is modified into a narrow sword-like organ, without hooks, 1.6 times the length of the head. The distance from the tip of the snout to the origin of the dorsal (in females) is equal to that from the origin of the anal to the end of the middle rays of the caudal. Pectorals reach over middle of ventrals; the latter do not quite reach the vent. Caudal subtruncate or slightly rounded.

General color in spirits olivaceous, belly yellowish. All fins are without color or pigment. Starting about the distance of the eye back of the pectoral origin, is a series of six or seven vertical streaks or narrow dark bars.

Dentition consists of two series of narrow spike-like teeth. The anal of the male of this species resembles exactly that of *Heterandria pleurospilus* (Günther) of Guatemala and of *H. lutzi* Meek of Mexico.

None of the females are pregnant.

Type, female, 64 mm., C.M. No. 4837.

Paratypes, one male, 35 mm., three females, 56-71 mm., C.M. No. 4838 a-b; I.U.M. No. 12690 a-b.

Brackish water, mouth of Rio Dagua, Colombia.

VOL. X, No. 9 INDIANA UNIVERSITY BULLETIN NOVEMBER, 1912

INDIANA UNIVERSITY STUDIES

No. 17

MATERIALS, METHODS, AND ADMINISTRATION OF HISTORY STUDY IN THE ELEMENTARY SCHOOLS OF THE UNITED STATES. BY ROLLA MILTON TRYON, A.M.

The 'University Studies' constitute a sub-series of the INDIANA UNIVERSITY BULLETIN *in which from time to time are published some of the contributions to knowledge made by instructors and advanced students of the University. At present not more than two or three such numbers are issued a year. The 'Studies' are continuously numbered, and, as needed, a title-page and table of contents will be issued, for binding them in volumes.*

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INDIANA UNIVERSITY STUDIES

No. 17 BLOOMINGTON, INDIANA NOVEMBER, 1912

Prefatory Note

The circumstances of the origin of this study, and the materials on which it is based, are set forth in the introduction. In brief, the study is the outgrowth of a desire to get as definite and tangible information about practices and tendencies in the teaching of history in the elementary schools as was embodied in a former study on the teaching of history in the high schools. A large number of school officials and teachers have responded to requests for informatioin in this search, and it is believed that the data collected, and Mr. Tryon's tabulation and criticism of it, are of sufficient value to warrant their presentation in this form to the teaching public. It may be added that the study in a more extended form has been presented by Mr. Tryon and accepted by the School of Education as a thesis for the degree of Master of Arts.

SAMUEL B. HARDING,
Professor of European History.

WILLIAM W. BLACK,
Dean of the School of Education.

December 12, 1912.

Contents

Materials, Methods, and Administration of History Study in the Elementary Schools of the United States

By Rolla Milton Tryon, A.M.

I. INTRODUCTION

Origin and Scope of the Inquiry. In September, 1909, Indiana University published a bulletin on History Teaching in the High School. The enthusiastic reception which this bulletin received influenced the Department of History and the School of Education to undertake a similar study covering history teaching in the grades. The material was gathered through a questionnaire sent out by the above Departments during the spring and summer of 1910. An attempt was made to secure answers from persons engaged in the various phases of school work. The questionnaire was sent to rural school teachers, county superintendents, city and town superintendents, grade teachers in city and town schools, ward principals, principals of small town schools, directors of practice and teachers in normal schools, grade supervisors, and history teachers in high schools. This wide range of school officials was appealed to on account of certain questions that called for suggestions and opinions. It was thought that the rural school teachers, and the grade teachers in a large or small system, might offer suggestions and express opinions equally valuable with those of administrators and supervisors.

Extent and Sources of Data. Fourteen hundred copies of the questionnaire were sent out. In the list were included schools of cities, towns, counties, and special schools, in practically every state in the Union. Of the total number sent out, 291 were returned, answered with varying degrees of fullness. The large difference between the number sent out and the number returned is explained by the fact that it was the policy to send a number of copies to each school system with the request that as many teachers as possible fill them out. This request was not always complied with; so that it often happened that only one questionnaire was returned by a system to which ten or fifteen blanks had been sent.

The materials for this investigation were originally gathered in 1910; but, owing to unavoidable delays, it was not until the spring of 1912 that the study was seriously undertaken. In order, therefore, to bring the data on the course of study as nearly up to date as possible, a supplementary request was sent to representatives of most of the school systems from which replies had been received, asking for copies of the course of study then in use. The response to this request was very gratifying, replies coming from two-thirds of those receiving it. The answers contained either a statement that the course had not been changed, or a copy of the new course was sent if changes had been made. This later material was used in tabulating the answers to the first question in the original questionnaire.

Few persons answered in full each question in the questionnaire. This fact accounts for the variation in the number reporting on the different questions; it has also made it necessary to give the reader the exact number of cases represented in each phase of this report.

Two hundred and fifty-nine schools or school systems were represented in the returns, not counting duplicate answers from the same system or systems. Of the 259 schools or school systems, 153 replies came from Indiana cities, towns, counties, and districts; and the remaining 106 from towns and cities in twenty-nine states and in the District of Columbia. The states represented in the returns, with the number of school systems in each, are as follows: Alabama, one; California, six; Colorado, five; Connecticut, four; Kansas, four; Kentucky, three; Maine, one; Massachusetts, five; Michigan, seven; Minnesota, three; Missouri, three; Montana, two; Nebraska, two; New Hampshire, three; New Jersey, five; New York, two; North Dakota, one; Pennsylvania, eight; Rhode Island, one; Ohio, eleven; Oklahoma, one; South Dakota, one; Tennessee, one; Washington, three; West Virginia, two; Wisconsin, five; Illinois, twelve; Iowa, three; Nevada, one; District of Columbia, one; Indiana, 153 (seven from county superintendents, eight from district schools, and 138 from Indiana city and town schools). Every section of the United States is represented in this distribution. There are five New England states, three Middle-Atlantic, fourteen Middle-Western, five Southern, and four Far-Western states. The distribution both in the United States as a whole, and within each state, is largely one of chance.

One hundred and forty-three reports were made out by persons signing themselves as superintendents of city schools; thirty-nine by ward principals; ten by county superintendents; eighteen by history teachers in grammar schools; six by assistant superintendents; eight by either the director of practice, the critic teacher, or the supervisor of training in a normal school; eight by teachers in district schools; six by teachers of history (grade not designated); six by primary and grammar grade supervisors; four by history teachers in high schools; two by high school principals; two by assistant principal, and a teacher for each of the first seven grades. In twenty-six cases there was no definite indication as to the position the person giving the data held in the system. Such a variation in the status of the persons furnishing the replies gives a breadth of opinion sufficient to cover practically every phase of elementary history work.

The Questionnaire. Facts, opinions, and suggestions were called for in the questionnaire. The facts included what was actually being done; the opinions dealt with specific features of course and method; the suggestions pertained to both material and matter. The complete questionnaire follows:

HISTORY TEACHING IN THE GRADES

The following questionnaire on courses in History and methods of History teaching in the grades has been prepared by the Department of History and the School of Education of Indiana University. It will be considered a very great favor if superintendents, principals, and teachers to whom this is sent will fill out, or cause to be filled out, the blanks below. If all the questions cannot be answered from the data at hand, please answer such as you can.

The investigation is a serious attempt to ascertain what is actually being done in History in the best city and country schools, and so to lay the basis for a more intelligent understanding of what is possible, as well as what is desirable. *The experience of the country schools, with their limited facilities, is just as important as that of the city schools,* and it is hoped that full and free co-operation will be given in this inquiry. The names of teachers and of schools will not, as a rule, be published in the report to which it is expected that this inquiry will lead.

I. General Information.—(1) Name of Teacher? Location? (2) Position? City or township school? (3 Preparation and length of experience? (4) In what grades of work? (5) How long in each?

II. Course of Study.—(1) What is the course of study in history now in use in your common schools: First grade? Second grade? Third grade? Fourth grade? Fifth grade? Sixth grade? Seventh grade? Eighth grade? (2) Specify the number of history recitations per week, and the length of period, in each grade; state if possible the per cent of time in each grade devoted to history: First grade? Second grade? Third grade? Fourth grade? Fifth grade? Sixth grade? Seventh grade? Eighth grade? (3) Are all the schools under this course required to cover the same amount of work in history, or is a part optional? (4) Should

European history be taught apart from American history? If so, what fields, and in what grades? (5) What work is now done in civics? (6) Can civics best be taught as a separate course, or in connection with American history? (7) What place does local history have? (8) What correlation is made with: Reading? Language work? Geography? Is the history of a country preceded, paralleled, or followed by its geography? (9) What changes would you make in your course?

III. ORAL TEACHING.—(1) To what extent, and in what grades, is the instruction in history oral? (2) What special preparation for story-telling has been made by the teacher? (3) Do you require written or oral reproduction, or both? In what grades? (4) Is it desirable, or not, to require or encourage note-taking on oral teaching? (5) Give any suggestions you can regarding oral teaching?

IV. USE OF TEXTBOOKS.—(1) In what grades are history textbooks in the hands of the pupils? (2) In assigning a lesson, what help is given by the teacher in the way of outlining, going over the lesson in advance with the pupils, etc.?

V. NOTEBOOKS.—(1) Are notebooks required? In what grades? (2) What material is entered in them?

VI. MAP WORK.—(1) What use do you make of wall maps? (2) What use is made of maps in the textbooks? (3) Do you require map-making in history? In what grades? How frequently? Are the maps drawn or traced, or are prepared outlines used?

VII. SUPPLEMENTARY AIDS.—(1) Do you require supplementary reading? If so, in what grades and what amounts? (2) What use do you make of pictures? (3) To what extent do you have pupils examine relics and other objects (as Indian bows and arrows, spinning wheels, etc.)? (4) To what extent are constructive activities employed (wigwam-making, weaving, modeling, drawing)? (5) What, if anything, has been done by your school in the way of historical pageants or the dramatization of history?

VIII. ADDITIONAL SUGGESTIONS.—Please state any additional devices that have proved successful in your work.

Method of Treatment. In this report, the topics are not treated in the same order as in the questionnaire. The eight general divisions shown above have been condensed into three, viz., Materials and Subject-matter, Methods and Devices, and Administration. The general plan followed in tabulating the materials and subject-matter in the grades has been to list everything taught in each grade, and at the same time to indicate the number of systems teaching each topic in each grade. A general summary then follows, indicating the prevailing tendency in each grade. Wherever possible, tables have been made to show comparisons among the various grades. The method followed throughout by the writer has been to submit the tabulated material, and so far as possible let it tell its own story. Elaborate comments have been purposely omitted.

Criticisms. The fact that no uniformity existed in the completeness with which the questionnaire was answered makes it impossible to tabulate the same number of answers on each question. The only plan to follow is to consider each question as a unit, and tabulate the material on it as such. Care has been taken, however, to give the number of systems reporting on each question. The reader must keep in mind that the systems represented in one phase of the work are not necessarily the same as those represented in another. Since the main purpose of the investigation is to find out what is being done, rather than where it is being done, no attempt has been made to keep a separate tabulation of the systems answering each question.

So far as relates to opinions, it must be borne in mind that they do not necessarily represent what is actually being done. This limitation is especially important, where the opinions come from persons teaching a course of study that has been thrust upon them. It is believed, however, that the opinions called for are of such a nature as to make the answers of real value in determining not only present conditions, but probable developments in the future. This explanation indicates the attitude held throughout in regard to opinions.

It might be said that the brief treatment herein given does not do justice to so large and important a subject. The writer frankly admits the truth of such a criticism. He fully realizes the possibilities as well as the need in this field for a more elaborate treatment than is here given. It is hoped, however, that even the fragmentary results here presented may not be found without their share of interest and value.

II. MATERIALS AND SUBJECT-MATTER

1. The Course of Study

First Grade. One hundred and eighty of the 291 replies reported work in history in the first grade; eighty-nine made no report in this grade, while reporting work in the other grades; twenty-two stated definitely that no history was attempted in the first grade. The various topics taught in the first grade are listed below. The number of times any one topic appeared in the 180 systems is indicated in the column headed frequency.

Topics and Fields Included	*Frequency*
The Indians and Early Pioneers—	
Stories of Indian and pioneer life	4
Primitive and pioneer life	7
Study of Indians and pioneers	1
Institutional life based upon Indian life	1
'Hiawatha' as basis for study of primitive people	9
Indian stories	15
Indian life and customs	56
Indian food, clothing, wigwams, etc	7
Stories of pioneer life	5
Individual pioneers: Marquette, Clarke, Penn, Frances Slocum, Boone, and Starke	53
Stories of Primitive People (Indians not included)—	
Primitive life: 'Arya and His Seven Sons'	1
Primitive life based upon Kablu in Jane Andrews' 'Ten Boys'	7
Stories of primitive people	4
Topics Not Included in the Above General Fields—	
Course suggested by the Committee of Eight	3
Great Americans	9
Special days like Flag day, Lincoln's and Washington's birthdays and Thanksgiving	11
Birthdays and holidays	13
Stories of local history	6
The Pilgrims and Thanksgiving	8
Stories and myths	11
Stories of Columbus, Lincoln and Washington	6
Home and neighborhood	3
Short stories in history and legend	3
Colonial life	2
Biography—mostly American	2
History stories as supplementary reading	1
Childhood of noted characters	1
Work correlated with reading and literature	1
Stories of great men	2

Work connected with language and geography (hunter life)	1
Mythological, biographical, and historical stories	1
Hebrew and Norse life	2
Biographical sketches	2
Oral reproduction of historical stories	3
Work correlated with nature study and language	1
Stories from 'Aesop's Fables'	1
Talks on family, home, and special days	1
Stories and some simple biographies	1
Work based on Eggleston's 'Great Americans for Little Americans'	1
History work in the nature of general lessons	1
Simple history stories—American chiefly	1
Names of president, governor, and school officers	1
Stories in Dopp's 'Tree Dwellers' and 'Early Cave Men'	2
General history stories	7
Bible stories	2
Stories of Rome	1
Stories of the Old World	1
Community life	1
Story of 'Agoonach' (Andrews' 'Seven Little Sisters')	2
History stories told by the teacher, no regular work outlined	4

It is evident that Indian, pioneer, and primitive life combined receive the most attention in the first grade history course. Regrouping the foregoing material under larger headings, one has the following classification.

General Topics	*Frequency*
Indian life	96
Pioneer life	70
Primitive life (not included in 1 and 2)	19
Stories, biographies, and celebrations connected with United States history	57
Local history and civics (community life, home and neighborhood, etc.)	15
Elementary Old World history	13
Miscellaneous and indefinite	42

The uniformity shown in the above is due largely to the fact that so many Indiana systems are represented in the report. Both Indian and pioneer life are found in the Indiana State Course of Study in history for this grade: and forty-three of the replies from Indiana counties and towns follow the state course. It is evident that most of the material in first grade history is taken from five rather distinct fields. The significant fact is the extreme variety of topics in each field.

A word of explanation is needed in regard to the frequencies in the above tabulations. The 290 cases shown here are accounted for by the fact that in many instances the same school system taught two, three, or more topics in the first grade. For example, the Committee of Eight recommends Indian life, Thanksgiving and the Puritans, Washington's and Lincoln's birthdays, and local history stories. Any system following this course would therefore appear four times in the frequencies, rather than once. No attempt was made to keep the 180 systems absolutely separate; the emphasis was placed upon the number of times any one topic appeared in all the courses. The reclassification in the summary of the table includes certain duplicates, which accounts for the 323 frequencies shown.

By reference to the tabulated topics, one notes certain material that might be classified as matter belonging to subjects other than history. For example, the thirty-three cases which include myth, fairy tales, folk stories, and fables could well be classified with literature or language material. Further examples that might be otherwise classified are, 'home and neighborhood', 'names of president, governor and school officers', 'talks on family and home', 'community life', 'Tree Dwellers' and 'Early Cave Men', and the 'Story of Agoonach'.

Second Grade. Two hundred and twenty-five of the returns either give the course in this grade, or make the statement that no history is included in the second grade work; the latter number twenty-five, or 11 per cent of the systems reporting. In sixty-six cases this grade is left blank, though work is reported in the upper grades. The actual work that the 200 systems are doing in history in the second grade is shown by the following tabulation of topics and fields included in the reports, with the number of times each topic appears.

Topics and Fields Included	*Frequency*
MATERIAL RELATING TO INDIAN, PIONEER, AND PRIMITIVE LIFE—	
Indian stories and legends	14
Indians; Pueblos and Cliff Dwellers	1
Indian life and myth	6
'Hiawatha'	4
Stories of American Indians and Eskimos	8
Stories of Pioneer life	12
Primitive life	3
Committee of Eight, Indian life, selection from 'Hiawatha'	3
MATERIAL RELATING TO AMERICAN HISTORY—	
Great Americans—Washington, Jefferson, Lincoln, Franklin, Longfellow, Webster, Louisa M. Alcott, Irving, and Francis S. Key	46
American heroes	30
Eggleston's 'Great Americans for Little Americans'	5

Stories in connection with Thanksgiving, Washington's and Lincoln's birthdays	3
Special days, Labor day, Christmas, Flag day, and other national holidays and anniversaries	21
Stories of Columbus	5
Stories of the Pilgrims	2
Simple history stories; chiefly American	2
Story of Washington and Franklin	3
William Penn	1
Colonial life	3
Pratt's 'American Stories for American Children'	1
Biography—mostly American	1
Committee of Eight course: Thanksgiving, Washington's birthday, Memorial day, and local events	3

Material relating to Old World History—

Norse life and heroes	60
Hebrew life	9
Story of Darius in 'Ten Boys'	7
Stories of Greek life	4
Stories of Rome	1
Bible stories	3
Story of the Aryans	2
Persian and Egyptian life	3
Jews and the Phoenicians	1
Stories of great men, ancient and modern	2
'Nimrod of the North'	1
Schwatka's 'Children of the Cold'	1
Japanese	1
Baldwin's 'Old Stories of the East'	1
Story of Kablu in 'Ten Boys'	1

Material not readily Classified in the above General Divisions—

Stories, fairy tales, and myths	10
Childhood of noted characters	2
History stories as told by the teacher	5
Stories of a historical nature	15
Work correlated with nature study and language	1
Stories from history and geography	1
Oral community life	1
Work in the nature of general lessons	1
Oral reproductions of historical stories	2
Cliff and lake dwellers	1
Stories of great men	2
Work correlated with literature and reading	1
History stories as supplementary reading	2
Short stories in history and legend	1
Home life	1
Farm life and simple people	1
'Robinson Crusoe' as basis	3

In the second grade most time is spent on some phase of American history. This fact is very clearly shown when the frequencies in the four general classifications above are summarized. Such a summary follows:

General Topics	*Frequency*
Material relating to primitive, pioneer, and Indian life	51
Material from some phase of American history	124
Material relating to Old World history	95
Material not included above (fairy tales, myths, legends, community life, work correlated with geography, etc.)	51

The above data show that American history in some form or other is receiving most attention in the second grade, with history relating to Old World stories a rather close second. The large number of cases in Indiana had an influence in this showing. The answers from Indiana are included in the forty-six frequencies showing material relating to American history, and the sixty showing material relating to Old World history. The material under the last heading in the summary is rather general and indefinite. Some of it could be considered as belonging to other subjects as well as history. Robinson Crusoe stories, fairy tales and myths, oral community life, cliff and lake dwellers, home life, and farm life are examples of such material. Whenever the history work is correlated with literature, geography, or civics, such material as the above is made the basis of the work.

Third Grade. Two hundred and nine of the replies give the course used in this grade, thirteen state that no regular work in history is attempted, and thirty-seven leave this part of the questionnaire unanswered. The interesting fact in the case of this grade is the prevalence of history other than American, there being almost twice as many systems giving the former as the latter. Some form of Greek, or Hebrew, life is the material most often included. This fact does not stand out so prominently when the forty-five cases in Indiana are subtracted from the total of sixty-six. No special subject-matter predominates outside of Indiana. The topics and fields included in the courses followed in the 209 systems giving history in this grade are shown in the following tabulation. An attempt has been made to organize all the material under three general headings. The variation under these headings is well shown by the large number of topics, especially under the first two.

Topics and Fields Included	*Frequency*
MATERIAL BASED ON AMERICAN HISTORY—	
Stories of Great Americans	16
Eggleston's 'Great Americans for Little Americans'	8
Thanksgiving and the Pilgrims	8
Colonial Days	2
Pratt's 'American Stories for American Children', Book II	2
American history stories	2
Stories of Washington, Lincoln, and Columbus	8
Story of early explorers	4
Colonial life	1
Mace's 'Primary History of the United States'	1
John Smith, Franklin, La Salle, Clarke, and Penn	1
Stories of Columbus	8
Holidays, birthdays and celebrations	8
Stories of pioneer life in America	8
The Indians	11
Biographical—American	4
In connection with Independence	3
Total	95
MATERIAL BASED ON OLD WORLD HISTORY—	
Hebrew life and heroes	66
Roman life, myths and stories	2
Norse life	3
General work based on Old World history (definite field not stated)	25
Total	96
MISCELLANEOUS MATERIAL (not definitely included in the above)—	
Material belonging to subjects other than history	9
Material of an indefinite nature	12
Total	21

The above summary clearly shows that Old World history is receiving the most attention in this grade. There seems to be rather a definite agreement as to the general fields to include in third grade history. The place where uniformity is lacking is in the topics to be treated in each field.

Summary of the First Three Grades. Before passing to the fourth grade it may be well to suggest some possible interpretations of the data concerning the work in history for the first three grades. Judging from the data, the work in history in the primary grades is directed toward the accomplishing of three things, viz.: to give the children what might be termed a historical perspective, to fix in their minds certain type forms, and to acquaint them with a few great historical facts. The myths, stories, and legends furnish material to accomplish the first result; primitive, Indian, and pioneer life gives material for the second purpose; while the work on biographies, anniversaries and the like furnishes certain facts on which later history may be based. The above purposes, which seem to be at the bottom of primary history work, are certainly worth special consideration by teachers and supervisors of these grades. If these aims are sound, there is need of much work tending toward uniformity of means. There might be a more general agreement on the material best adapted to give the child the proper historical perspective, on the best types with which to acquaint the primary children, and on the great historical facts that should be mastered now for all time. These are some of the lines along which one may expect development of the history course in the future.

Fourth Grade. In this grade material was tabulated for 244 systems. Out of 252 replies, all but eight state that history is included in the fourth grade course. It is interesting to note the general uniformity that has begun to appear in this grade. The prevalence of Roman history in some form or other stands out very strikingly, appearing in 125 of the systems. Most of the systems basing the fourth grade work on Old World history are found in Indiana. The sixty-five cases giving American history in this grade are systems, for the most part, outside of Indiana. All the courses reported for this grade are shown in the following tabulation. The report is given in this form to show in a definite manner just what phases of the general fields are included in the history work of the fourth grade.

Topics and Fields Included	*Frequency*
MATERIAL RELATING TO AMERICAN HISTORY—	
Bass's 'Stories of Pioneer Life'	11
Stories of great Americans	9
Local history stories	11
Early explorers: Columbus and the Norsemen	4
American history	11
Simple history stories, chiefly American	4
American life and adventure	6
Shaw's 'Discovery and Exploration'	11
Stories of Colonial life	3
State history	4
Pratt's 'American History for American Children', Books I and II	2
Biography—mostly American	7
Stories in connection with Thanksgiving, Decoration day, Labor day, Lincoln's and Washington's birthday	5

Local history, embracing also adjoining states	1
Eggleston's 'Great Americans for Little Americans'	2
Tappan's 'American Hero Stories'	1
Indian stories	3
Stories of the Revolution	1
Committee of Eight course	2
History stories in connection with United States geography	1
History of the Flag and stories of Hiawatha	1
Eggleston's 'Elementary United States History' as a reader	1

MATERIAL RELATING TO OLD WORLD HISTORY—

Harding's 'City of the Seven Hills'	86
Life of the Romans	15
Stories of the Romans	14
Story of Horatius, in 'Ten Boys'	5
Greek life	21
Greek myths	5
Roman myths	2
Hebrew life	3
Bible stories	3
Norse stories	1
Ancient and Mediæval stories	3
General history stories	2
Stories of Bible lands, Greece, and Rome	1
Greek and Roman biography	1
World Heroes—Joseph, Moses, David, Homer, Caesar, Charles the Great, Alfred the Great, William the Conquerer, and Joan of Arc	1
English history stories	1
Stories of the Old World	1

MATERIAL NOT DIRECTLY INCLUDED IN THE ABOVE DIVISIONS—

Historical stories selected by teacher	5
Stories as supplementary reading	5
Childhood of noted characters	1
Short stories in history and legend	1
Hunter life, shepherd life, and development of agriculture	1
Work correlated with literature and reading	1
'The Cave-Boy', 'Children of the Cliff'	1
Work correlated with language and geography	2
Biographical stories	11
Oral history stories	4
Fables and folk lore	1
Mythology	5

In order to show the prevailing tendency in this grade a summary of the material given above follows.

Fields Included	*Frequency*
I. OLD WORLD HISTORY—	
Roman history, biography, and myths	125
Greek history, biography, and myths	29

Hebrew life	.
Mediæval history stories and biographies	4
English history stories	1
Norse stories	1
Total	167
II. American History—	
Based on a text in American history	28
Stories relating to American history and holidays	21
State and local history	16
Total	65
III. Miscellaneous Material—	
Biography	18
Indefinite	14
Material not really history	8
Work correlated with language, reading, or geography	9
Total	49

The above tabulation clearly brings out the rather general agreement as to the fields of history to be included in the fourth grade work. There is certainly a strong belief in the value of some phases of Old World history.

Fifth Grade. Two hundred and fifty-four systems reported the work done in this grade; three systems report no history in the fifth grade. The noteworthy fact is the great predominance of material based on United States history—221 systems including it in one form or another. The climax of uniformity so far is reached in this grade. Little difference of opinion exists regarding history material here—there being but thirty-one instances of topics taken from Old World history, and twenty-eight of a general nature, many of which might be correctly classed with American history.

Topics and Fields Included	*Frequency*
Material Based on American History—	
Gordy's 'American Leaders and Heroes'	45
Eggleston's 'First Book in American History'	25
Mowry's 'First Steps in History of Our Country'	11
American history from biographical standpoint	79
Tappan's 'American Hero Stories'	3
Montgomery's 'Beginner's History of the United States'	2
Pioneers in America	7
Elementary American history	5
American history stories as supplementary reading	5
Stories of Americans	3
State and local history	5

Thomas's 'Introductory Course in United States History'	1
American biography	2
Pratt's 'Stories of American History for American Children', Books III and IV	1
Eggleston's 'Great Americans for Little Americans'	2
Cortez, Balboa, Columbus, Pizarro, and Magellan	1
Colonial history	3
Stories of Columbus and early settlements	10
Southworth's 'Builders of Our Country', Book I	1
Mace's 'Primary History of the United States'	1
Stories of American life and adventure	3
Early history of America	1
'Hiawatha'	3
Stories of Columbus	2
MATERIAL BASED ON OLD WORLD HISTORY—	
The stories of Wulf and Gilbert in Andrews' 'Ten Boys'	9
Roman history	6
Mowry's 'First Steps in English History'	3
Stories from English history	6
Greek and Roman history stories	4
Harding's 'Story of the Middle Ages'	1
Harding's 'Greek Gods, Heroes, and Men'	1
Guerber's 'Story of the Greeks'	1
Greek stories and biographies	3
Ancient history stories	7
Norse stories	1
Stories of the Old World	1
Heroes of other lands	1
MATERIAL NOT DEFINITELY INCLUDED IN THE ABOVE GENERAL HEADINGS—	
The World's great discoverers	8
World history	1
History stories as supplementary reading	9
Stories as teachers may select	3
Work correlated with literature and reading	1
Carpenter's 'Geographical Readers'	1
Stories of great men	1
Work correlated with language and geography	1
Biography	2
Committee of Eight course	3
Oral history stories	1

By throwing all the material listed above together on the basis of the general fields covered, the central tendency in this grade is clearly shown. Such a grouping follows:

Topics and Field	*Frequency*
AMERICAN HISTORY—	
United States history, text in hands of the pupils	95
United States history from a biographical standpoint	87

Early Colonial history and pioneer life in America	29
State and local history	5
Total	216
OLD WORLD HISTORY—	
Greek and Roman history	22
English history	9
Total	31
Miscellaneous and indefinite	38

The above summary shows two tendencies in the fifth grade, viz.: the predominance of American history, and the practice of placing a history text in the hands of the pupils. The replies from Indiana had much to do in increasing the number of cases where texts are in the hands of the pupils, this being a rather general practice in this state.

Sixth Grade. All of the 238 systems tabulated offer some history in this grade. The material shows a lack of uniformity. Makers of courses of study are not yet certain just what history should be taught in grade six. Of the field, American history holds the lead, with English history a close second. Outside of Indiana, American history prevails, while inside the state most cities and counties have English history. The following is a complete tabulation of material found in this grade.

Topics and Fields Included	*Frequency*
MATERIAL BASED ON AMERICAN HISTORY—	
Gordy's 'Leaders and Heroes'	24
Tappan's 'Our Country's Stories'	6
Tappan's 'American Hero Stories'	5
American history	12
McMaster's 'Primary History of the United States'	5
Montgomery's 'Beginners' American History'	21
Primary history of the United States	5
Mowry's 'First Steps in the History of Our Country'	3
Biography of typical men and events in pioneer America	1
Great Americans and early discoverers	1
Biography, colonial period, and men of recent times	2
Mace's 'Primary History of the United States'	1
Indians of the Northeast	1
Discovery, exploration, and colonization	2
United States history from biographical standpoint	1
Southworth's 'Builders of Our Country', Book I	2
Eggleston's 'First Book in American History'	3
Spanish and French settlements	1
United States history, Revolutionary and National periods	1

Pioneer history stories as lessons in American history	1
United States history, Colonization period	2
'American Hero Stories' as reading	4
Thompson's 'History of the United States'	1
Pratt's 'Stories of American History for American Children', Book V	1
Elementary narrative of American history	1
McMaster's 'History of the United States'	1
State history (textbook used in one case)	5
Introductory history of the United States	2
Thomas's 'Elementary History of the United States'	1
MATERIAL BASED ON OLD WORLD HISTORY—	
Mowry's 'First Steps in English History'	32
English history, biography, and stories	27
Tappan's 'England's Story'	6
Greek history	3
Greek and Roman life	1
'Life With our English Grandfathers'	2
Continental and English history	1
Harding's 'City of the Seven Hills'	1
Ancient history	8
Story of Roger in 'Ten Boys'	1
European as related to American history	5
Stories of France—'France's Men of the Middle Ages'	1
General history centering on history of England	1
English history from standpoint of biography and story	45
Guerber's 'Story of England'	2
'France's Men of Modern Times'	1
Stories of ancient people	4
Stories of Rome	3
European civilization through stories	4
General history	1
English history as a supplementary reading	1
MATERIAL THAT COULD NOT BE INCLUDED IN EITHER THE ABOVE GENERAL DIVISIONS—	
Committee of Eight course	3
Work correlated with language and geography	1
World history	1
Elementary history in hands of pupils	1
Textbook, biographies	1
History stories as told by teachers	1

The material shown in the above tabulation may be somewhat unified by reclassifying. A classification may be made which shows the tendency inside and outside of Indiana. The majority of the 111 frequencies of English history is found in Indiana, while the majority of the 120 in American history is found outside the state. The following shows to what extent the above two fields predominate in this grade.

Topics and Fields	*Frequency*
AMERICAN HISTORY—	
American history with text in hands of pupils	82
Early American history, including explorers, settlements, Indians, and pioneers	12
American history (nothing said about text)	21
State history (text used)	5
OLD WORLD HISTORY—	
English history	111
Greek, Roman, and Ancient history	21
European history (continental)	10

Three tendencies seem to be indicated by the above reports, viz.: to continue the American history of the fifth grade, to devote the entire time to English history as an introduction to the American which follows, and to go over again the cycle of history covered in the first three grades—thus making two complete cycles before the eighth grade is finished. This last is what the Committee of Eight seems to have in mind in the course planned for this grade. The three systems using this course on Greek, Roman, and General European history indicate a growing sentiment in favor of the last tendency mentioned above. This plan will likely become more generally followed, now that suitable texts can be procured.

Seventh Grade. Two hundred and fifty-nine replies gave reports for the seventh grade, the largest number reporting so far. This is to be explained by the fact that material in this grade is definite and well understood and could be easily tabulated; while in grades below this one, it was much easier in a number of cases to leave the question unanswered than to attempt an explanation of what was actually done. The following tabulation shows the marked predominance of United States history. It also shows the uniformity found in the fifth grade has again returned, there being even more in the seventh than in the fifth. Out of the entire number of frequencies, there are but twenty-nine not having material from United States history.

Topics and Fields Included	*Frequency*
American history to about 1789	100
American history (no limit stated)	135
Finish United States history	3
Montgomery's 'Beginners' History of the United States'	3
State history	2
The thirteen colonies	1
American history, explorations and settlements, with European history emphasized	3
English background for American history; discovery and colonization.	5
Revolutionary and National periods of American history	4

English history	6
Guerber's 'Story of the English'	2
Mowry's 'First Steps in English History'	1
General history, specializing on England	1
England and Europe	7
Leading events in World's history from Caesar to 1453	1
Roman history	1
Guerber's 'Story of the Romans'	2
Guerber's 'Story of the Greeks'	2
Hebrew life	1
'European Hero Stories' by Tappan	1
Ancient history	2
History as supplementary reading	2

Certain facts appear in the above table. They are, the uniformity found in history material in this grade, the slight tendency to correlate American and English history up to about 1789, the tendency to cover about half the field of United States history in the seventh grade, and the absence of history material other than English and American.

Eighth Grade. The story of this grade is a brief one. Out of the 259 systems reporting, practically all teach history in the eighth grade, there being but eight systems having history other than United States. The five cases of civics represent systems that finish history by the middle of the eighth year and spend the remainder of the year on civics, usually with a text in the hands of the pupils. The distribution of material for this grade follows:

Topics and Fields Included	*Frequency*
United States history completed	170
American history (no amount stated)	84
Westward expansion, industrial and political history of the United States	2
The making of the American nation	2
State history	5
Greek history and life	2
English history	2
Roman life and stories of the Romans	3
Stories of the Middle Ages	1
Civics	5

The uniformity found in grades seven and eight may be due in a large measure to the length of time history has been taught in these grades.

Summary. A great variety of history topics occur in grades I, II, and III. More uniformity is found in grades IV and V. Grade VI is the uncertain field. United States history has almost full sway in grades VII and VIII.

History is pretty thoroughly established in all the elementary grades. The various committees that have been so busy the past fifteen years have seen to this. The work that is needed at present is to determine the best subject for each grade, and to begin a campaign to get this taught.

2. Special Phases of the Course in History

The Work Done in Civics. The question relating to civics was a general one. Some answers stated the course in civics, without further information, while others gave, in addition, the grade, or grades, in which civics is taught, and still others added the amount of time given to the subject. No attempt has been made to tabulate the corresponding answers. The course, the grade, and the amount of time are treated separately.

Of the 224 answers concerning civics, nearly 25 per cent give no course that could be differentiated from history; thirty-three of this number say they have no regular course, thirty-seven study the national government and constitution, and twenty-five the state government and constitution. The different phases of the work in civics are shown in the following tabulation.

Topics and Fields Included	*Frequency*
State civics and government	25
National civics and United States Constitution	37
Study of city	7
Study of county	7
Local civics and government	8
Dunn's 'Community and Citizen'	11
Dale's 'American Citizen'	3
Home civics	6
Gulick's 'Town and City'	2
Hill's 'Junior Citizen'	2
Foreman's 'Civics'	1
Mace's 'Civics'	1
None except incidentally	12
No regular course	33
In connection with history	55
With geography and history	5
Little in grades	7
With hygiene	1
With geography	1

The grades in which civics is taught either separately or in connection with history are shown in the first table below, 224 schools and school systems being represented by the replies:

Grade	*Frequency*
Grade I	7
Grade II	7
Grade III	7
Grade IV	12
Grade V	16
Grade VI	24
Grade VII	31
Grade VIII	91

The increased occurrence from the first to the eighth grade is very evident from the above table. The large difference in the number teaching civics in the seventh and eighth grades is due to the fact that the study of the Federal Constitution is often the only work done in civics, and this study generally takes place in the eighth grade.

In the matter of time spent on civics, one-half year is the most common in those systems teaching it as a separate course. When it is taught as a part of United States history it is not possible to say just how much time is given to one and how much to the other. The answers indicate that but little time is usually given to the subject when treated separately. The least time given is one month; the most, is one year.

On the whole, the answers show a rather unsettled condition in the matter of civics teaching. Such answers as 'none, but should be some', 'little, need more', indicate that there is a growing sentiment in favor of the subject. One superintendent gives as an objection to teaching history and civics together the following: 'The strong history teacher makes it all history, while the strong civics teacher makes it all civics'. Another suggests that we need a new civics written, which he thinks might solve some of the difficulties. The writer was somewhat surprised to find no larger use of such books as Gulick's 'Town and City' and Dunn's 'Community and the Citizen'.

One hundred and thirty out of the 229 answering this question think that civics can best be taught in connection with American history, sixty-one would teach it as a separate course, the remainder give a variety of answers. Some of the typical ones are: 'Taught both ways'; 'separate in eighth, together in others'; 'local government separate, national government with history'; 'separate but continually related to history'; 'constitution with history, remainder separate'; 'together if have suitable text'; 'separate up to fifth, then with history'; 'does not interest pupils as separate course'; 'parallel to last half of eighth, then separate'.

One concludes from the above that there is no great demand at present for a separate course in civics; yet at the same time, while reading the answers, the impression grows that even the 130 are not satisfied with what is being done with civics in connection with history. A difficulty which some answers cite is the difficulty of getting the teacher to do justice to each when carried together. One or the other usually suffers when taught together.

European History in the Grades. Of the 191 replies to the question whether European history should be taught apart from American history, eighty-three, or 43½ per cent, would teach European separately. Judging from the amount of available material based on European history one is not surprised at this number. The following is a summary of the answers: Eighty-three would teach European apart from American in all the grades; twenty-nine would teach the two fields separately in the lower grades, but together in the upper grades; forty-one would teach all European history in connection with American; nine would not teach it in the grades at all; eleven would use it as a foundation for American history. The following additional methods were given from one to three times: 'Portions apart and portions in connection with'; 'apart only as biography, give American history and European reference when possible'; 'with American up to the sixth grade'; 'European history should both precede and parallel American history, and teach just before taking up American history'.

Besides the various answers indicated in the above summary, several others appeared which could not be classified with these. The following are some typical ones: 'Should precede, in order to show origin of American history'; 'growth of institutional life in America should be a continuation of the same in European history'; 'European history has no place in the rural schools'; 'too much time is given to Greek and Roman history'; and 'European history should be taught to establish connections with American history'.

Not all of those answering 'yes' to the question whether European history should be taught, followed up the answer by stating what fields should be covered and in what grades. The following table shows the replies of the 191 who answered the question. According to this table most of the persons replying would teach English history in the sixth or seventh grade. Greek and Roman come next, with practically the same number of cases, the former being taught in the third grade and the latter in the fourth. The desire for material in general European history is evident from the answers calling for a course in this field. All these answers taken together really places this field next to English history in preference.

Fields to be Taught.	Grades.								Grade not Designated.	Total.
	1	2	3	4	5	6	7	8		
Outline of World's history							1			1
Ancient history					1	1			1	3
English history					3	15	10	1	11	40
General history								1		1
Stories of historical nature	2	2	2	2	1	1	1			11
Selected fields of history of mankind						1				1
Greek			7	3	1				6	17
Roman			2	8	2				6	18
Elementary course in European						2				2
European hero stories	2	2	2	2	2				1	11
Hebrew			1	1	1					3
Teutonic			1	1	2				1	5
Mediæval			1	1	1	2			2	7
European history up to 1492							1			1
European history	1	1	1	1		2			4	10
Oriental			1			1				2
French									1	1
Myths and stories	1	1	1							3
So much as has a direct bearing on the United States					1	1	1	1		4
Emphasize United States connections							1			1
Some introductory						1				1
Committee of Eight									2	2
Fields out of which American history grows									1	1
Phases that touch American history									1	1
Norse									1	1

The Place of Local History in the Course. The question calling for the work done in local history was a general one. The prevailing tendency, as shown by the answers from the 222 systems reporting on this question, is to give little or no time to local history. Nevertheless, a feeling is prevalent that more time should be given to this phase of history work than it is now receiving. Thirty-seven systems report that this work has an important place in the course and that definite and detailed work is done; seventy-one systems are evidently neglecting it, and have no course worth mentioning; the remaining 114 systems claim to do a little local history work, but do not feel they are accomplishing anything worth while, because the course is unorganized and the material difficult to secure.

There is some difference of opinion as to the value of local history work, as the following answers will indicate: 'No place, but should have'; 'More attention should be given it' (5 cases); 'Should be studied in grades I, II, III, and IV' (4 cases); 'Needs a place; better have more local history and less Greek and Roman'. The other side of the question finds expression in language like this: 'Unnecessary to have special time for local history'; 'Much so-called local history of little value'; 'May serve as a stimulus, other than this it is of little value'. These expressions were not at all numerous, and should not be taken as any indication of a general sentiment against local history.

While the question did not call for subject-matter, many answers nevertheless indicated briefly what is being taught. Out of the sixty-eight replies, thirteen teach state history, thirty correlate with local geography, twenty-one study the city, county, and state, and four correlate with either the regular history, geography, or reading.

Some local history is done in all the grades—some systems doing it in one grade, some in another. The following table shows the occurrence in each grade in the sixty-eight systems reporting:

Grade	*Frequency*
Grade I	20
Grade II	21
Grade III	25
Grade IV	30
Grade V	14
Grade VI	22
Grade VII	14
Grade VIII	15

There is little evidence that local history is taught in any one grade much more than in another. From the data supplied one concludes that the courses are very indefinite, and the material unorganized and often hard to obtain. There is evidence that most systems favor some work of this sort. To get the work in such form that both teachers and pupils can use it seems to be the present problem. Some cities publish material for this work in pamphlet form and put it in the hands of either the pupils or the teachers. Indianapolis, Chicago, and New Haven, publish excellent material for local history teaching.

To give a more definite idea of what the above cities publish, a brief description of an account of early New Haven follows. This material is published in the course of study in history for this city. Source material is given on the founding and settlement of New Haven, the laying out of the town, the purchase of land, the first election, Governor Eaton, the first meeting house and early church going, founding of Yale College, planting of elms, adornment of the Green and Grove Street Cemetery, James Hillhouse, William Lyon's idea of sidewalks, David Austin, General David Wooster, the first schoolmaster, oldest dwelling, funeral customs, the bell ringer, the chimney sweep, the stocks, New Haven trade, names of the streets, the regicides, trouble with the Quakers, and King Philip's War. The main facts are given relating to the above topics. With material like this, teachers are no doubt able to do local history work of an excellent quality. Such examples are certainly worth following by cities that wish to do effective work in this field.

Suggested Changes in the Course in History. The changes suggested in the courses of study are indicative of the unrest that exists, and also of the direction the movement for better courses of study in history is taking. Eighty-seven of the returns leave this part of the questionnaire unanswered; this may or may not mean that they are satisfied with the present course. Thirty-two say that they wish no change at the present; sixteen are trying new courses; and five testify to liking the course as it now exists. The changes suggested by the dissatisfied ones have been grouped under thirteen headings, as shown below. The numbers in parentheses indicate the number desiring that particular change.

1. *Civics:* Give more time to local civics (4); teach civics in connection with American history (2); put a course in civics in the eighth grade (2); introduce one term in civics (1); more civics (3); systematic work in civics in all grades (3); give some good work in civics (1). Total, 16.

2. *Local history:* Put in stories of pioneer life, also what farmer boys and girls have done (1); have nothing but local history in the first and second grades (1); select books for lower grades dealing with home life (1); more local history (10). Total, 13.

3. *American history:* More systematic connection between American history and contemporaneous and related European history (2); study United States Constitution at the beginning of the

eighth grade (1); more American life and biography; have too much study of Ancient history which children do not understand (1); use primary history of the United States in sixth and seventh grades (1). Total, 5.

4. *English history:* More English history (1); put English history in fifth and sixth grades (1); English history in the sixth grade (1); some regular work on Ancient and English history (1); put English history back into the course (1). Total, 5.

5. *European history:* German history better for the fifth grade (1); doubt the propriety of any European history except English (1); put European history in high school where it belongs (1); drop out large part of European history, further simplify and correlate around a larger radius (1); more ancient and European history stories (2); emphasize European history more (1). Total, 7.

6. *Greek and Roman history:* Too many Greek myths in third grade (1); give in this order: Oriental, Greek, Roman, German, English and United States (1); eliminate all Greek, Roman, and Hebrew history (1); take out all myths in lower grades (1). Total, 4.

7. *Additions:* Put more history in lower grades (1); increase the material, begin book in fourth grade (1); more biography in grades VI, VII, and VIII (1); more extended work in parallel readings and current topics (3); more time for history (9); more stories in lower grades (3); more oral history (1); uniform work in all grades (1); read more and tell more stories (1); should be some work in grades V and VII (1); add one-half year of special intensive study (1); make work in lower grades more intensive (1). Total, 24.

8. *Correlations:* Thorough and systematic correlation of history, English, and geography (1); a well graduated set of historical readers arranged as a unit to use in grades II, III, IV, V, and VI (1); am planning a course in history as supplementary reading (1); correlate reading and history more closely (1); more correlation, course logical and progressive (5); better books for correlation (1). Total, 10.

9. *Relating to Committee of Eight:* Adopt Committee of Eight's course (2); change sixth year to that of the Committee of Eight (1); Committee of Eight, except sixth grade (1). Total, 4.

10. *Textbooks:* Simple text in sixth grade (1); have uniform text in state in grades V and VI (1); state should adopt a two-

book series for the grades V, VI, VII, and VIII (1); course satisfactory, texts not (4); amount of matter too great, texts too burdensome (1); good text in fourth grade (1). Total, 9.

11. *What to emphasize:* More attention to industrial phase, less on war and politics (2); less stress on battles, more on spirit, cause and effect (3); adjust course to child and community (2); more attention to historical setting (1); make history more institutional (2); more time for supplementary work on pivotal points (1); make more definite, leave less optional (3); fewer biographies, told in simple language, will get better results in fifth and sixth grades (1); shift emphasis from hero worship to instruments of peace (1). Total, 16.

12. *Eliminations:* Eliminate isolated facts (2); have no history below fifth grade (2); have no history below sixth grade (1); narrow the field and do more thoroughly (1); omit some parts (2); fewer points required (1). Total, 9.

13. *Teachers and Methods:* More detailed helps should be supplied teachers (1); most trouble with unprepared teachers (2); teachers can not do grades I, II, III, and IV in Indiana State course (1); needs chiefly those of method (1); must have better teachers (1); give quite a free rein to a good teacher (1); less required work and more freedom to the teacher in selecting material (1). Total, 8.

The above tabulations indicate the direction in which change is desired. More civics, more history material, or more time for history, and a change of emphasis in presenting the material now used, are the chief lines on which one may expect future developments. There is also a slight indication that local history will receive more time in future courses of study.

The desire to shift the emphasis to phases of history work other than those which many courses at present emphasize is brought out by the following: 'Omit much detail', 'center attention on great movements', 'teach less about the heroes of war and more about the heroes of peace', 'make history less a study of man and more the study of the development of the institutional life of the people'. The outside pressure back of some phases of history work is suggested by the teacher who said: 'Omitting campaigns in war would certainly not meet the approval of the members of the Grand Army of the Republic'. This pressure is offset largely by the economic ideals of the present age, which are acting to throw the emphasis upon the commercial and industrial phases of history.

By a careful check it was found that the desire for more civics came from persons that at present are doing little or nothing along this line. The same can be stated concerning those desiring changes in other lines. For example, in a certain school, no history work is given in grades V and VII. From this system came a desire for such work in these grades.

Summary. (1) A few systems have an excellent course in civics and teach it as a separate subject. The general tendency is to teach the subject as a part of some other work, usually history. There is a demand for a history text with a sufficient amount of civics in it. A few of those who replied feel that this would solve the problem, especially in the upper grades.

(2) There is a strong desire for the teaching of European history in the grades, but nine out of 191 replies say that it should not be taught. English history is the most favored field, with Roman second, Greek third, and general European fourth. The prevailing purpose in teaching English and general European history is to give a background for American history. A slight demand is shown for the teaching of American history up to about 1763 as an outgrowth and part of European history.

(3) The local history work is unorganized and in a very uncertain condition. A few of those who replied think it is of little importance, while the majority recognize that they are neglecting it and feel that some systematic work in it should be done. Some is done in all grades. There is a slight decrease from the first to the eighth grade. Most systems teach it in the fourth grade.

(4) The suggested changes in the course in history indicate a demand for more civics, and local history, more systematic connections between European and American history, more English history, more regular history work in the lower grades and more systematic correlation of history with other subjects. There is also a demand for better texts for the fifth and sixth grades, for more emphasis on the industrial phase and less on war and politics, and for courses of study full of suggestions worked out in detail.

III. METHODS AND DEVICES

1. Oral Teaching

Introductory. Oral teaching in history is considered from the standpoint of the extent to which the instruction in history is oral and of the grades in which it is emphasized; the preparation of teachers for story-telling; the requirements as to oral and written reproduction, and the desirability of encouraging note-taking on oral teaching. Some helpful suggestions regarding oral instruction in history are listed at the close of the section.

Extent to Which Instruction in History is Oral. The replies from the 259 schools, or school systems, show that oral instruction is practically the only kind given in history up to the fourth grade. From here occurs a rather rapid decrease. This fact is very clearly shown by the following tabulation:

	Occurence in Grade—							
	1	2	3	4	5	6	7	8
Wholly or mostly oral	198	201	200	157	61	34	3	2
In part oral	12	13	18	35	39	34	38	26
Total number of systems employing	210	214	218	192	100	68	41	28

A few scattering replies could not be included in the above. Some typical ones are: 'All grades in which history is taught', very little or none'; 'none at all except in connection with reading history stories'; 'lecture method used some in advanced grades'; 'not much except in primary grades'; 'instruction oral with occasional written reviews'; 'oral instruction principally used in connection with special days'; 'large amount of the work is story-telling'. The total number of systems represented in the above answers is only seventeen—'very little or none' being the reply of eight of this number.

Preparation of the Teacher for Story-Telling. The large amount of oral instruction in the lower grades as shown above indicates the need for teachers who are trained story-tellers. The answers on this phase of the questionnaire show a woeful lack of definite, systematic, and deliberate preparation of teachers for this work. Schools for the training of teachers evidently have a field here in which valuable and effective work can be done.

The following statements show the multiplicity of the qualifications listed, the numbers in parentheses indicating the number of systems reporting that particular qualification: None (48); none, except experience (9); none in most cases (4); none to any great extent (4); not so general as is desirable (5); practice in it and an appreciation of its value (5); special training in normal school (17); read Bryant's 'How to Tell a Story' (6); varies with teacher (5); what comes from learning the story to be told (6); what is necessary for the lesson to be given (4); have a well-organized story-teller's league (2); some attend courses in story-telling at public library (3); oral reading and practice (3); no more than for other subjects (3); some done in teacher's meetings (2); training given in a good kindergarten and primary school (6); some teachers are naturally good story-tellers (2); it is part of work in the primary grades (1); none aside from instruction in summer normals and institutes (6); teachers acquaint themselves with subject and learn to illustrate with stereopticon (1); story-telling given prominent place in city institutes (1); trained story-tellers from library go around and exemplify the work (1); general answers such as, little, general, no uniform preparation, and under supervision (20); story rehearsed to supervisor before told, if necessary (1); teachers in grades I, II, and III had one term of such work (5); study best methods in story-telling and best books on the subject (3); professional training and wide-awake teaching (1); have large library and teachers have special reference books on this subject (1); school room practice and careful daily preparation (3); teachers in grades V and VI make a specialty of story-telling (1); natural ability, effort to do the work well and special preparation (3); individual and cannot be answered (1); slight in connection with literature course in normal school (1).

A classification of the above shows that of the 186 systems represented, the teachers in 126 of them have had practically no preparation for story-telling. In thirty-six systems they have had training in special schools, and in twenty-four special training is given them in connection with their work while teaching. Such a condition is rather surprising and certainly needs attention if results in proportion to the amount of time spent in oral teaching are to follow.

Oral and Written Reproductions. Oral and written reproductions are used in all grades. Where they are both used the amount increases toward the eighth grade, but where oral reproduction only is used the amount decreases toward this grade. The amount of such increase and decrease is shown in the table below, 247 systems being represented in the replies:

Requirements.	Number of Systems Requiring in Grade—							
	1	2	3	4	5	6	7	8
Oral	74	72	62	36	39	18	14	13
Written	1	2	5	10	19	21	21	21
Both written and oral	25	37	69	107	119	105	120	117

Forty-three systems report that they require both oral and written reproduction, but fail to state in what grades this requirement holds. The above table shows the predominance of oral over written reproduction, especially in the lower grades. Both methods are used more frequently in the upper grades. The number of systems requiring either or both is in a way an indication of the efficiency of oral instruction, for it is generally conceded that unless either or both methods follow such instruction much of its value is lost.

Note-Taking on Oral Teaching. On note-taking on oral teaching opinions only were asked for; but these opinions no doubt represent practice, coming as they do from persons actually engaged in school work. One hundred and twenty-four of the 224 replies give a direct answer to the question—101 say note-taking on oral teaching is *not* desirable, and twenty-three that it is desirable. Of the remainder, fifty-six say 'desirable to some extent in the upper grades—possibly sixth, seventh and eighth, but never below these grades'; twenty say 'a little might be done'; two feel that such work 'is not possible in the grades'; two others say it is 'both dangerous and unprofitable'; and the remaining twenty give such answers as 'none except dictation'; 'desirable when can be done'; 'note-taking is required'; 'only dates, names and important events'; 'depends upon the grade, subject and object'.

From the above replies one concludes that little note-taking on oral teaching is done in the 224 systems represented. In fact there is evidence in the answers of actual opposition to such work. If attempted at all, many feel that it should be on a rather small scale and confined chiefly to the upper grades. No reply favors elaborate work in note-taking.

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Suggestions Regarding Oral Teaching. One hundred and sixty-five of the returns had no suggestions to offer on oral teaching of history. The remaining 114 of the total returns represent those who had ideas on this phase of the work and wish others to share them. Since these suggestions were given primarily to help those engaged in oral history teaching, it seems worth while to insert them as they were given, indicating just how many times each one occurs in the replies in order to show the prevalence of the various suggestions: Have material well organized (7); use many questions (4); should be well outlined and illustrated (4); get the teacher full of her subject (6); clear and concise reproductions, useless otherwise (8); limit to primary grades (2); get interest of pupils, stop when this fags (4); few points will give better results than many that are vague (3); should be very vivid (4); maintain continuity (2); as dramatic as possible without being sensational (4); the aim to be clear and definite (2); teacher not to do all the talking (2); story based on outline on the board (2); select important phases, treat them intensively (2); should not be simply a 'pouring-in process' (1); have definite field to cover (1); work on new period introduced orally by teacher (1); teacher to be a good story teller (2); animate and give the story local coloring (1); make the story true to history in essentials (1); must not be carried too far in the upper grades (1); a pleasing voice and ability to make points stand out are necessary (1); told, not read (22); questions must lead to definite end (2); encourage the pupils to tell a story they have heard or read (1); give in a simple and straightforward manner (2); impersonate historical characters (1); frequent reviews (1); have teachers with training in story-telling (2); have pupils do supplementary reading (2); reproduce entire story rather than answer questions (1); oral teaching a farce above fourth grade (1); must be in reach of children (2); no superfluous words, instruction real, interest vital (3); should create a love of history (1); keep in story form (2); read historical poems to children (1); dramatize in grades I, II, III, and IV (1); use as supplementary to text (2); correlate with other subjects (2); cultivate ease and freedom in pupils (1).

All the answers and courses of study submitted indicate that some of the great needs in oral teaching at present are to have teachers who can tell a story, and some definite instructions as to the method of presentation and more definite material. The instruction to teachers given in one course will illustrate what is desired: 'The following method is to be rigidly adhered to. It is the only method by which the work can be made interesting and effective, and at the same time the most economical of the child's time. (1) The teacher tells the story, or fact. (2) An outline, either in the form of questions, brief sentences, or suggestive words, is written on the board. Reference to the page, or pages, in the reading text are also given. (3) The pupil reads the required material from the textbooks. (4) The pupils reproduce the narrative'. Such a definite method as this, strictly followed, will probably give better and more uniform results than no method at all. The method is applicable only to grades that have reading material, but with a slight modification it could be used in any grade.

Summary. (1) Oral instruction decreases as the eighth grade is approached. In the first three grades little other than oral instruction is given. As a rule teachers have had none or very little special training in story-telling. The large amount of oral work done creates a pressing need for teachers trained in the art of story-telling.

(2) Oral reproduction of history stories is more common than written in all the grades. Both oral and written are used increasingly from fourth to eighth grade inclusive. There is a feeling that unless oral instruction is followed by some form of reproduction it is of little value.

(3) Note-taking in the grades is not favored, some say it is not possible, others would have very little, while the majority say it is undesirable. There is a feeling that note-taking destroys the effectiveness of the oral instruction.

(4) The suggestions on oral teaching show that qualities much desired in such teaching are vividness, organization, questions and illustrations, dramatic presentation and presentation in story form. No one suggestion predominates to any great extent.

2. General Aids and Devices

Helps Given by the Teacher in Assigning the History Lesson. An excellent index to the real character of history teaching in the grades was found in the answers to the question calling for the helps given the pupils by the teacher in assigning the history lesson. That teachers feel the importance of this assistance is clearly shown by the returns. There are many evidences that teachers recognize that during the assignment period they have an opportunity to do some real and genuine teaching, and that many of them are not missing the opportunity. The same plan is followed in dealing with these replies that was followed with suggestions on oral teaching. The helps are listed as given by those answering this part of the questionnaire. The frequency is also given in each case, to indicate to the reader the extent each help or plan is used.

A great variety of helps and plans came from the 270 replies to this phase of the questionnaire. While there seem to be a great many ways of helping the pupils during the assignment period, yet when the list of helps is scrutinized carefully, two or three methods seem to predominate. Of the 270 cases represented, ninety give the pupils outlines, placed on the blackboard or in notebooks; sixty-eight go over the lesson with the class, explaining difficult points; and fourteen study the lesson with the class. These three methods include 172 cases. Many of the remaining ninety-eight are probably as good as, or better, than those mentioned and should receive equal prominence. The complete list of helps follows: Call attention to the most important points in the advanced lesson (36); lessons outlined for pupils (59); questions or outline placed on blackboard (23); explain difficult points (12); go over lesson carefully with class (17); leading questions given (8); pupils make their own outline (10); assign by topics (7); lesson studied by teacher and class together (10); connection with previous lesson kept clear by continuous outline (7); read and study lesson with pupils one day, recite the next (3); references, pictures, and maps suggested (5); general answers like 'little or none', 'topic method', 'left to teacher', 'often neglected' (11); children led to discriminate as far as possible for themselves (3); outlines are developed (3); language difficulties explained (2); glimpses of what is to follow given (3); read lesson over with beginning classes, question after reading it (4); special assignments for special preparation (4); general thought of advanced lesson worked out from preceding one (2); definite instructions as to what to learn and how to acquire it (1); lesson taught with books open (1); the assignment is the 'preparation' according to the five formal steps (1); explain importance and relation of work assigned (2); list of topics with general references and citation to references given (5); go over lesson in advance with pupils (3); relative importance of topics suggested (1); definite problem set for mastery

(6); difficult words placed on blackboard and pronounced (1); make assignment very definite (4); have children understand what is wanted (1); outline enough to show how to study (1); just enough to arouse interest in next lesson (7); oral lesson goes before book reading (1); teacher should read advanced lesson with pupils, noting the large topics and prepare lesson according to the outline thus made (2); extended amount of history should be first read, then several days used in developing it (1); brief outline of next lesson hinted (1).

Some of the answers not listed above deserve a little notice. For example, one remarks, 'If the outline were as it should be, there exists no need of going over the lesson in advance'. Another feels that this is the weak place in the work of many teachers; while another holds that at least half of the time should be spent in assigning the lesson.

Material Entered in Notebooks. It is one thing to require notebooks to be kept, but it is quite a different thing to determine what is worth entering in them. Along with the requirement to keep a notebook should always go a list of exercises of sufficient value to be worth placing in the book. There seems to be no reason why a course of study in history should not definitely indicate notebook exercises, as well as topics for oral discussion in the recitation period. To show definitely what is kept in notebooks and the extent to which each item is used, the answers of the 121 systems requiring them were classified as follows: Outline of work (57); maps (35); assignments, regular and special (11); summary of vital points and important events (23); special readings and reports (9); compositions on historical themes (5); reproductions from oral work (6); notes on outside reading (7); biographical notes (6); lists of questions (7); lists of dates (8); points of interest found in reference books (5); illustration and sketches (9); additional facts to emphasize and supplement the textbook work (8); supplementary work given by teacher (4); pictures, diagrams, topics, extracts, and synopses (11); notes containing summary of oral lessons (3); outlines prepared by children (3); general outline of text (3); reading and class notes (5); dates which the teachers aim to make emphatic and use in review (2); essential points in outlines (3); grouping of material covering long period (2); written lessons (2); definitions, special outlines, and outline of lesson taught (7); items of interest and information (3); essential points deduced from study of text and reference books (4);

clippings kept in scrapbook (1); historical topics and connected reproductions (2); poems to be kept or memorized (1); pupils required to reproduce each topic in writing (1); answers to questions on great points of term's work (1); organize and correlate the topics treated (1); description of most important event (1).

To show the prevailing tendency more strikingly, the above material may be grouped in larger units, all phases of one kind of work being thrown together under one heading. The following summary shows such a regrouping: Outlines in one form or another (70); outside reading and class notes (35); maps, pictures, diagrams, drawings, and sketches (45); summaries of vital points and important events (34); regular and special assignments, lists of questions with answers, and important dates (36); written lessons like compositions on historical themes and reproductions (16); additional items and facts given by the teacher to supplement the text (15); historical portfolios and scrapbooks made (2).

The interesting fact brought out by the above arrangement is the uniformity in the material placed in the notebooks. There seems to be an unconscious agreement among teachers as to what is proper material for this work. Outlines are rather common. The thirty-five cases giving outside reading and class notes indicate that this sort of work is receiving an almost equal share of the time, if the outlining work is not included.

Wall and Textbook Maps. It is generally agreed that history work is poorly done unless constant use is made of maps as the work progresses. To get some estimate of the extent and quality of the use of wall and textbook maps, two questions called for replies relating to this method. A rather generous response came to both questions—217 systems reporting use of wall maps, and 190 the use of textbook maps. Two types of answers were given to each question, viz., one type stating how maps are used, and another stating why they are used. The following are some typical answers as to how wall maps are used; the number of times each answer appears is indicated by the number in parentheses: Pupils point out on the map the section under discussion (6); claims of territory are located (7); journeys, routes and movements are traced (11); movements of armies are followed on the map (10); refer to wall map during study and recitation (11); use in making mapbooks (3); pupils stand near map when reciting (1); locate places and events described in text (5).

The following are some of the purposes for which wall maps are used: To connect geography and history (6); to give definite ideas of direction and location (15); to make text more clear and emphatic (1); to localize matter of history (2); to show how the thing studied is affected by its geography (2); to study physical features (4); to make history appeal to pupils as a past reality (1); to make discussions more intelligent (1); to clinch abstract information (1); to test pupils' knowledge (1); to show the disadvantages of the people in certain districts (1); and to bring events and places into relation (1).

The answers show that textbook maps are used practically in the same ways and for the same reasons as wall maps. In a few cases a different use is given for the former. Some of the replies follow: Studied as carefully as other parts of the text (42); used in home study (1); reproduced on the blackboard (6); studied and copied during the study period (3); teach them in connection with wall maps (1); go over maps in the assignment (1); used as a guide reference to wall map (1); and to find small places quickly (1). The reasons given for the use of textbook maps are so much like those given for the wall maps that they need not be reproduced.

One thing is evident from the answers to the questions calling for the above material, viz., that teachers do use both kinds of maps in a variety of ways and for a variety of purposes. This evidence should encourage textbook makers and writers to include in their books many well-selected maps. The general use that teachers make of such maps would seem to justify an abundant use of maps in history texts.

Use Made of Pictures in History Teaching. Pictures are used in some systems to a large extent. One system reports a collection of 8,000; another says 'we have hundreds arranged in sets so they can be passed around easily'. Four systems have sets of lantern slides, and nine have stereopticon views. Only twenty-four of the 291 reporting say they make little or no use of pictures; forty-one leave the question unanswered, and nine report that they have no material. The answers given have more to do with why pictures are used than how they are used. Some of the typical purposes follow with the number of times each occurs: To emphasize persons, places, and facts (8); to excite interest and make the meaning clear (9); to make *real* the men, events, and places (2); to show costumes, battle fields, armies, and machinery (5); to keep children realizing that history is not 'dead' (1); to strengthen the study of the text (1); to illustrate and lend correlative interest in art and literature (1); to intensify feeling (1); to fix historical truths (1); and to make the child's mental picture clear (1).

A few examples may be given of how pictures are used: Each room collects and mounts pictures for history (2); stories about pictures given (4); studied and made part of the lesson (2); pictorial charts made by pupils and teacher (1).

Suitable pictures are considered valuable aids in teaching history. One says, 'they are the most valuable aids we use', others feel that they are not using them as extensively as they might, and say they intend to use them more. In general the answers show there is much systematic work yet to be done in this phase of history teaching. The proper use of pictures, the securing of suitable ones, and the amount of time to be given to such work, are problems which many teachers have not yet solved.

Use of Relics and Similar Materials in Teaching History. Relics and objects such as Indian bows and arrows, spinning wheels, weapons, powder-horns, and other material commonly found in historical museums are not used to any great extent. Two hundred and forty-three systems report on this question. Of this number, eighty-nine give general answers which indicate little use; fifty-one say such material has little or no use in their systems—no reasons being given for the neglect; twenty-one do not use them because no material is accessible; forty-eight either have a general museum, or visit the museum in the town. The remaining thirty-four replies contain answers like the following: 'have an exhibition in the seventh grade', 'are establishing a commercial museum', 'we do not encourage the study of relics', 'depends upon the teacher', 'each teacher who travels is made to contribute in this way', 'have an exhibition of art curios—many of historic interest'.

The extent of the use of relics and similar materials is seen from the above. Museums are rather uncommon. Schools having a collection of any sort are equally as uncommon. Yet while this is true, there are evidences that such work is favored and more would be done if material was accessible. The scheme of having pupils and teachers contribute is certainly an excellent way to build up a small and at the same time useful collection of valuable material. Probably the most satisfactory form in which to have the material is a collection for each grade. A few systems have their material in this form, and say that the pupils show great interest and receive much help.

Employment of Construction Activities in Teaching History. The reports do not show that construction activities are employed very extensively in history work. Of the systems and schools represented in the returns, thirty-nine leave the question unanswered. When one adds to this number those reporting little or none (63) and 'to some extent in lower grades' (21), about half of the systems are included. That the reader may know in detail what the answers of those reporting contain, they are tabulated below: Little or none (63); frequently, considerable, some in grades I and II (17); much in lower grades (41); to some extent in lower grades (21); drawing, weaving, modeling, and wigwam making in primary grades (17); story of Washington, Columbus, and the Pilgrims illustrated in primary grades (2); drawing more than others (21); manual training in grades I, II, and III correlated with such work (6); construction work regularly done in primary grades (7); build pioneer houses in sixth grade (1); make section of Roman road, battering ram, and castle (1); children reproduce weapons and utensils (1); correlate drawing and history (1); drawing and painting pictures for historical notebooks (1); posters made for historical pageant (1); much of it is waste of time (1); done by teachers who know how (2); not as much as we should like (2); drawing much, others little (3); make Greek and Roman houses in grades III and IV (1); Indian village constructed (1); boys make crude weapons and shields, girls make costumes for history scenes (1); modeling and wigwam-making in grade I (3); weaving, modeling, drawing, and painting in all grades (1); do modeling and drawing (2); correlate history and reading in this way (2). Throughout the replies there are evidences that such work is considered entirely worth while. The small systems do little work along this line, yet the answers indicate that the country teacher recognizes its value even if she is unable to do it.

Use of Dramatization and Historical Pageants in History Teaching. Dramatization has certainly not yet come into its own in history teaching. Of the entire number reporting, forty-one leave this question unanswered, 121 say 'nothing is attempted', and thirty, 'little or not much'—making a total of 192 of the total number of systems (259) represented in the returns. The nature of the work done by those reporting actual work of this kind is indicated by the few replies listed below. The extent of each kind of work is shown by the number in parentheses, which is the number of systems doing this particular work: Dramatized scenes from Colonial life (1), Hiawatha (4), Miles Standish (8), Evangeline (1), Story of the Pilgrims (3), Greek games and Robin Hood (1), Life of George Washington (1), King Arthur's Round Table (1), Columbus at the Court of Spain and his return from the first voyage (1), Siege of Calais (1), Queen Margaret and the Robbers (1), First Continental Congress (1), Signing the Declaration of Independence (2), Life of Benjamin Franklin and Henry Hudson (1). Answers such as the following indicate in a general way what is done: 'Some simple historical stories dramatized in grades I, II, III and IV', (1); 'dramatize once a year in grades I, II, III and IV', (1); 'some attempts have been made with little success', (1); 'nearly all primary stories dramatized', (2); 'have had tableaux', (4); 'occasional character representations', (1); and 'attempt something in each grade', (1).

The historical pageant is receiving little attention in the grades. It may have no place here. Later developments will likely determine whether it has or not. There seems to be little opposition to its use. In fact, many express a belief that such work is worth while and that they expect to do more in the future.

Helps and Devices Suggested.—Some persons feel that the teacher is the panacea for all the ills in history teaching. One says: 'A good live, patriotic, and public-spirited teacher is the best device'. The same superintendent goes on to say: 'I use no device in the course, and permit none except in the way of showing correlations and dramatizing'. Another says: 'The only devices I believe in are that a teacher should, (*a*) know the lesson, (*b*) be wide awake, (*c*) not talk over the heads of her pupils'. Another thinks the best way to aid the school is to aid the teacher, since he never saw a good teacher with a poor school, and vice versa.

Of course no one disputes the importance of the teacher in securing efficient work in any subject; at the same time teachers are not of uniform ability. Furthermore, few teachers have time to think out and ponder over devices and helps for each subject. Since this is a recognized fact, each course of study should be full of suggestions and devices. The reports indicate that courses of study are weak in this respect. Comparatively few devices were suggested by those reporting. Those reported are given below; they are arranged in two divisions, the first containing those needing no description, and the second those briefly described.

Under the first division just mentioned are the following: 'Reading tables organized, pupils bring books and magazines'; 'debates on historical subjects'; 'paragraph analysis as a means of teaching how to study'; 'historical fiction and poems to supplement'; 'current events to connect past and present'; 'tales by old soldiers, early settlers, men of talent in some line, and persons who have visited historic places'; 'flag day pupils taught why flag is waving'; 'the studies of one typical northern colony and of one southern, relate all others to these two'; 'writing biographical sketches using a picture of the man, his home, etc., for illustrations'; 'organize Constitutional Convention, assigning pupils to represent men', 'visit suitable places and institutions in local history', 'use School City for civics', 'put up daily work where it can be seen', 'the pupil-teacher method of recitations', 'child comes before the class and tells the story in the first person', 'printed blanks for reports in supplementary reading', 'graphic representation of historic facts', 'study cross-section of country at given periods', 'use longitudinal method of treating topics', 'frequent use of "word" review', 'give each pupil a specific task', 'organize the entire work of the school for several days around one historic thought', 'singing patriotic songs', 'clippings from news papers and magazines displayed in room', 'naming important dates and asking for events and vice versa', 'pupils operate the stereopticon and describe the pictures'.

The class of devices requiring a brief description to be understandable show some interesting attempts to make history concrete. They are given in the words of the one reporting. Characteristic ones are:

(*a*) 'Teacher impersonates certain characters, as a definite way to tell pupils about the person studied; the teacher has been a Persian soldier, King Cyrus, Eskimo woman, Arab, and a Chinese lady of high lineage. The children act with the teacher'.

(*b*) 'Allow pupils to criticise each other both as to facts presented and language used. Pupils address each other by name. The pupil criticised must accept the suggestion or defend his position'.

(*c*) 'Have a set of history cards, choose sides with captains. When a card cannot be guessed by the side on which it started, and the other side does guess it, the captain has a right to take the first side's best guesser'.

(*d*) 'When studying men like John Adams, Patrick Henry, and Richard Henry Lee some member of the class memorizes all, or part, of a notable speech made by one of these men and delivers it before the class, which assumes the rôle of the historic assembly to which the speech was delivered'.

(*e*) 'Pupil is assigned a topic, steps to the front, tells what he knows about it, and all others who wish to ask him questions stand. Any question he cannot answer is answered by the one asking it'.

(*f*) 'A common mapbook in which the pupils take turns illustrating a lesson in history. This compels them to compare their work with others of their grade'.

(*g*) 'Pupils make their own outline. Each day two or three are placed on the board. Recite from these outlines'.

(*h*) 'After a pupil has recited on a topic all other pupils who know more on the topic stand. The pupils who have just recited call upon all standing for any additional material they may have'.

(*i*) 'Discussions of questions on which the textbooks usually present but one side: e.g., right of taxation; Boston Massacre—mob riot, or patriotic action?; John Brown—patriot, or insane crank?; nature of the Union—right of secession?; Dred Scott Decision—legally correct?; Mexican War— justifiable?; sometimes the teacher takes one side and the class the other; sometimes the class is divided to form sides. If the teacher convinces all, or nearly all, he must exchange sides and meet his own arguments if presented again by the class'.

(*j*) 'Much drawing to illustrate the written historical reproduction. For example, if the subject is 'Little Ben Franklin', draw a map of Boston at that time, and a whistle, a candle-moulds, a candle-sticks, a bar of soap, a kite, and so forth; these drawings should appear at the proper place in the reproduction'.

The above suggestions are presented for what they are worth. They indicate that some real thinking is being done along lines of better methods of instruction in the history work.

Summary. (1) Placing an outline of the lesson on the board, or dictating it to the class and going over the lesson in advance with the class, are the most common ways of assisting the pupils when assigning the lesson. The former may be as much for the teacher's benefit as for the pupil's during the recitation period. The large number of answers indicate that teachers are conscientiously meeting this important problem.

(2) Few courses of study show any definite requirement as to what should go into the notebook. Simple outlines appear nearly twice as often as any other kind of material. There are indications, however, that notebook exercises in the strict sense are sometimes included.

(3) Both wall and book maps are much in use. No method predominates. The individual initiative of the teacher is much in evidence here, a fact which accounts for the thirty-two uses listed in the tabulation. There exists a rather strong desire on the part of teachers for more maps of both kinds. There is a feeling that textbook makers do not insert enough maps. This feeling is especially prevalent in smaller schools, where the equipment of wall maps is rather meagre.

(4) The use of pictures in history teaching is also much in favor. The large collection possessed by some schools speaks well for the equipment in this phase of the work. There are indications that pictures will be employed much more in the future than in the past. Teachers and pupils are making their own collections where school authorities do not furnish them.

(5) The value of relics and related material in history teaching is clearly recognized, yet not much use is made of that material. The chief difficulty in doing the work lies in securing the material, especially in new towns and districts. There is no indication that this will ever be an important phase of grade history work, except in large cities, where museums are accessible.

(6) Construction activities may be used in other lines of work, but there is little evidence that they are used to any great extent in connection with history work. The value of such work is clearly recognized even if it is little used. The indications are that it will more and more become a permanent phase of the history work, especially in the lower grades.

(7) A majority of the systems reporting attempt nothing in the way of dramatization, and the use of the pageant. Much more of the former than the latter is done where either is attempted. A strong belief in the value of both lines of work is prevalent. If such a belief is not lost in the multiplicity of other plans of work, the future may see some excellent work in both of the these fields.

IV. ADMINISTRATION OF THE COURSE OF STUDY IN HISTORY

1. The Time Devoted to History

Number of Recitations per Week in Each Grade. The number of recitations per week given to history in each grade is one index to the amount of time given to the subject. The tendency in the first grade of the 116 systems reporting is to have three recitations per week, this number gradually increases until it reaches five in grades V, VI, VII, and VIII. The complete distribution is shown in the table below:

Number.	Frequency in Grade—								Total.
	1	2	3	4	5	6	7	8	
Number of systems represented	116	127	147	163	200	209	222	206	
One recitation per week	22	19	17	15	11	6	1	0	91
Two recitations per week	34	34	28	27	26	19	8	0	176
Three recitations per week	29	34	46	45	32	32	13	13	244
Four recitations per week	5	7	5	10	12	17	14	12	82
Five recitations per week	26	33	51	66	119	135	186	181	797
Median number of recitations	3	3.3	3.6	3.9	5	5	5	5	

The table clearly shows the decrease in the number of systems having one recitation a week as the eighth grade is approached. The same decrease is also noticeable in systems having two and three per week. When four recitations each week begin, the decrease has changed to an increase which gets greater until five per week occur. One would scarcely have thought, before tabulating the above material, that half of the elementary grades are devoting five recitations per week to history.

Length of the Recitation Period in Each Grade. The recitation period varies from five to forty-five minutes in length in the systems reporting, the former occurring six times, the latter twenty-eight. A twenty-minute period seems to be the favorite, with a thirty-minute as second choice. The order is as follows: twenty-minutes, occurring 406 times; thirty-minute, 307 times; twenty-five minute, 278 times; and fifteen-minute, 206 times. No other period comes near in length of time to any of the above, the ten-minute being nearest with but fifty-two frequencies.

Speaking generally, the length of the recitation period in grades I and II is fifteen minutes; in III and IV, twenty minutes; in V and VI, twenty-five minutes, and in VII and VIII, thirty minutes. The median length in minutes for each grade from I to VIII inclusive is as follows: 14.83, 14.67, 20.87, 18.67, 27.20, 23.50, 28.00, and 30.40. It is interesting to note that the second is less than the first, the fourth less than the third, and the sixth less than the fifth when stated in terms of the median. The table which follows shows the strong tendency in the eighth grade to lengthen the recitation period to equal the customary high school period, there being approximately 25 per cent of the totals in the eighth grade which have a period of thirty-five minutes or more. This might be explained by either the tendency to do departmental work in this grade, or by the fact that the eighth grade is sometimes thrown with the high school and uses the same length of recitation periods.

Length of Period.	Frequency in Grades—								Total.
	1	2	3	4	5	6	7	8	
Number of systems reporting	114	125	142	173	200	207	219	216	
5 minute period	3	3							6
6 minute period			2						2
8 minute period				2					2
10 minute period	19	16	4	3	2	2	1	1	48
12 minute period	1	3	2		3	2	2	1	14
13 minute period		1	1						2
15 minute period	46	45	35	32	22	14	8	4	206
17 minute period			1	1					2
18 minute period					1				1
20 minute period	34	41	69	79	73	57	28	25	406
22½ minute period						1	1		2
25 minute period	2	5	12	33	46	71	69	40	278
27 minute period					1	1	1	1	4
28 minute period							1		1
30 minute period	9	11	13	21	41	46	76	90	307
32 minute period								1	1
35 minute period			1	1	3	4	10		19
37 minute period							1		1
35 minute period								19	19
40 minute period			1	1	5	5	13	22	47
45 minute period			1		3	4	8	12	28
Median duration	14.8	14.6	20.8	18.6	27.2	23.5	28.0	30.4	

Number of Minutes per Week Given to History in Each Grade. The most exact check on the amount of time given to history is the one now under discussion. Whether there is correlation between time given to history and the results obtained is yet an unsolved question. Before the investigations of Rice[1] and Stone[2] on the re-

[1] J. M. Rice, *Forum XXXIV; 281.*
[2] C. W. Stone, *Arithmetical Abilities.*

lation of the time given to arithmetic and results obtained, one might have believed there was a close correlation between the two in any subject; in view of the fact that in arithmetic the correlation between the two variables mentioned above is a low one, conclusions with reference to the relation in other school subjects must be withheld until more investigations have been made.

By reference to the next table it will be observed that the time given to history gradually increases from the first to the eighth grade, the median time in minutes per week from the first to the eighth grade inclusive being as follows: 33.33, 43.40, 48.00, 75.00, 85.00, 98.19, 113.23, and 132.06. The range is from ten to 225 minutes per week. One hundred minutes per week is the favored time, having 218 totals. Both 125 and 150 minutes per week are close seconds to the above, the former with 215 totals and the latter with 210. By comparing the totals in the foregoing with those which follow, one notices that there is more general agreement as to the length of the recitation period than as to the number of minutes per week to be given to history. The explanation of this difference is the fact that recitation periods are determined from a psychological point of view, while the number of minutes per work given any subject is usually a local matter, often determined without much thought.

	Frequency in Grades—								Total.
	1	2	3	4	5	6	7	8	
Number of systems represented	116	125	147	163	210	215	222	216	
10 minutes per week	1	1	2	...	...	...	...	...	4
12 minutes per week	1	1	...	...	...	...	...	...	2
15 minutes per week	3	2	1	1	1	...	...	...	8
20 minutes per week	21	15	10	10	3	1	...	...	60
25 minutes per week	1	2	3	1	2	2	1	...	12
30 minutes per week	28	23	8	8	7	3	...	...	77
36 minutes per week	...	...	2	...	...	...	...	...	2
40 minutes per week	9	11	19	14	3	5	1	...	62
42 minutes per week	...	1	1	...	...	...	...	...	2
45 minutes per week	16	15	15	11	6	3	...	...	66
50 minutes per week	6	8	5	6	8	8	2	1	44
60 minutes per week	7	17	25	31	28	20	9	2	139
75 minutes per week	11	14	22	21	22	19	10	5	124
80 minutes per week	1	1	2	4	18	5	5	4	40
90 minutes per week	1	2	2	3	4	6	7	4	29
100 minutes per week	9	11	24	35	51	42	25	21	209
125 minutes per week	...	...	2	10	31	57	68	47	213
150 minutes per week	1	1	3	7	22	27	64	85	210
160 minutes per week	...	...	...	...	...	1	2	2	5
175 minutes per week	...	...	1	1	2	12	12	19	47
200 minutes per week	...	...	...	...	1	2	9	18	30
225 minutes per week	...	...	...	...	1	2	7	8	18
Median time per week	33	43	48	75	85	98	113	132	

Per Cent of the School Time Given to History in Each Grade. Just what per cent of the school time history should have is a question for the future to settle. The next table will show present practice as revealed by this investigation. The variation is from one to thirty-three per cent, ten per cent being the favorite proportion (in 140 cases). A glance at the totals show that there is at present no common agreement as to the per cent of time to give to history. The median per cents show an expected increase from the first to the eighth grade. These median per cents in order of grades beginning with the first are 6.61, 9, 9.33, 10.67, and 10.94. Superintendent Wilson[3] found in computing the per cents for seventy-eight courses of study in arithmetic that the per cents for each grade beginning with the first ran as follows: 6, 11½, 14½,

Time Given to History.	Frequency in Grades—								Total.
	1	2	3	4	5	6	7	8	
Number of cities reporting	64	62	88	88	121	128	134	135	
1 to 2 per cent	9	8	3	1	....	....	....	....	21
2 to 3 per cent	9	8	7	9	4	5	....	....	42
3 to 4 per cent	10	8	10	7	3	....	1	....	39
4 to 5 per cent	3	12	16	11	10	8	....	....	60
5 to 6 per cent	8	6	8	8	8	8	7	1	54
6 to 7 per cent	5	4	14	18	16	10	5	4	76
7 to 8 per cent	2	6	2	4	7	16	9	8	54
8 to 9 per cent	3	4	8	12	13	16	17	10	83
9 to 10 per cent	....	....	1	2	4	3	7	9	26
10 to 11 per cent	9	....	11	9	22	22	30	37	140
11 to 12 per cent	....	....	....	....	....	1	2	3	6
12 to 13 per cent	....	....	1	1	7	6	7	10	32
13 to 14 per cent	....	....	....	1	2	5	7	2	17
14 to 15 per cent	....	....	....	....	2	2	5	4	13
15 to 16 per cent	2	2	3	1	8	8	13	9	46
16 to 17 per cent	2	3	1	1	5	4	5	8	29
17 to 18 per cent	....	....	....	1	2	1	1	1	6
18 to 19 per cent	....	....	....	....	....	....	....	....	......
19 to 20 per cent	....	....	....	....	....	2	....	....	2
20 to 21 per cent	2	1	3	2	7	10	14	25	64
21 to 22 per cent	....	....	....	....	....	....	....	....	......
25 per cent	....	....	....	....	1	1	2	3	7
29 per cent	....	....	....	....	....	....	1	....	1
30 per cent	....	....	....	....	....	....	....	1	1
33 per cent	....	....	....	....	....	....	1	....	1
Median	5	5	6	6.6	9	9.3	10.7	10.9	

15½, 16, 17, 16, and 17. It will be observed that these are higher in every grade, the greatest difference being in grades III and IV. The difference in per cents by grades beginning with the first is 1,

[3]Course of Study in Mathematics—Connersville, Ind., Public Schools p. 8.

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6.50, 8.50, 8.89, 7, 7.67, 5.33, and 6.06. The difference in grades II and III is more than the per cent of time that history receives in these grades. If Rice and Stone's findings in regard to the correlation between time spent on arithmetic and results obtained hold good, the future may see some reduction in the time given arithmetic. If this reduction ever comes, history may come in for its share of the extra time.

Summary. (1) The prevailing tendency is to give three recitation periods per week to history in grades I, II, III, and five periods per week in grades V, VI, VII, and VIII. There are indications from the material tabulated that the custom of five recitations per week is moving towards the first grade.

(2) The median recitation period ranges from fifteen minutes in the first grade to thirty in the eighth. The most common periods are fifteen, twenty, twenty-five, and thirty minutes, the total number of times that each occurs in all grades being 206, 406, 278, and 307. The sum total of the number of periods less than fifteen minutes in length is but eighty, which fact clearly shows that it is being recognized that periods must be of sufficient length to do something more than mere testing.

(3) The decrease in the number of minutes per week devoted to history in the form of recitation periods is rather gradual from the eighth to the first grade. This follows the historical development of the subject as it was introduced in the grades, beginning in the eighth and moving down the grades toward and finally including the first. The future will, no doubt, see a slight increase in the number of minutes per week in grades below the seventh.

(4) The median per cent of the school time devoted to history ranges from five in grade I to nearly eleven in grade VIII. As to this item the grades fall in two equal divisions, the four lower and the four higher. The per cent of time in each group varies from 1.6 in the lower group to 1.9 in the upper group. This result seems to indicate that the unit in this distribution is a group of grades rather than a single grade.

2. Special Requirements

Flexibility in Systems. The answers to the question, 'Are all the schools under this course required to cover the same amount of work in history, or is part optional'? show a great lack of flexibility. Out of the 195 replies to the question, 138 said all the schools under the course were required to do the same amount of work in history. A variety of requirements exists in the schools replying to the question. The following is a summary of such requirements, the number of school systems having them is indicated by the numbers in parentheses: All doing the same amount (138); most required, some optional in lower grades (5); history stories in third grade optional (1); part the same, extra optional (2); much optional (3); modifications often required (1); uniform, except English history optional in seventh or eighth grade (1); same amount in grades VI, VII, and VIII (3); part is optional (8); all required in grades IV, V, VI, VII, and VIII (5); same work done in grades V, VI, VII, and VIII (7); American elementary history required (1); required in grades VII and VIII, other optional (4); country schools do not do all (1); all do the same in eighth grade (1); some of the reading is optional (1); amount required depends upon the class (1); requirements not so rigid as in reading, language and arithmetic (1); optional (2); all do not do the same (2); optional in grade I, required in all others (3); course suggested, material left to the teacher (1); some optional in schools containing many foreign children (1); all required where school is not crowded (1).

The above tabulation shows that in the lower grades the amount of work done may vary. Twenty-four out of the fifty-seven cases not requiring the same amount, require the same in grades VII and VIII; twelve require the same amount in grades V, VI, VII, and VIII; while eight require the same amount in grades IV, V, VI, VII, and VIII. These figures show that in systems where the custom is not to require all to do the same, there is a gradual movement downward from the eighth grade. This fact is also in harmony with the fact that history has been moving downward from the eighth grade toward the first ever since it got into the elementary curriculum.

The conclusions from the data in the answers to the question are: (1) There is evidence that requirements in the work in history are fast becoming as rigid as those in the three R's, approximately 70 per cent of the 195 school systems requiring each grade to do the work outlined. (2) In the school systems not requiring all to do the same amount of work, there is a tendency to extend the requirements to include the first grade.

The Use of a Textbook in History Teaching. The tendency to use a textbook in the hand of the pupils is rather general even down to and including the fifth grade. Two hundred sixty-seven of the replies reported on the use of textbooks. A few of this number use them merely as supplementary readers. Of those using books as texts (as textbooks are generally used), 251 cases are found in the eighth grade, 245 in the seventh, 207 in the sixth, 157 in the fifth, thirty-one in the fourth, and four in the third. The tendency to extend the use of the text downward through the grades is very much in evidence. The abrupt drop from the fifth to the fourth grade indicates that at present more emphasis is placed on history in the four upper grades than in the four lower ones. It is no doubt a safe prophesy to say that ten years hence the fourth grade will stand in the same relation to the fifth as the fifth now stands to the sixth. The following summary shows the combinations found and the prevalence of each in respect to the use of textbooks in each grade: Three systems use a text in the eighth grade only; three in 7A and eighth; forty-two in seventh and eighth; three in 6A, seventh and eighth; forty-three in sixth, seventh and eighth; twenty-six in fourth, fifth, sixth, seventh and eighth; three in third, fourth, fifth, sixth, seventh and eighth; three in fifth, seventh and eighth; one in fifth, sixth and eighth; one in sixth and eighth; one in fourth, sixth and eighth; one in sixth and seventh; one in fifth, sixth and seventh; four in fifth and sixth; one in third, fourth, fifth and sixth. Two use as supplementary readers in grades III, IV, and V; one in grades IV and V; one in III and IV; one in VI and 7B; one in VI; one in V and VI; one in II, III, and IV; and one in grade V.

This summary brings out the fact that four arrangements include the great majority of the cases. The use in grades V, VI, VII and VIII leads with 117 systems; VI, VII, and VIII follows with forty-seven; while VII and VIII come next with forty-two. The rather large number of systems with books used in grades IV, V, VI, VII, and VIII is an evidence of the tendency to extend the use of the text toward the lower grades.

The above material, when rearranged on the basis of a single grade, shows that but few systems use the text in the hands of the pupils below the fifth grade. The occurrence of the textbook requirement by grades in the 259 schools and school systems reporting are: first grade, 0; second grade, 0; third grade, four; fourth grade, thirty-one; fifth grade, 157; sixth grade, 209; seventh grade, 246; eighth grade, 251. It is evident from these figures that in general the four higher grades use a history text, while the work in the four lower grades is done without a text in the hands of the pupils.

Notebook Requirements. Two hundred and fifty-one answers gave data on notebook requirements. Of this number 106 say they are not required, 120 require them, and twenty-five give qualified answers. The grades in which notebooks are required in the 120 systems above are as follows: eleven require them in the eighth grade only; fifty-one in grades VII and VIII; twenty in grades VI, VII and VIII; ten in V, VI, VII and VIII; seven in IV, V, VI, VII and VIII; five in III, IV, V, VI, VII and VIII; two in V, VII and VIII; one in II, III, IV, V, VI, VII and VIII; eleven in IV and VIII; two in VI and VII; one in IV, VI, VII and VIII; two in V and VI; one in VII; two in IV, V, and VI; and two in all grades. Twelve do not require them, but nevertheless use them in grades V, VI, VII and VIII; one only permits their use in grades VII and VIII; three use them to some extent in VI and VIII; four use them sometimes in VI, VII and VIII; three make their use optional in VI, VII and VIII; and one uses them very little in VII and VIII.

The fact brought out by the above replies is the increased amount of notebook work as the child progresses in the grades. The interesting fact established from the answers is that there are about as many systems not requiring notebooks as there are requiring them. The question, 'Are such requirements on the increase or decrease?' might here suggest itself. For the answer we shall have to wait till some future investigation is made. Comparisons will then be in order. Whether or not such requirements should, or should not, increase will also have to remain unanswered until some one gives us a standard for measuring results in history. With a standard of some sort, one could easily tell whether or not notebook keeping is worth while. Below is a table showing the occurrence of notebook requirements by grades:

	Frequency in Grades—							
	1	2	3	4	5	6	7	8
Required	2	4	8	19	31	52	102	111
Not required but used	....	....	....	....	1	1	1	1
Only permitted in	....	....	....	....	....	....	1	1
To some extent in	....	....	....	....	....	1	....	1
Optional	....	....	....	....	....	1	1	1
Number suggested and urged	1	1	1	1	1	1	1	1
Very little	....	....	....	....	....	....	1	1
Sometimes used in	....	....	....	....	....	1	1	1
Grade totals	3	5	9	20	33	57	108	118

Map Requirements. Maps are required in all grades from the first through the eighth, the number of systems requiring them increasing as the eighth grade is approached. Of the 250 answers to the question, only nineteen have no requirements—the great majority of systems having some requirement in this phase of the work. The table below shows the frequencies in each grade as well as the various shades of requirement. The totals for each grade show the increase in the number of systems with the various requirements for each grade. The large number in the eighth grade is a testimony of the faith most people have in the value of map work in this grade.

	Frequency in Grades—							
	1	2	3	4	5	6	7	8
Regularly required	8	8	12	25	36	82	141	147
Occasionally required	5	5	5	5	11	15	29	34
Not required, but some done	....	....	....	1	4	6	6	6
Very little, not rule, optional	1	1	1	2	2	3	3	3
A limited amount	....	....	....	1	3	3	4	5
Total	14	14	18	34	56	109	183	195

How Frequently Maps are Required. The 187 answers as to the frequency of map requirements show a woeful lack of definiteness. If maps are required, why should not certain maps be specified and the number of them? In this respect, courses of study are very weak. If any results worth while are to come from map requirements, definite instruction must be given concerning them. In each grade where maps are required, the teacher should definitely understand just how many and what maps are to be made. If a map is worth making in one seventh grade, it is worth making in all seventh grades. The following analysis shows the frequency of map-making as reported: Once a month (6); no rule (79); as needed or when necessary (17); left to teacher (9); when lesson or subject requires it (12); when useful or best work demands it (9); occasionally (7); average six each semester (2); once in two weeks (3); two each week (5); sketch maps very often (2); depends upon work in text (2); about forty in all (2); important subjects and movements (2); one each week (3); when they seem to help (2); twelve or fifteen during the year (1); three to five per year (5); ten per year (1); eight to ten each term (1); one or two per term (1); each new territory and important boundary (2); in wars and colonization, few others (2).

On careful examination, the above table shows that the great majority of systems have no rule regarding the frequency of map-making. In fact, 149 of the 187 totals fall in this group. Where any requirement is made, it often lacks definiteness; for example 'about forty in all'; 'twelve or fifteen during the term', 'one or two per term', etc. As an example of what might be required, the requirements in one course of study for grades VII and VIII are given.[4]

I. MAPS TO BE DRAWN IN FIRST HALF OF SEVENTH YEAR—
 First week.—Indians, distribution of tribes.
 Second week.—World in Fifteenth century
 Third week.—Trade routes to the East.
 Sixth week.—Spanish explorations.
 Ninth week.—Early voyages.
 Eighteenth week.—European colonies in 1650 and French explorations.

II. MAPS TO BE DRAWN IN SECOND HALF OF SEVENTH YEAR—
 First week.—Territory after French and Indian Wars.
 Third week.—Revolution in Northern and Middle States.
 Fourth or Fifth week.—Revolution in Southern States.
 Seventh week.—Land claims of the thirteen original colonies.
 Fifteenth week.—Lewis-Clark's route and the United States in 1810–1812.

III. MAPS TO BE DRAWN IN FIRST HALF OF EIGHTH YEAR—
 First week.—Missouri compromise.
 Second week.—United States in 1825.
 Sixth week.—Territory acquired from Mexico.
 Ninth week.—Confederate and Union territory.
 NOTE.—Trace all cámpaigns of the Civil War on outline maps in the tablet.

IV. MAPS TO BE DRAWN IN SECOND HALF OF EIGHTH YEAR—
 First week.—Territorial growth of the United States to 1867.
 Fourth week.—Trace Union Pacific Railroad on map of United States.
 Tenth week.—Standard time belts.
 Fourteenth week.—United States and its possessions.

The writer does not mean to say that the above requirements are ideal, but he does want to make the point emphatic that any requirements as definite as the above will get better results than the plan usually followed as shown by the preceding tabulation.

How Maps are Made. Most of the 217 systems reporting for this phase of the work either have the maps drawn or use prepared outlines—118 cases of the former and fifty of the latter. Besides the above two methods, maps are traced in eight systems; drawn or traced in six; drawn and traced in nine; drawn, traced

[4] Nashville, Tenn, Grammar Schools—*Handbook in Geography and History.*

and prepared outlines used in fourteen; sketched in four; drawn and prepared outlines in five; and traced or prepared outlines in three. Such are the frequencies of each method. The method of drawing maps is more frequently used than all others combined.

Collateral Reading Requirements. Material was tabulated from 284 replies on the subject of collateral reading, including the amount and in what grades required. In answer to the direct question: 'Do you require collateral reading'? 219 say 'yes' and twenty-two say 'no', the remainder giving qualified answers like the following: Required as supplementary reading in all grades, (9); encouraged but not required, (10); not required, but credit given if done, (1); very little either required or done, (4); and nineteen cases with answers such as 'to some extent', 'few special reports on assigned topics', and 'but little time should be given to this in the grades'. Of those systems requiring collateral reading, thirteen systems require it in the first and second grades, twenty-four in the third, thirty-two in the fourth, fifty-four in the fifth, seventy-nine in the sixth, 143 in the seventh, and 153 in the eighth. Twenty-four of the replies do not designate in what grades it is required.

Not all of the 219 systems requiring supplementary reading give a complete answer to the request for the amount required in each grade. Some of the requirements given and the number of cases are: no special amount, (16); as much as possible, (10); to a limited extent, (10); left to the teacher, (8); as time and library permits, (7); special topics worked up and reported upon, (6); must read one book besides the text, (5); depends upon the class, (8); from one-half to one-fourth of the time given to history (3); to a large extent, (2); depends upon the material at home (2); everything class can find, (2); thirty minutes per day, (1); four books required and furnished in grades V, VI, VII and VIII, (1); each class has one extra book per pupil, (1); one book per month, (1); one lesson each week from supplementary readers, (1); enough to show that the text does not contain the whole story, (1); some one reads a reference and reports each day, (1); two-thirds of the time given to history, (1); numerous assignments made to individuals, (1); one special report each term per pupil, (1); not much, the regular work in history is enough, (1).

The main fact brought out by the above material is the indefiniteness of the requirements. In fact, nearly all of them are so general that they are of little value. Right here is where some effective work on the part of teachers and supervisors seems to be needed. As long as requirements are given in a general way, little collateral reading will be done. Unless there is strict supervision of what is done, it will certainly be haphazard and of little value.

Summary. (1) In a given system, little flexibility in the material of the course of study is permitted. In most cases, all schools of a system are compelled to follow the same course rather closely. Whether or not the flexibility permitted in respect to method is conducive to the best work is doubtful.

(2) Textbooks in the hands of the pupils are most common in grades V, VI, VII, and VIII. There is a slight tendency to include the fourth grade. The chances are small that textbooks in the hands of the pupils will ever go much below the fourth grade. They will be used below this grade for supplementary reading, but not as texts in history.

(3) There is either much lethargy, or actual opposition, to requiring notebooks in elementary history. One hundred and six of the 251 systems reporting do not require notebooks. The important question here concerns what should be placed in the notebooks rather than whether or not they should be required. Along with the requirement to keep a book should go at least a suggestion as to what exercises are worth placing in the books and some directions as to the form in which such exercises are to appear.

(4) The requirement concerning map-making is very general. Some sort of maps are required in all grades. Almost the same requirements hold for the two upper grades. A rapid decrease is noticed as the first grade is approached. Much effective supervision can be done by indicating what maps are to be drawn and how often, rather than by leaving the whole matter to the teacher in charge. There is absolutely no uniformity existing about how often maps are to be made. When such a condition exists, maps are made if time permits and materials are near at hand.

(5) How to manage and how to secure the proper amount of collateral reading in the grades are questions that are yet unsolved. Two things very much needed as shown by the answers are suitable reference books and some definite system of checking the work after it has been done. The answers to the direct question here show that such work is very generally required, but the answers to the amount done also show that there is much uncertainty as to both the method of doing it and the amount to be done.

3. Correlations

Correlation of History and Reading. Eighteen of the 238 systems reporting on correlation of history and reading say that no correlation is attempted. There were twelve answers of 'very little' and 'incidental'. The various methods of correlating the two subjects are shown in the following tabulations of the replies. Seventy-eight systems use supplementary reading of a historical nature, eleven make history largely a reading lesson, thirteen review all selections of a historical nature in the reader when the topic is up in history. Eight combine history and reading up to the seventh grade, eight read much biography in the seventh and eighth grades, four bring out the history of the selection read and develop historical characters, five do much oral reading during the history recitation, four devote to history the time given to reading, four make the reading lesson a basis for the history lesson, four use classics and memory gems having a historical bearing, four study the lessons of a historical nature in the readers as history, three base the sentences in the primary reading on history material, two make much of the history selections in the readers used in grades III and IV, two give the reading period over to history twice a week, two read poems and choice bits of literature especially related to history, two explain the history suggested by the reading lesson, two use the Little Chronicle in the reading class for current history.

A summary of these methods, and others not listed, gives the following results: Either supplementary reading is used in the line of history or history material used for reading matter, (98); combine history and reading in some form or other, (21); read selections of a historical nature at the time the history referred to in said selection is being studied, (20); emphasize the historical phase of all reading matter of a historical nature found in the readers, (12); give the reading time over to history with much oral reading during the recitation, (12). The above summary clearly brings out the fact that at present teachers are trying to solve the problem of history, especially in the lower grades, by making a reading lesson of the material through reading. Whether this is justifiable or not is an unanswered question. It is likely that both reading and history suffer much by such an arrangement. Whether the gain overbalances the loss is another question yet unanswered.

Correlation of History and Language. Twelve of the 237 systems reporting on the correlation of history and language say 'no correlation'; twelve others give 'very little' as an answer. To the above should be added twenty-two general statements such as 'do correlate' and 'much correlation'. Eliminating these forty-six systems, 191 are left whose answers show a definite attempt at correlation. The methods given follow: fifty-four take subjects for compositions from history, sixty-nine use history as a basis for both oral and written language work, twelve insist upon correct forms of expression during the history period, twelve use written history lessons as language work, eight use topics from history in the language work, nine write biographies as language exercises, five write long historical themes, two debate historical subjects, six use when convenient historical sentences for examples, two combine language and history, three grade written history work for errors in English, two dramatize historical events in the primary grades, and two write character sketches and descriptions of historical scenes. One has the children make stories from history topics, one has them copy history in a notebook, one gives a prize for the best essay in the eighth grade on a historical subject, one has the pupils write a history of the city as composition work, and one teaches historical poems in the language work.

A summary of the above statements gives the following result: Oral and written language work should be based on material previously taken as history, (126); historical themes, character sketches, biographies, and history of the city should be made a part of the composition work, (29); written work in history may be made to serve as language work, (15); correct English should be insisted upon during the history recitation, (12); historical subjects should be debated, (2); language and history should be combined, (2); historical events should be dramatized, (2). The correlation done by the 236 systems cited above is the sort in which most teachers believe. Such correlation can be made without any harm to either history or language. In fact, history receives direct aid from such work. Historical ideas that cannot be expressed in clear-cut English are worth very little to the pupil. The methods of correlation represented in the above table are all good, and should be used with equal emphasis. The correlations between language and history are much more satisfactory than those between reading and history.

Correlation of History and Geography. The most common way to correlate history and geography is to parallel them in the course of study. Eighty-two of the 237 systems reporting follow this plan, while fifty-four precede the history of a country by a study of its geography and sixty-two use both of the above plans. A striking uniformity of opinion is expressed concerning this phase of the history work. The uniformity comes, no doubt, from the historical fact that geography was in the curriculum when history entered, so that it was perfectly natural and logical to correlate the history of a country with its geography. The table following shows the uniformity spoken of above: History of a country preceded by its geography (54); history of a country paralleled by its geography (82); history of a country preceded, paralleled, and followed by its geography (4); history of a country followed by its geography (7); history of a country preceded, and followed by its geography (6); history of a country paralleled and preceded by its geography (62); no attempt made to correlate (7); no rule (3); taught in connection with geography (1); correlated to some extent (3).

Summary. (1) A definite effort is being made to correlate history and reading. All but eighteen of the 238 systems reporting attempt some correlation of the two subjects. A large variety of methods exists. The large number is indicative of the attempts that are being made along this line. There are dangers here that should be avoided. For example, a common way to correlate the two is to read history material during the reading period. This method is good for history but not equally as good for reading, since it narrows the child's reading to one interest, and takes away the opportunity to develop many phases of reading that are supremely important.

(2) The correlation of English and history is a little more general than that of reading and history. The same variety of methods exists. The correlations found here are not so damaging to the English composition work as the correlations with reading are to the reading work. The most common way is to use history material as a basis for oral and written composition. Of course, everyone recognizes the possibility of overworking such a plan to the detriment of composition, for there are phases of work in composition that require other than historical material on which to work.

(3) An effort is being made to parallel the history of a country with its geography. Another plan of almost equal importance is to precede the history of a country by its geography. A few systems teach history in connection with geography up to the seventh grade but such a method is not at all common.

V. GENERAL SUMMARY AND CONCLUSION

The following are the main general conclusions deduced from this limited study:

1. As to Materials and Subject-Matter: (a) Much uniformity exists in the material in grades VII and VIII. The first, third, and sixth grades are the uncertain fields. Material based on American history predominates in grades II and V. Old World history occupies the greater part of the time given to history in the fourth grade. (b) Both civics and local history are neglected. There exists a demand for both, but lack of time prevents their general introduction. A few systems have excellent courses in each. (c) There is a strong desire for European history in the grades. Nearly half of those replying want it taught apart from American history. English history is the field most favored. (d) There is a tendency to shift the emphasis in teaching history from war and politics to the social and economic life of the people studied.

2. As to Methods and Devices: (a) The work in history in the first three grades is practically all oral, the amount of oral instruction getting less as the eighth grade is approached. Oral reproduction is more common in all grades than written. Note-taking on oral history teaching is not favored. The returns show that the majority of teachers have had but little special training in story-telling. (b) The most common way to help the children in assigning the history lesson is to give an outline, usually placing it on the blackboard. (c) There is much uncertainty as to what is proper and suitable material to enter in the notebook. Outlines of the work are most often favored. Indefiniteness and lack of specific requirements characterize this sort of work. (d) Wall and book maps are extensively used. A great variety of uses are found for them. The indications are that this phase of the history work is not being neglected. (e) The use of pictures, relics, dramatization, and pageants, and the employment of constructive activities in history teaching varies very widely in the systems reporting. There is little evidences that the above phases of work are used extensively. Some feeble efforts are being made in the larger systems. Little of such work is attempted in towns, and in the country districts.

3. As to the Administration of the Course of Study: (a) Schools and grades in the same system are all required to follow

the same course of study in history. The flexibility is in method rather than in matter. (b) Textbooks in the hands of the children are used in grades V, VI, VII, and VIII, increasing as the eighth grade is approached. (c) Notebooks are not generally required. Where they are used, no definite requirements are made as to the material to be placed in them. (d) Map-making in elementary history is pretty generally required. Maps are most often required in grades VI, VII, and VIII. There is absolutely no regularity as to what maps should be made. Over half of the systems reporting have the pupils draw maps. One-fourth use prepared outlines. (e) Collateral and supplementary reading is generally required. The effect of the requirement is offset by the indefiniteness as to both the amount and the frequency of such work.

Judging from the material on which this study is based, the indications are that the future may expect improvements in the teaching of history in the elementary schools primarily in the following respects: (1) more uniformity in the materials used in all grades below the seventh, (2) more systematic work in both civics and local history, (3) better trained teachers in the art of story-telling, (4) more definiteness about what is desirable in the use of notebooks, and in map-making, (5) a more general use of pictures, construction activities, and dramatization, (6) the more general use of a textbook in the fourth grade, and (7) a greater definiteness in the matter of collateral reading.

INDIANA UNIVERSITY, MARCH, 1913

INDIANA UNIVERSITY STUDIES

18. SOME RESULTS FROM AN ICHTHYOLOGICAL RECONNAISSANCE OF COLOMBIA, SOUTH AMERICA, PART II. BY CARL H. EIGENMANN

INDIANA UNIVERSITY STUDIES

BLOOMINGTON, INDIANA, MARCH, 1913

[Contributions from the Zoological Laboratory of Indiana University. No. 131.]

Some Results from An Ichthyological Reconnaissance of Colombia, South America. Part II.

CARL H EIGENMANN

An account of the Colombian Expedition of December, 1912, to April, 1913, was published in Part I of the present paper. (Indiana University Bulletin, X, No. 8, Sept., 1912, issued December 23, 1912.) The questions of geographical distribution that should find their solution in western Colombia and in Panama and that led to the Colombian Expedition have been considered by the present author in Science, N. S. XXII, July 7, 1905, pp. 18-20; in the Popular Science Monthly, June, 1906, pp. 515-530; and more fully in Reports of Princeton University Expedition, Patagonia, III, 1910, pp. 225-511. The reconnaissance outlined was undertaken in large part as a contribution to the solution of questions of the distribution of fishes.

The first part of the present paper contained also descriptions of thirty-one new species and four new genera of fishes. As an introduction to the results of further studies on the material collected, the article published in Science, now out of date, is reproduced in part.

'The evidence collected indicates that the Pacific slope fauna of tropical America has been derived from the Atlantic slope fauna. Only three of the genera of fresh-water fishes of the Pacific slope are peculiar to it; all the rest are identical with Atlantic slope genera. Even many species are identical on the two sides. The indications are that in the main the Pacific slope fauna was derived from the Atlantic slope fauna in times much more recent than the obliteration of the interoceanic connection between the Pacific and Atlantic. An examination of the distribution of the genera with representatives on the Pacific slope on the Atlantic side of the continent shows that nearly all have a very wide range and are found either in the Rio Magdalena or the Chagres. This indicates that the present fresh-water fauna of the Pacific slope crossed the divide somewhere near Panama. It is to be borne in mind that a barrier which may be ample to keep apart two marine faunas is not necessarily a barrier to the intermingling of two fresh-water faunas. It is quite within the range of possibilities that the Atlantic slope fauna ascended the Chagres and succeeded in crossing the low divide and descended the Pacific rivers. The Chagres route has a rival farther south. In Colombia the Cordilleras form four separate chains. The eastern, east of the Rio Magdalena, the central, between the Magdalena and its tributary, the Cauca, the western, west of the Cauca, and finally, a coast range. Between the western Cordillera and the coast Cordillera is a trough whose highest point is but 300 feet above sea level.

'In the west Cordilleras to the east of this trough arise two rivers, both of which flow into the longitudinal valley, where one, the Atrato, flows to the north into the Carribean, the other, the San Juan, to the south, and then through a break in the coast Cordilleras to the west to the Pacific Ocean. The height of land separating the two systems scarcely reaches a height of 100 m. This waterway is one of the strategic points in the geographical distribution of South American fishes, and it is more than to be regretted that there is not a single record of a fresh-water fish from either of these rivers!

'We are a little more fortunate about our knowledge of the fishes of the two sides of Panama, but are far from an exhaustive knowledge on the subject.

'It would certainly be a disgrace not to make an exhaustive study of the fresh-water faunas of the two slopes before there is a chance of the artificial mingling of the two faunas. It ought to be urged upon congress to make provision for the biological survey of the canal zone if the president or the bureau of fisheries does not already possess authority to provide for it. The work should be undertaken at once.

'For the biological survey of the Atrato-San Juan route we must depend upon private enterprise, and it is to be hoped that the means for so interesting and profitable work will not be lacking when the volunteers for the work are so numerous and willing.'

A partial examination of the material collected shows that for several species of fishes the watershed between the Atrato and San Juan is not a barrier. Even such large species as *Ctenolucius beani* Fowler are found in both the San Juan and the Atrato Rivers. It seems, however, that the 'channel' fishes of the Atrato have not succeeded in crossing to the San Juan. They are not found on the Pacific slope. The details of the distribution will be given in the final report which will be adequately illustrated.

A new type of Scale in Fishes, developed in the Pterobryconinæ

At Boca de Raspadura, a small village at the junction of the San Pablo with the Raspadura and near the continental divide between the Atrato and San Juan basins, collections were made in the comparatively barren Raspadura and San Pablo Rivers. Nothing of note was secured that was not also obtained in other parts of the Raspadura, Quito and Atrato Rivers. Behind the town is a small brook, not more than five feet wide, with vertical walls several feet high and hidden by overgrowing shrubs and weeds. The use of a cheese-cloth net in a little pool of this brook yielded a startling lot of remarkable fishes.

Nematobrycon palmeri, heretofore known only from the Pacific slope, was taken here.

Bunocephalus colombianus, described in the first part of this paper, extends the known distribution of this genus for more than a thousand miles. This was also taken at Quibdo some time later.

Thoracocharax brevis, a new species, helps to solve the question arising from the presence of this genus on the Pacific side of Panama.

To this list of notables must be added a new subfamily of Characins represented by a single minute specimen ornamented, as far as I am aware, with an entirely new type of scale.

PTEROBRYCONINÆ Subf. nov.

PTEROBRYCON Gen. nov.

Dentition as in the Tetragonopterinæ. Gill-membranes united, free from the isthmus. Dorsal and anal rounded, the middle rays longer than those before or those after them, last anal ray produced. Caudal naked; one scale on each side of the shoulder modified; lateral line incomplete.

This genus, as far as I know, is unique among fishes in the prolongation of some of the scales into long structures, enlarged and ocellated at the end, thus remotely recalling an ocellated feather in a peacock's tail.

Pterobrycon landoni sp. nov.

Type, 25 mm. Boca de Raspadura. C. M. No. 5051.

Head, 3.5; depth 4+; D. 10; A. 17; scales?; lateral line incomplete; eye 2.5. About 18 scales in front of the dorsal.

Very slender, tapering from head to caudal; the caudal peduncle nearly twice as long as deep; origin of dorsal equidistant from tip of snout and end of middle caudal rays, the fifth and sixth rays longest, not quite as long as head, the rays to the first and last graduate; adipose very minute; caudal deeply forked, the lower lobe the longer, more than a third of the length from snout to caudal, the lower fulcra separate, forming a spur (?); anal unique among the characins, the last ray prolonged, reaching to near second third of lower caudal lobe, the remainder of the fin shaped like the dorsal, the highest middle rays a little higher than the highest dorsal ray; ventrals truncate, fan-shaped, the tips of the rays protruding, the inner ray prolonged, reaching the base of the thirteenth anal ray; pectorals lanceolate, placed low, reaching to or nearly to the ventrals.

Mouth very oblique, second suborbital covering the entire cheek; gill-membranes united, free from the isthmus; premaxillary with four teeth forming an irregular outer series and four larger ones forming an inner series; maxillary with two teeth. Mandible with three large teeth in front, abruptly smaller ones on the sides.

Sides peppered; an oval black spot just above the base of the last anal rays, a streak from this toward caudal nearly free from chromatophores; a similar black spot at base of upper caudal rays.

A scale on the left side of the body, the third from the median dorsal series and about the seventh from the head, prolonged into a slender rod nearly one-third of the length from snout to caudal, reaching to near the origin of the anal where it is expanded into a two-lobed, black-margined flap; the corresponding scale on the right side of the body is broad and spatulate but not unduly prolonged; caudal naked, the scales at the base of the lower lobe forming a pouch.

Named for Mr. Hugh McK. Landon of Indianapolis, Indiana, who in large measure has made possible a second expedition into the Choco regions of Colombia.

Adaptive Radiation as illustrated by the Genera Creagrutus and Bryconamericus

Ingress to the portion of Colombia under consideration has been difficult. The Cordilleras have long been an effective barrier to the immigration from the Amazon and the Orinoco where fishes are found in great variety. Under such conditions it is not surprising to find that representatives of only one or two branches of a large genus have succeeded in gaining entrance, nor that once some member has gained entrance it should have adapted itself to the great variety of environmental units to be found here. The genus *Creagrutus* gained entrance once and then spread and became modified in various ways. It is encountered by the thousands of individuals.

To attest to the single origin of all the forms of *Creagrutus* in Western Colombia we have the peculiar modification in the arrangement of the teeth common to all of the species. The radiation which has taken place is given below.

Two branches of the genus *Bryconamericus* have gained access to Colombia. Its representatives are also found in great abundance. One branch, which at a venture I should say came by way of Lake Maracaibo, has developed a peculiar modification in the caudal and anal of the male. This branch (Argopleura) has given rise to several species. The other branch possibly came from the south. *Peruanus* is found in Peru from the coast to the Beni and its nearest relative is found in northwestern Argentina. It is, however, possible that it has relatives in the unknown regions to the east of the Magdalena basin.

CREAGRUTUS Günther.

Key to the Species of Creagrutus.

a. Premaxillary with an inner series of four or five teeth; five teeth alternating form an outer series of three teeth and a middle series of two teeth.

b. Anal 11; eye 2.6 in the head; suborbitals leaving a narrow naked margin; a silvery lateral band and conspicuous curved dark bar behind the shoulder. Scales about 6-36-2.5; depth 4.33.

1. **melanzonus** Eigenmann.

bb. Anal 12; eye 3 to 3.66 in the head; suborbital bones leaving almost half of the cheeks uncovered; anterior edge of anal and outer edge of ventrals white; caudal, dorsal and anal with more numerous chromatophores than the pectoral and ventral. Humeral spot and lateral band faded. Scales 4.5-38 to 40-3. Depth 3-3.5; head 4.

2. **peruanus** Steindachner.

bbb. Anal 14; eye 4 in the head; suborbital as wide as eye, touching the lower preopercular limb but not the angle; a more or less distinct blackish band runs from a black humeral spot to the middle of the root of the caudal fin. Scales 5-39-3. Depth 3.33; head 4.

3. **mülleri** Günther.

aa. Premaxillary with an inner series of three or four teeth; a series of four or five teeth extending obliquely from the third of the inner series to the foremost tooth; a tooth lateral to the fourth tooth of this series from in front, another tooth in the angle between the inner series and the oblique outer series.

c. Pores of the lateral line alike, normal.

d. Second suborbital not as wide as eye, leaving a narrow naked area; A. 13; scales 4-40-3.

4. **beni** Eigenmann.

dd. Second suborbital as wide as or nearly as wide as eye, in contact with the preopercle below, leaving a naked area behind.

e. A. 10 to 11; depth about 3.5; Lat. l. 36-38; eye a little greater than snout; caudal peduncle more than 2 in the head.

5 **brevipinnis** Eigenmann.

ee. A. 12 or 13, occasionally 11, rarely 10 or 14; Lat. l. 33-36; depth 2.75-3.25; depth of caudal peduncle 1.6-2 in the head.

6. **magdalenæ** Eigenmann

eee. A. most frequently 14, rarely 15, more rarely 12; Lat. l. 33-36; depth 3.1-3.6; depth of caudal peduncle 2 in head.

7. **affinis** Steindachner.

cc. Pores of the posterior part of the lateral line broad, slit-like, covered by a scale-like flap; first tooth of the premaxillary placed well in advance of the rest, the median toothless space of the premaxillary bordered by four teeth on each side; A. 13-15; Lat. l. 39-40.

8. **caucanus** Eigenmann.

Creagrutus affinis Steindachner

Creagrutus affinis Steind., Fischf. Cauca and Flüsse bei Guayaquil, 1880, 27 (Cauca, near Caçeres).

Creagrutus notropoides Meek, Field Museum Publication 158, 68, Feb. 1912. (Chagres.)

Habitat: Cauca, Atrato, San Juan and Chagres.

Steindachner, whose specimens came from near Caceres on the Cauca, gives the following facts concerning his *C. affinis:*

The largest specimen is 45 mm. long.

D. 10; A. 14; V. 8; L. lat. 36-37.

Head, $3\frac{5}{8}$; depth 3.5+; eye 2.4-2.5; interorbital 3.6; snout 4 in the head. Pectoral as long as head without snout, reaching ventrals.

This description excludes the specimens taken in the upper Cauca, *brevipinnis* having but 10-12 anal rays and *caucanus* having a smaller eye and the scales 39 to 41. Of the remaining material collected in Colombia, some of the specimens collected in Soplaviento, Bernal Creek, the Atrato and the San Juan agree in the number of anal rays and scales. Of these, those from the San Juan-Atrato basin agree more closely in the size of the eye and in the depth and it is to these that the name *affinis* should probably be applied. I collected no material in the lower Cauca, from which the types of the species came.

C.M. 4890, I.U.M. 12731. Eight, largest 79 mm. Puerto Negria.

C.M. 4891, I.U.M. 12732. Four, largest 80 mm. Half way between Puerto Negria and Istmina.

C.M. 4892 a-j, I.U.M. 12733 a-j. Over 100, largest 85 mm. Istmina.

C.M. 4893, I.U.M. 12734. Over 100, largest 51 mm. Boca de Raspadura.

C.M. 4894 a-j, I.U.M. 12735 a-j. Forty-three, largest 65 mm. Quibdo.

The specimens enumerated above are certainly very closely related to if not identical with the *C. notropoides* of which Dr. Meek kindly lent me two specimens. The principal part of the following description is based on Istmina specimens where the species reaches its maximum size.

Head 4; depth 3.1-3.6; D. 10; A. 13-15, most often 14; scales 4-33 to 36, most often 34 or 35; eye a little longer than snout, 3 in head, about equal to the interorbital, a little larger in specimens from other places.

Body, and especially caudal peduncle, compressed; heaviest below origin of dorsal; profile nearly straight over the head and nape, slightly convex toward dorsal; snout bluntish; preventral area broad; predorsal area with eight to ten scales; depth of caudal peduncle about half the length of the head, a little over half its own length. Frontal fontanel much smaller than the parietal, the head convex. Second suborbital a little less than the diameter of the eye; naked area behind the second suborbital one-fourth to one-half as wide as the suborbital; premaxillary-maxillary border a simple curve, about as long as the eye; the horizontal extent of the premaxillary about as long as the maxillary. First two teeth of the premaxillary just in front of the lower lip. The position of the first tooth in the types of *notropoides* is considerably different from that in the rest of the specimens. In the types of *notropoides* it is forward and medial, in the rest it is mostly forward, approaching the condition in *caucanus*. Maxillary with 1-3 teeth; mandible with four teeth, of which one is quite small, lateral.

Gill-rakers about 6+10.

Scales of the sides forming a sheath at the anterior part of the anal. Base of caudal lobes scaled; a large axillary scale; lateral pores simple.

Origin of dorsal in front of middle, its highest ray reaching to near end of last; anal emarginate, the highest rays not reaching tip of last; ventrals reaching to or not quite to the anal; pectoral to or not quite to the ventrals.

A silvery lateral band; a humeral bar.

Creagrutus magdalenæ sp. nov.

Type C.M. 4880, 78 mm. Girardot.

Paratypes, over 100, largest 83 mm. Girardot. C.M. 4881 a-o; I.U.M. 12722 a-o.

Paratypes, 15. Honda. C.M. 4884 a-g; I.U.M. 12725 a-h.

Paratypes, largest 54 mm. Peñas Blancas. C. M. 4885 a-i; I.U.M. 12726 a-h.

Here should probably also be placed C.M. 4883 a-j; I.U.M. 12724. Over 100. Apulo.

Head 4; depth 2.75-3.25 (rarely in small ones 3.5); D. 10; A. usually 12 or 13, occasionally 11, rarely 10 or 14; scales 4-33 to 36-3. Depth of caudal peduncle 1.6-2 in the head, 1.5-1.7 in its length. Eye equals snout, 3.5 in head, 1.25 in interorbital in largest, .6 in snout, 2.5 in head, .8 in interorbital in a small one.

Adult greatly compressed, subrhomboidal; preventral area broad, postventral bluntly keeled; predorsal area with 9 or 10 scales. Frontal fontanel much smaller than parietal; angle of second suborbital an orbital diameter from eye in the adult, slightly narrower in the smaller, naked strip behind the second suborbital about one-third as wide as the suborbital. Maxillary-premaxillary border a simple curve, slightly longer than the eye, the horizontal part of the premaxillary about as long as the maxillary; two or three teeth on the maxillary; mandible with three large teeth, and one or two small ones on the sides.

Gill-rakers about 6+10.

Scales on the sides forming a sheath for the anterior part of the anal; caudal lobes scaled for about one-third of their length. Lateral line tubes and pores simple; dorsal slightly emarginate, its highest ray reaching near tip of last, its origin considerably in advance of the middle; anal short, emarginate, its highest ray reaching to or nearly to the tip of the last, its origin equidistant from end of lateral line and opercle. Ventrals reaching to or nearly to the anal, pectoral to or nearly to the ventrals.

A silvery lateral band, a dark humeral bar; back dusky.

Creagrutus magdalenæ var.?

The following specimens from the Magdalena basin have the number of anal rays of *affinis* and the shape of *magdalenæ.*

[1] Over 1,000. Bernal Creek near Honda. C.M. No. 4882; I.U.M. 12723.

[2] Over 40, largest 54 mm. Soplaviento. C.M. No. 4886 a-t; I.U.M. 12727 a-t.

Creagrutus caucanus sp. nov.

Type (a) and paratypes (b-g) 26, the largest 113 mm. Paila. C.M 4895 a-g; I.U.M. 12738 a-g.

Paratypes, 40, the largest 83 mm. Cauca at Cali. C.M. 4896; I.U.M. 12736.

Paratypes, 2, 64 and 84 mm. Cartago. C.M. 4897 a; I.U.M. 12737 a.

Paratypes, 2, 33 and 50 mm. Cali. C.M. 4898 a-b.

Head 4-4.33; depth 3.5-3.75; D. 10; A. usually 14, sometimes 15 or 13, rarely 12; scales 4-39 to 41-3; eye in largest specimens equals snout, 3.5 in the head, 1.33 in the interorbital; in the smaller it is equal to the interorbital, 3 in the head.

Heaviest above middle of pectoral, tapering to a slender caudal peduncle whose depth is one-half its length or one-half the length of the head. Profile regularly arched to the dorsal; preventral area broad, rounded, predorsal area with nine or ten scales; head smooth, convex in cross section; occipital process short and pointed, about one-sixth of the distance of its base from the dorsal; frontal fontanel much smaller than the parietal; angle of second suborbital an orbital diameter from the eye; naked area behind the second suborbital .4 as wide as the suborbital. Snout pointed, in contact with the preoperculum along its entire margin below. The premaxillary-maxillary border a simple curve, horizontal extent of the premaxillary much shorter than the maxillary which equals the eye; lower jaw included, the first two teeth of the premaxillary considerably in front of the margin of the lower jaw. Maxillary with two or three multicuspid teeth; lower jaw short, with three heavy teeth in front and two graduated smaller ones on the side. Lower lip very thick.

Gill-rakers 5+10.

No scales on the anal, a sheath along its anterior half formed by the scales of the sides; caudal lobes scaled for a little ways; pores for a variable distance from behind broad, covered by a free flap of the lateral line scale. This flap has the appearance of an accessory scale and distinguishes this species. A large axillary scale.

Dorsal slightly emarginate or truncate, its highest ray about reaching tip of the last, its origin nearer snout than caudal by one or two diameters of the eye. Anal emarginate, its highest ray reaching to the base of the penultimate ray or to the second fourth of the last. Ventrals reaching to or nearly to the anal, pectorals to or nearly to the ventrals.

A bright silvery lateral band; a large humeral bar; back dusky.

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1. Of eleven selected at random two have 14 anal rays, nine have 13; two have 35 pores in the lateral line, nine have 36.

2. The anal rays usually number 14 or 15, rarely 13 or even 12; the lateral line contains 35 or 36 scales, rarely 37.

Creagrutus brevipinnis sp. nov

Type (a), Paratypes, 60, largest 66 mm. Piedra Moler. C.M. No. 4887 a-i; I.U.M. 12728 a-h.

Paratypes, 16, the largest about 57 mm. Paila. C.M. No. 4889 a-h; I.U.M. 12730 a-h.

Paratypes, 29, largest 55 mm. Cartago. C.M. No. 4888 a-e; I.U.M. 12729 a-e.

Closely related to *C. magdalenæ;* distinguished from the other species of this genus in Colombia by the small number of anal rays and by the shape.

Head 4, depth 3.4-3.6; D. 10; A. 10 or 11 (most frequently 11); scales 4-36 to 38 (rarely 35)-2.5; eye .8-1 in snout, 2.8-3 in head, .8 in interorbital. Depth of caudal peduncle, 2+ in its length, 2.2-2.5 in the head.

Heaviest below the front of the dorsal; caudal peduncle slender; second suborbital in contact with the preopercle below, its greatest width distinctly less than the diameter of the eye, the naked portion of the cheek about one-third as wide as the suborbital.

Dorsal emarginate, the highest ray reaching to tip of the last ray; anal very similar to the dorsal, the highest ray reaching to or nearly to the tip of the last.

Silvery; a dark humeral bar.

BRYCONAMERICUS Eigenmann

Key to the species of Bryconamericus, found between Peru and Costa Rica.

a. Slender; a brilliant lateral band; a glandular scale on the base of the middle caudal rays of the male overarching a cavity beneath it; hooks on the anal of the male confined to a circular patch covering part of the tenth-fifteenth (about) rays; lower caudal fulcra in the male prominent, continuous in profile with the tips of the anal rays. Anal with 33-45 rays. Caudal margined with dark. Argopleura subg. nov. type *magdalenensis.*

b. Maxillary reaching suture between first and second suborbital, its tip frequently touching second suborbital. Scales 7 (rarely 6)-42 to 45-5; A. 33-36; lateral band shading downward; numerous chromatophores between anal and lateral line, those near the anal arranged along the interhæmals.

1 **conventus** Eigenmann.

bb. Maxillary not reaching suture between first and second suborbital. No interpolated rows of scales; lateral band sharply defined below.

c. Six scales between origin of dorsal and lateral line; scales 6-41 to 43-5; A. usually 35 to 36, rarely 33 or 34, 37 or 38; base of anal 2.66-2.75 in the length; head 4.8-5; depth 3.9-4.2; a few chromatophores half way between anterior part of anal and lateral line; chromatophores along base of anal rays.

2. **diguensis** Eigenmann.

cc. Five scales between the origin of the dorsal and the lateral line.
d. A. usually 31 or 32, sometimes 29, 30, 33 or 34; base of anal 3 or a little more than 3 in the length.

3. **chocoensis** Eigenmann.

x. Head 4.3-4.5; depth 3.4-3.75; scales 5-39 to 41-5.

chocoensis from San Juan.

xx. Head 4.33-4.75; depth 3.75-4; scales 5-39 to 41-4.

chocoensis from Atrato.

dd. A. 35-45; head 4.75-5.33; depth 3-4; D. 10; scales 5-40 to 43-4; eye 2.33-3 in the head, equal or a little greater than interorbital; base of anal 2.4-2.6 in the length; origin of anal under anterior half of dorsal.

4 **magdalenensis** Eigenmann.

y. A. 34-43 (usually 35 to 37); origin of anal nearer base of middle caudal rays than to snout; some chromatophores along interhæmals; a small spot at base of middle caudal rays.

magdalenensis from Rio Viejo.

yy. A. 40-45; origin of anal equidistant from snout and caudal; a row of chromatophores along the base of the anal rays; a few chromatophores half way between lateral line and anterior part of anal; no caudal spot.

magdalenensis from Magdalena and Cauca.

aa. Caudal of male without glandular scales, hooks of anal in male along all of the anterior rays. Lower caudal fulcra not prominent.
e. Six to nine scales between the lateral line and dorsal; depth 2.5-3.5 Pacific slope of Ecuador, on both slopes of Colombia and Central America.) subgenus.
f. Maxillary with 0-3 teeth, confined to the upper anterior margin.
g. Origin of dorsal equidistant from tip of snout and base of middle caudal rays or nearer the latter. (Peru to Panama.)
h. Middle caudal rays pale, no caudal spot; scales 6 or 7-36 to 40-7; A. 26-30. Head 4.4; depth 3.4; pectorals reaching ventrals, ventrals to anal; origin of dorsal equidistant from base of middle caudal rays and from snout.

5. **simus** (Boulenger.)

hh. A conspicuous black spot on caudal peduncle, not continued to the end of the rays.
i. Scales 8-40 to 45-6 or 7; head 3.6; maxillary equal to length of eye; eye larger than interorbital.

6. **emperador** Eigenmann

ii. Scales 6-38-5; head 3.66; maxillary three-fourths as long as eye; eye greater than interorbital.

7. **ortholepis** Eigenmann.

iii. Scales 6 (or 7)-39 or 40-5 or 6; head 4-4.6; maxillary three-fourths as long as eye; eye equals interorbital or not quite equal to it; males with tubercles on head, fins and scales.

8 **scopiferus** Eigenmann

hhh. Middle caudal rays black.

j. D. 10 (rarely 9); eye 3-3.5 in the head, 1.1-1.25 in the interorbital; depth 2.9-3.25.

9. **caucanus** Eigenmann.

jj. D. 11; eye 3.1-3.5 in the head (2.75 in the young), 1.2-1.4 in the interorbital; depth 2.5-2.8 (3.25).

10. **peruanus** (Müller and Troschel)

gg. Origin of dorsal an orbital diameter nearer the snout than to the base of the middle caudal rays. (Costa Rica and Ecuador.)

k. Eye equals the interorbital; A. 28-31; scales 7-39 or 40-6.

11. **ricæ** Eigenmann

kk. Eye 1.3-1.5 in the very convex interorbital. A. 28 or 29; scales 7-37 to 39-6.

12. **scleroparius** (Regan.)

ff. Maxillary with 2 to 11 teeth.[3]

l. Lateral line sagging but little, a line drawn from origin to end of lateral line passing below the dorsal through the middle of the first row of scales above it; scales not deflected toward the anal; pectoral not reaching ventrals; depth 3-3.5; A. 21-25; scales 6 or 7-41 to 43-5 or 6; eye 1.3-1.5 in interorbital; mandibulary teeth nearly regularly graduate.

13. **tolimæ** Eigenmann.

ll. Lateral line sagging so that a line connecting its origin and end passes under the dorsal through the middle or upper corner of the second row of scales above it; scales deflected towards the anal; pectoral reaching ventrals. Eye equals interorbital; origin of dorsal under middle or anterior part of dorsal.

m. Scales 7 or 8-45 to 48-5 or 6; depth of caudal peduncle less than its length; depth 3.2-3.4; A. 30-34; maxillary teeth 3-9, usually extending over less than half the free margin.

14 **dentatus** Eigenmann.

3. See also B. boquiæ 16.

mm. Scales 9-44-6; depth of caudal peduncle equal to its length; depth 3; A. 31; maxillary teeth 6, on about half the free margin; lateral teeth of the mandible suddenly minute.

15. **decurrens** Eigenmann.

mmm. Scales ? ; A. 26-29; maxillary teeth usually 7-10, usually extending over more than half the free margin; lateral teeth of the mandible suddenly minute.

16. **boquiae** Eigenmann.

1. Bryconamericus conventus sp. nov.

Type, about 47 mm. Soplaviento. C.M. No. 5060.

Paratypes, 70, largest 53 mm. Soplaviento. C.M. No. 5061 a-n; I.U.M. No. 12802.

Head 4-4.33; depth 3.33-3.6; D. 9 or 10; A. 35 or 36 (rarely 33); scales 7 (rarely 6)-42 to 45-5; eye 2.5-3 in head, equal to or a little larger than the interorbital; base of anal 2.6 to 2.7 in the length.

Slender, dorsal and ventral profiles nearly equally curved, tapering from the front of the long anal to the caudal peduncle, the depth of which is equal to its length, about half the length of the head; preventral area rounded, without distinct median series of scales; predorsal area rounded, with a median series of about fifteen scales.

Occipital process about one-sixth of the distance from its base to the dorsal, bordered by three scales on each side; interorbital smooth, convex; second suborbital leaving only a very narrow naked border behind its margin; mouth terminal; maxillary equal to the eye in length, reaching to the suture between first and second suborbitals; two or three teeth in the outer series of the premaxillary, four in the inner; one to three minute teeth on the maxillary; mandible narrow, with four larger teeth in a crescent, the third from in front frequently the largest, the fourth always small and followed by a series of suddenly minute teeth.

Scales thin, with few radiating lines, regularly imbricate except from above the middle of the ventrals where there are interpolated series causing the series below the lateral line to be deflected toward the anal; caudal naked, males with an enlarged scale overarching a pouch below the middle caudal ray; a single series of scales along the anterior anal rays; axillary scale small.

Origin of dorsal equidistant from snout and base of middle caudal rays; origin of anal on vertical from middle dorsal rays; ventrals reaching anal; pectorals to ventrals; lower caudal fulcra prominent, continuous with the margin of the anal, the tip of whose last rays reach the fulcra.

A diffuse silvery band, well demarked above, fading out downward; no humeral spot, middle caudal rays dusky; scales of the back margined with dusky. Numerous chromatophores between anal and lateral line, those nearest anal arranged in rows along the interhæmals.

2. **Bryconamericus diquensis** sp. nov.

Type, 60 mm. ♂ Soplaviento. C.M. No. 5072.

Paratypes, 19, 40-59 mm. Soplaviento. C.M. No. 5073 a-e; I. U. M. No. 12820 a-e.

Head 4.8-5; depth 3.9-4.2; D. 10; A. usually 35 or 36; rarely 33, 34, 37 or 38. Scales 6-41 to 43-5 (5 above the lateral line in one, 4 below it in two); eye 2.6-2.75, greater than interorbital. Base of anal 2.66-2.75 in the length.

Maxillary not reaching the suture between the second and third suborbitals. No interpolated rows of scales below the lateral line; origin of anal on or very little behind the vertical from the origin of the dorsal.

Lateral band sharply defined both above and below. Prominent chromatophores along the bases of the anal rays. A few chromatophores about half way between lateral line and anterior part of anal.

3 **Bryconamericus chocoensis** sp. nov

Type, 61 mm. ♂ Istmina. C.M. No. 5036 a.

Paratypes, 200, largest 68 mm. Istmina. C.M. No. 5037 a-z; I.U.M. No. 12939.

Paratypes, 3, largest 60 mm. Half way between Istmina and Puerto Negria. C.M. No. 5038.

Paratypes, 19, largest 63 mm. Puerto Negria. C.M. No. 5039 a-j; I.U.M. No. 12940.

Paratypes, 3, lagest 51 mm. Boca de Raspadura. C.M. No. 5040.

Paratypes, 11, largest 50 mm. Boca de Certegai. C.M. No. 5041 a-f; I.U.M. No. 12941.

Paratypes, 75, largest 68 mm. Quibdo. C.M. No. 5042 a-j; I.U.M. No. 12942 a-j.

Head 4.3-4.5 in San Juan specimens, 4.33-4.75 in Atrato specimens; depth 3.4-3.75 in San Juan specimens, 3.75-4 in Atrato specimens; D. 10 (rarely 9); A. usually 31 or 32, sometimes 29, 30, 33 or 34; scales 5-39 to 41 (rarely 37)-4; eye 2.5-2.75 in San Juan specimens, 2.75-3 in Atrato specimens, equal to the interorbital.

Specimens from the San Juan, deeper, more compressed than those from the Atrato. Maxillary not reaching the suture between the first and second suborbitals; no interpolated rows of scales below the lateral line; base of anal three or a little more than three in the length, its origin equidistant with the middle or end of the dorsal from the snout.

Lateral band sharply defined above and below. Caudal margined with dusky. Chromatophores at base of anal tending to arrange themselves along the interhæmals; more prominent in the Atrato specimens than in those from the San Juan, most prominent in those from Boca de Certegai.

4. **Bryconamericus magdalenensis** sp. nov.

Type, 71 mm. Girardot. C.M. No. 5063.

Paratypes:

Several hundred, largest 72 mm. Girardot. C.M. No. 5064; I.U.M. No. 12822.

Head 5-5.33; depth 3.-3.5; A. 40-43; scales 5-41 to 43-4.

Three hundred, largest 67 mm. Apulo. C.M. No. 5071; I.U.M. No. 12826.

Two, 39 and 43 mm. Puerto Berrio. C.M. No. 5075.

Eighty-nine, largest 58 mm. Peñas Blancas. C.M. No. 5065; I.U.M. No. 12821.

Three, largest 50 mm. Honda. C.M. No. 5067.

Head 4.75-5; depth 3-3.6; A. 39-45; scales 5-40 to 43-4.

Fifteen. Cauca at Cali. C. M. No. 5069; I.U.M. No. 12824.

Head 5; depth 3.75-4; A. 40-45; scales 5-41 or 42-4.

Twenty, largest 55 mm. Cartago. C.M. No. 5068; I.U.M. No. 12823.

Fifty-three, largest 55 mm. Piedra Moler. C.M. No. 5070; I.U.M. No. 12825.

Head 4.75-4.9; depth 4; anal usually 35-37; scales ?

Head 4.75-5.33; depth 3-4; D. 10; A. 40-43 in the Magdalena between Peñas Blancas and Giradot; 34-43 ((usually 35-37) Piedra Moler and Cartago[4]; 40-45 in the Cauca at Cali; scales 5-40 to 43-4; eye 2.33-3 in the head, equal to or a little greater than the interorbital.

Maxillary not reaching the suture between the second and third suborbitals. No interpolated rows of scales below the lateral line. Origin of anal under first to middle dorsal rays, equidistant from tip of snout and base of middle caudal rays, in Girardot and Cali specimens, nearer caudal in Cartago and Piedra Moler specimens; base of anal 2.4-2.6 in the length.

Lateral band sharply defined both above and below. Caudal bordered more or less distinctly with dark. A row of chromatophores along the base of the anal rays, a few chromatophores half way between front of anal and lateral line. All of these sometimes very faint, strongest in specimens from Cartago and Piedra Moler where some chromatophores are arranged in series along the interhæmals as in *conventus*.

The specimens from Cartago and Piedra Moler have in addition a small circular black spot on the base of the caudal which with their short anal may entitle them to a distinctive name. All of them have lost their scales.

7. **Bryconamericus ortholepis** sp. nov.

Type, 48 mm. Boca de Raspadura. C.M. No. 5088.

Head 3.66; depth 3; D. 11; A. 33; scales 6-38-5; eye .6 in snout, 2.6 in head; interorbital 2.9 in head. Depth of caudal peduncle equal to its length, equal to the length of the eye.

Similar to *scopiferus;* preventral area rounded, with a regular series of 13 scales; the short postventral area trenchant; predorsal area rounded, with 7 regular median scales from the dorsal forward and then three larger, unsymmetrical scales; occipital process nearly equilateral, about one-sixth of the distance from its base to the dorsal, bordered by three scales on each side; interorbital very slightly convex; snout but little decurved forward; mouth terminal, the maxillary-premaxillary border angulated, as

4. In Cartago specimens one has 33 anal rays, one has 34, five have 35, six have 36, three have 37, one has 38 and one 43.

long as the eye; second suborbital leaving an exceedingly narrow naked margin behind; premaxillary with five teeth in the anterior series, the first, third and fifth in front of the lower lip; three teeth in the maxillary; four large teeth in the mandible; minute ones on the sides.

Scales arranged with striking regularity, their margins well marked; caudal naked, without glandular scale; axillary scale well developed. A series of scales along the base of the anal rays. Origin of dorsal equidistant from tip of snout and end of last scale of the lateral line, its highest ray a little less than the head in length, origin of anal equidistant with middle of dorsal from the tip of the snout; ventrals reaching the anal, pectorals slightly beyond tip of axillary scale.

Iridescent, nearly evenly covered with chromatophores; a black spot, not ocellated with lighter, at the end of the caudal peduncle, not extending on the middle rays; a faint humeral spot crossing the third scale of the lateral line, a fainter dusky band above the seventh to the tenth.

This species is evidently closely allied to *scopiferus* which has frosted, papery scales, a distinct silvery band and in which there are no chromatophores in front and below the caudal spot.

8. **Bryconamericus scopiferus** sp. nov.

Type, 90 mm. C.M. No. 5026. Istmina, Rio San Juan.

Paratypes, 88, 38-105 mm. Istmina. C.M. No. 5027 a-z; I.U.M. No. 12793.

Paratypes, 120, largest 108 mm. Cisnero, Rio Dagua. C.M. No. 5028 a-z; I.U.M. No. 12794.

Paratypes, 29, 50-108 mm. Cordova, Rio Dagua. C.M. No. 5029 a-d; I.U.M. No. 12792.

Head 4-4.6; depth 2.5-2.9; D. 11; A. 29-32; scales 6 (or 7)-39 or 40-5 or 6, rarely 38 or 42 scales. Eye 2.4-2.7 in the head, equal or very little less than the interorbital; base of anal 3 in the length.

Compressed, more or less elongate; dorsal and ventral profiles equally curved; preventral area rounded, without a distinct median series of scales; predorsal area bluntly keeled, with a median series of eleven scales. Occipital process one-fifth or one-sixth of the distance from its base to the dorsal, bordered by two or three scales on each side; skull smooth, very little convex; frontal fontanel but little shorter than the parietal without the occipital groove; snout short, jaws nearly equal; maxillary-premaxillary border angulated, equal to or very little longer than eye, the maxillary about three-fourths the length of the eye; cheek, except a narrow strip behind, entirely covered by the second suborbital, which at its widest point is about two-thirds as wide as the eye. Four or five teeth in the outer row of the premaxillary, four in the inner; two or three small teeth on the maxillary; four graduated teeth on the mandible and a few smaller ones on the sides.

Dorsal equidistant from snout and caudal or a little nearer the snout, pointed, its high anterior rays longer than the head; adipose fin well developed; caudal lobes longer than the highest dorsal rays; anal emarginate, its origin about on the vertical from the last dorsal ray; ventrals not reaching the pectorals, the latter to or nearly to the ventrals.

Scales regularly imbricate, the rows not deflected toward the anal: caudal naked; anal with a narrow sheath composed of one series of scales.

A silvery lateral band; a conspicuous oval black spot on the caudal peduncle, extending but little over the bases of the middle caudal rays. Region along base of anal and basal part of the fin bright, brick-red.

The specimens from Cisnero and Cordova (formaline) differ from the above in having the depth 3-3.25. The pectorals are a little shorter than in the types. C.M. No. 5028; I.U.M. No. 12794.

Breeding males with the head, fins and margin of scales profusely covered with minute tubercles.

Measurements of Seven Specimens from Istmina.

D.	A.	Scales	Depth	Eye
11	30	6-38-5½	2.66	2.5*
11	29	6-39-5½	2.75	2.5†
11	29	6-39-5	2.66	2.5†
11	31	7-39-6	2.75	2.4
11	29	6-39-5	....	2.4
11	30	7-40-6	2.5	2.5
11	32	7-39-6	2.9	2.66

Measurements of Three Specimens from Cisnero.

D.	A.	Scales	Depth	Eye
11	30	6-40-5	3.25	2.7*
11	31	6-39-5	3.2	2.66
11	30	7-42-5	3	....

Of eight others two have the anal 28, and six have it 30; two have the lateral line 40 and six 39.

9. **Bryconamericus caucanus** sp. nov.

Type, 80 mm. Piedra Moler. C.M. No. 5031 a.

Paratypes, 130, largest 80 mm. Piedra Moler. C.M. No. 5031 b-z; I.U.M. No. 12795.

Paratypes, 60, largest 84 mm. Paila. C.M. No. 5032 a-j; I.U.M. No. 12796.

Paratypes, 4, largest 60 mm. Cauca at Cali. C.M. No. 5033 a-b; I.U.M. No. 12797.

Paratypes, 40, largest 66 mm. Cartago. C.M. No. 5034 a-e; I.U.M. No. 12798.

Paratypes, 50, largest 72 mm. Cali. C.M. No. 5035 a-j; I.U.M. No. 12799.

Paratypes, 11, largest 58 mm. to base of caudal. Boquia. C.M. No. 5030 a-f; I.U.M. No. 12800.

Allied to *B. peruanus*, abundant in the upper Cauca. Reaching a length of 84 mm.

* Equals interorbital.

† Slightly greater than interorbital.

Head 4-4.5; depth 2.9-3.25; D. 10; A. 25-28; scales 6-37 to 40-5 or 6 (usually 39 scales in the lateral line); eye 3-3.5 in the head, slightly less than interorbital. Base of anal 3-3.5 in the length.

Compressed, dorsal and ventral outlines nearly symmetrically and equally curved, depth of caudal peduncle equal or not quite equal to its length, 1.7-2 in the head. Preventral region rounded, without a regular median series of scales; predorsal area narrow with a median series of 11-13 scales.

Occipital crest about one-sixth of the distance from its base to the dorsal, bordered by three scales on the side; frontal fontanel considerably shorter than the parietal. Second suborbital leaving a very narrow border behind, and at times a small angle below its anterior edge naked; maxillary a little more than 3 in the head, scarcely longer than the snout. Usually four, sometimes five, scales in the front series of the premaxillary; four graduated teeth in a crescent and numerous smaller teeth on the sides of the lower jaw; maxillary with three teeth.

Scales as in *peruanus*.

Origin of dorsal about equidistant from snout and caudal; middle caudal rays dusky.

Otherwise as in *peruanus*.

13. **Bryconamericus tolimae** sp. nov.

Type, 118 mm. Ibagué. C.M. No. 5057.

Paratypes, 15, 56-115 mm. Ibagué. C.M. No. 5058. I.U. No. 12850.

Head 4.2-4.6; depth 3-3.5; D. 10; A. 21-25; scales 6 or 7-41 to 43-5 or 6; eye 3.5-3.75 in the head, 1.3-1.5 in interorbital; depth of caudal peduncle 2.5 in the greatest depth; length of caudal peduncle about half the depth of the body.

Elongate, rather heavy at the shoulders. Preventral area rounded, without a median series of scales, post-ventral area narrowly rounded. Predorsal area narrowly rounded, with about 14 scales, the 4 to 6 *nearest the* occipital process in a median series, behind these there is no regular median series, the scales of one side or the other overlapping the median line. Occipital process short, about one-eighth of the distance from its base to the dorsal; head broad, convex, the snout rounded; the mouth terminal, the maxillary border making an angle with the premaxillary border; maxillary not quite reaching end of the first suborbital, equal to the eye in length; greatest width of second suborbital equal to the eye in the largest, narrower in the smaller. Usually four or five teeth in the front row of the premaxillary arranged in a straight line; four teeth in the inner row of the premaxillary; maxillary with six to seven teeth, fewer in young, arranged along half the free margin of the maxillary. The maxillary teeth vary considerably in the extent of the border of the maxillary over which they are distributed. In the younger they may be restricted to near the upper angle. Mandibulary teeth nearly regularly graduate from the first to the last.

Origin of dorsal slightly nearer tip of snout than base of caudal, rounded or truncate, the longest ray scarcely reaching beyond tip of penultimate, 3.75 in the length; caudal lobes short, about equal to the length of the head; origin of anal below vertical from base of last dorsal ray.

Origin of ventrals equidistant from tip of snout and middle of last anal ray; ventrals short, reaching anus; pectorals not reaching ventrals by about three scales.

Scales regularly imbricate, not notably smaller over the anal musculature and the rows not deflected toward the anal; caudal naked but the lobes with a rather broad basal sheath of scales not attached to the rays; anal with a sheath of a few scales along the bases of the anterior rays, the scales not attached to the rays; axillary scale short; each scale with many (as many as 20 in some cases) radial striæ. Lateral line complete, but little decurved.

A dull humeral band crossing the third and fourth scales of the lateral line; a band on caudal peduncle, extending to end of middle rays.

4 **Bryconamericus dentatus** sp nov.

Type, 98 mm. Piedra Moler. C.M. No. 5054a.

Paratypes, 16, 40-96 mm. Piedra Moler. C.M. No. 5054 b-h; I.U.M. No. 12828.

Paratypes, 20, 40-118 mm. Paila. C.M. No. 5053 a-e; I.U.M. No. 12827.

Paratypes, 2, 45 and 90. Cauca at Cali. C.M. No. 5074; I.U.M. No. 12848.

Head 4-4.5; depth 3.2-3.4; D. 10; A. 30-34; scales 7 or 8-45 to 48-5 or 6; eye 3 in head, equal to the interorbital; depth of caudal peduncle less than its length, 2 or less in the length of the head, 2.75-3 in the depth.

Compressed, slender, dorsal and ventral profiles equally and evenly curved; preventral area narrow, narrowly convex between the pectorals, no regular median series of scales; predorsal area with about 13 scales not in a regular series; occipital process about equal to one-seventh of the distance from its base to the dorsal, bordered by three scales on each side; interorbital convex, smooth; snout pointed, the lower jaw slightly the shorter; second suborbital leaving a narrow naked border behind, its greatest width in the largest specimens three-fourths as long as the eye; maxillary almost or quite reaching to the end of the first suborbital, equal to the eye in length, premaxillary-maxillary border without a distinct angle. Four teeth in the inner series of the premaxillary; outer row of premaxillary teeth four to six, very variable in position, the first and last usually quite evident, in front of the lower lip when the mouth is closed (the first is quite prominent and well formed in the Piedra Moler specimens). Sometimes the teeth are in a curve, sometimes they are all in a straight line, sometimes alternate teeth are withdrawn from the line, sometimes the middle one is withdrawn, etc.; maxillary with from 3-9 teeth, the anterior ones 3-5 pointed, the last one frequently remote from the others, conical; the teeth sometimes extending over half the margin of the maxillary, rarely over more than one-half. Mandible with five larger teeth in a series and about ten graduated ones on the side, the break between the fifth and sixth not very pronounced.

Gill-rakers 8 + 9.

Origin of dorsal equidistant from tip of snout and end of lateral line or nearer the snout, its margin subtruncate, its highest ray extending for a distance equal to about two scales beyond the tips of the penultimate, about equal to the length of the head, caudal lobes about 3.5-4 in the length; anal slightly emarginate, its origin under the middle of the dorsal or a little further forward; ventrals not reaching anal, their origin equidistant from tip of snout and last fourth of the anal; pectorals reaching origin of ventrals or a little beyond.

Scales thin, with about 10 radii, regularly imbricate, except over the anal where there are a few interpolated scales; lateral line much more sagging than in *B. tolimæ;* caudal naked, the lobes with a basal sheath; anal with a variously developed sheath of a single series of scales; axillary scale short.

Middle caudal rays black; a large, faint shoulder band crossing the third to fifth scale of the lateral line. Silvery.

A specimen from Peñas Blancas, 42 mm. C.M. No. 5056 has depth 3.68: A. 29; scales 7, .5-41-5.

15. **Bryconamericus decurrens** sp. nov.

Type 57 mm. to base of caudal. Soplaviento. C.M. No. 5055.

Paratype, 53 mm. to base of caudal. I.U.M. No. 12829.

Evidently closely allied to *B. dentatus*, from which it differs much in shape.

Head 4.33; depth 3; D. 10; A. 31; scales 9-44-6; eye 3 in the head, equal to the interorbital; depth of caudal peduncle equal to its length; premaxillary with four or five teeth in the outer series, four in the inner; six teeth on the maxillary on half or a little less than half the margin of the maxillary. The last tooth in the paratype is remote from the rest, mandibulary teeth of the sides abruptly smaller.

Origin of dorsal equidistant from tip of snout and end of lateral line; origin of anal under anterior half of dorsal, its base 2.8-3 in the length; interpolated rows of scales beginning over the middle of the ventrals, the rows of scales distinctly decurvent to the anal. Otherwise as in *dentatus.*

16. **Bryconamericus or Hemibrycon boquiæ** spec. nov ?

Type, 48 mm. to base of caudal. Boquia. C.M. No. 5059 a.

Paratypes, 21. Boquia. C.M. No. 5059 b-k; I.U.M. No. 12831.

These specimens are in very bad condition. They belong to a species evidently closely related to if not identical with *tolimæ.* They differ in having the anal rays ranging from 26-29; the mandibulary teeth are quite different, the first three teeth are comparatively large and nearly uniform in size, the fourth is notably smaller and the rest are suddenly minute.

These specimens came out of the brook at Boquia and there will be no difficulty in determining their relationship if additional specimens are taken at the same place. They were associated with the similar *Bryconamericus caucanus.*

The teeth number 3 in the first row of six premaxillaries, 4 in twenty-two, 5 in eleven, 6 in one and 2 in one; they number 4 in the second row in thirty-seven, five in four and three in one. The maxillary teeth are $\frac{1}{2}$, $\frac{1}{3}$, $\frac{0}{4}$, $\frac{2}{5}$, $\frac{4}{6}$, $\frac{8}{7}$, $\frac{8}{8}$, $\frac{9}{9}$, $\frac{6}{10}$ $\frac{2}{11}$, where the numerator represents the number of the teeth and the denominator the number of individuals having them.

Bryconamericus tolimæ, decurrens, dentatus with the present species, form an almost complete bridge between the *scleroparius* branch of the genus *Bryconamericus* and *Hemibrycon*.

New Genera and New Species of Fishes

MICROGENYS gen. nov.

Type, *Microgenys minutus* sp. nov.

Allied to Creagrutus and Bryconamericus, having the anal like the former and the teeth like the latter.

Microgenys minutus sp. nov.

Type, 45 mm. C.M. No. 5007; two paratypes, C.M. No. 5008; I.U.M. No. 12818. Piedra Moler.

Head 4-4.33; depth 4; D. 10; A. 10; scales 4-35 (about)-2.5; eye .7 in snout, 3 in head, 1 in interorbital; depth of caudal peduncle a little more than 2 in the length of the head, 2.4 in its own length.

General appearance of *Creagrutus brevipinnis E.* from the same locality, but a little more slender. Predorsal area rounded, with about 11 median scales; ventral surface broad, rounded; occipital process very short, about one-seventh of the distance from its base to the dorsal; skull smooth, rounded; frontal fontanel about half as long as the parietal; snout very blunt, rounded, the jaws equal, the lower slightly projecting when the mouth is open; second suborbital about three-fourths as wide as eye, in contact with the lower limb of the preopercle; mouth very small, maxillary-premaxillary border only about three-fourths as long as eye; four teeth in the outer row of the premaxillary, the first and third slightly withdrawn from the rest, four teeth in the inner series, the two median ones of the two premaxillary unusually close together; three small teeth on the maxillary; five to seven graduate teeth on the mandible. Teeth brown-tipped, each with a large triangular median cusp and a very minute lateral cusp near the base on each side.

Gill-rakers 5 + 9.

Origin of dorsal almost exactly equidistant from tip of snout and base of middle caudal rays; margin of dorsal truncate, rays nearly coterminous; distance between dorsal and adipose 4½ in the length; caudal forked, the lobes more than 4 in the length; anal short, slightly emarginate, its highest rays not reaching tip of the last, its origin under end of the dorsal; ventrals short, about two-thirds the length of the head, their origin in advance of the vertical from the origin of the dorsal, not reaching anal; pectorals shorter than the head, not reaching the ventrals; scales thin, deep; caudal naked, about three scales of the sides forming a basal sheath for the anterior part of the anal.

A median, silvery band.

ZYGOGASTER gen. nov.

Type. *Zygogaster filiferus* sp. nov.

Premaxillary teeth in two series, five teeth in the second series, caudal and anal naked; lateral line complete; maxillary with teeth along its upper angle only. Origin of dorsal a little in advance of the middle; second suborbital in contact with the preopercle along its lower limb; preventral area compressed, the scales of two sides separated by a series of narrow median scales, the marginal scales of the two sides with their lower margins straight; dorsal falcate; outer ventral rays filiform.

Zygogaster filiferus sp. nov.

Type, 110 mm. Apulo. I.U.M. No. 12847.

Head 4.25; depth 3; D. 11; A. 38; scales 7-38-6; eye 1- in snout, 3 in head; interorbital 2.9 in the head; depth of caudal peduncle equals its length or the length of the postorbital portion of the head.

Slender; ventral profile a nearly regular segment of a circle from the mandible to the end of the anal; dorsal profile a little less regular, less deeply arched. Preventral area narrow, rounded, with a narrow median series of scales; postventral area narrow; predorsal area rounded, with about six median scales in front of the dorsal, and about six irregular scales further forward. Occipital process unusually long and slender, its length equal to nearly a third of the distance from its base to the dorsal; interorbital very convex; snout pointed, mouth terminal; maxillary about .6 as long as eye; maxillary-premaxillary border equal to the eye in length; greatest width of the second suborbital about two-thirds of the length of the eye; five teeth in the front row of the premaxillary on one side, four on the other, five teeth in the inner series of the premaxillary. One tooth on the maxillary, four large teeth in the mandible in front, minute ones on the sides.

Scales regularly imbricate except over the anal muscles where they are much smaller and the rows are deflected toward the anal; caudal naked; anal with a sheath of a single series of scales which are continuous with those above its base; axillary scale long; lowest row of scales of the sides with their ventral margin straight, those of the two sides nearly meeting in front of the ventrals; a narrow median series between them.

Origin of dorsal an orbital diameter nearer tip of snout than end of last scale of the lateral line; the second ray prolonged in a filament, 3.33 in the length; caudal deeply forked, the lobes about 3.5 in the length; anal low, but little emarginate, its origin equidistant from middle of eye and end of last scale of the lateral line, on the vertical from the last dorsal ray; outer ventral ray prolonged, reaching to base of fifth anal ray; pectorals reaching 2 scales beyond origin of ventrals.

Easily distinguished by the filiform dorsal and ventrals; the position of the dorsal; the five teeth in the inner series of the premaxillary and the peculiar scaling of the preventral and predorsal areas, as well as by the small scales covering the anal musculature.

The type is a male with retrorse hooks along the first ten anal rays.

Astyanax daguæ sp. nov.

Type, 58 mm. Cordova. C.M. No. 5052.

Head 3.75; depth 2.4; D. 11; A. 31; scales 8-35-7; eye 2.5; interorbital 3.

Premaxillary teeth $\frac{4}{5}$ $\frac{4}{5}$; maxillary teeth 4; mandibulary 5-5 and abruptly minute ones on the sides. Origin of dorsal under base of fourth dorsal ray.

Dorsal falcate, reaching to adipose; pectorals reaching beyond origin of second third of ventrals, ventrals to base of 8th anal ray; a faint, diffuse humeral band; a very narrow lateral band.

Astyanax microlepis sp. nov.

Type, 88 mm. Piedra Moler. C.M. No. 5001.

Paratypes, 4, 48-87. Piedra Moler. C.M. No. 5002 a-b; I.U.M. No. 12769 a-b.

Paratypes, several hundred, largest 112 mm. Cartago. C.M. No. 5003 a-z; I.U.M. No. 12770 a-z.

Paratypes, 50, largest 108 mm. Paila. C.M. No. 5004 a-j; I.U.M. No. 12771 a-j.

Paratypes, 20, largest 99 mm. Cali. C.M. No. 5005 a-j; I.U.M. No. 12772 a-j.

Paratypes, several hundred. Cauca near Cali. C.M. No. 5006 a-z; I.U.M. No. 12773 a-z.

Very similar to *Pœcilurichthys caucanus* St. and *Astyanax faciatus* Cuvier, from which it differs in the number of scales.

Head 3.66; depth 2.8-2.2; D. 11; A. 22-25; scales 8 to 10-50 to 55-8 or 9; eye 3.33 in the head; interorbital 3.

Profile over eye depressed; preventral area narrow, flattened, without a distinct median series of scales, about 17 scales in front of the ventrals; postventral area narrowly rounded. Predorsal area narrow, bluntly keeled, without a distinct median series of scales, about 13 scales in front of the dorsal. Interorbital convex, smooth, occipital process about one-fourth of the length from its base to the dorsal, bordered by four or five scales along each side, usually a few small scales about its tip; frontal fontanel narrow, triangular, not very much shorter than the parietal without its groove; snout pointed, second suborbital narrower than the eye, leaving a naked border around its entire margin; mouth small, maxillary not extending beyond origin of the eye; maxillary-premaxillary border angulate, equal to half the length of the head without the opercle; lower jaw short, comparatively weak.

Four or five teeth in the outer row of the premaxillary, five in the inner, the lateral one minute; one tooth on the maxillary; five or six graduate teeth on the mandible in front and sometimes a few minute ones on the side.

Gill-rakers 7 + 12.

Origin of dorsal about equidistant from caudal and snout, its height 4-4.5 in the length; adipose well developed; caudal lobes 4-4.33 in the length; origin of anal equidistant from caudal and origin or middle of pectoral; depth of caudal peduncle 1.25-1.33 in its length; ventrals small, 1.5-1.66 in the length of the head; not reaching the anal; pectorals reaching to or nearly to the ventrals, equal to head without snout, or a little longer.

Scales very regularly imbricate, the rows not deflected toward the anal by interpolated rows; caudal naked; anal with a very narrow sheath of one row of scales in front; a well developed axillary scale. Lateral line but very little decurved.

A vertical humeral spot, widest and most intense over the lateral lines. A silvery lateral band, expanded at the end of the caudal peduncle; no spots or bands on the fins.

Astyanax ruberrimus sp. nov.

Closely allied to *A. fischeri* Steindachner, differing chiefly in its notably greater depth.

Type, 107 mm. Istmina. C.M. No. 4912.

Paratypes, several hundred, largest 113 mm. Istmina. C.M. No. 4913 a-o; I.U.M. No. 12751.

Paratypes, 7, largest 113 mm. Half way between Puerto Negria and Istmina. C.M. No. 4914; I.U.M. No. 12752.

Paratypes, many, largest 94 mm. Puerto Negria. C.M. No. 4915 a-z; I.U.M. No. 12753 a-z.

Paratypes, 95, largest 93 mm. Cordova on the Dagua. C.M. No. 5093 a-z; I.U.M. No. 12857.

Head about 4; depth 2.2-2.75; D. 11; A. 23-28; scales 7 or 8-35 or 36-7 or 8 (6 in Rio Dagua); eye 3 in the head; interorbital 2.4-2.5.

Deep and robust, ventral profile a little more arched than the dorsal, and a little more regular; preventral area broad, slightly flattened, with about 14 scales not in a distinct median series; postventral area rounded; predorsal area keeled, with 10 or 11 median scales.

Occipital crest about four in the distance from its base to the dorsal, bordered by three or four scales on each side; interorbital smooth, convex; frontal fontanel narrow, about half as long as the parietal without the groove; naked margin around the free border of the second suborbital about one-fourth as wide as the suborbital; maxillary equals snout, four in the head; three or four teeth in the outer series of the premaxillary, five in the inner; one or two broad-tipped maxillary teeth; mandible with four or five large teeth and about seven small ones on the side.

Gill-rakers 7 + 11.

Origin of dorsal equidistant from tip of snout and caudal or a little nearer the former, its anterior rays 3.4 in the length; caudal about 3.5 in the length; anal slightly emarginate, its highest ray equals length of head without snout, its origin behind the vertical from the last dorsal ray; ventrals reaching anal and pectorals the ventrals in the young, not reaching anal and ventrals in the adult.

Scales everywhere regularly imbricate except at least in Istmina specimens between the anal and the first row of scales below the lateral line; one or two rows of interpolated scales causes the series in a triangle above the anal to be deflected toward the anal; ten, more or less radii; caudal naked; a series of low scales along the base of the anterior anal rays; lateral line nearly straight.

The specimens from the Dagua river have the lateral line more decurved than the rest.

A conspicuous black spot occupying the entire width of the caudal peduncle in the young, somewhat narrower in the adult, not continued on the middle rays; a faint vertical humeral spot. Base of dorsal yellow, shading into brick red; middle of caudal yellow, the rest brick-red; base of anal brick-red.

Astyanax aurocaudatus sp. nov.

Type 60 mm. C.M. No. 5162.

Paratypes, 9, largest 60 mm. Boquia. C.M. No. 5163 a-d; I.U.M. No. 12911.

Head 3.5-3.75; depth 2.6-2.75; D. 10; A. 24; scales 7-35+2-5; eye .8-1 in snout, 3.5-3.8 in head; interorbital 3 in head; depth of caudal peduncle less than half the length of the head; base of anal 3-3.5 in the length.

Deep, compressed, blunt headed; predorsal area keeled, with about 12 median scales; occipital process narrow, reaching a little more than a sixth of the way to the dorsal, bordered by about three scales; head in the occipital region much arched, the fontanels narrow, the frontal fontanel very short, only about one-fourth as long as the parietal without its groove; second suborbital very small, usually narrower than the naked portion of the cheek, cheek very deep; the vertical limb of the preopercle extending downward and backward, the angle acute; lower jaw included, short, but a trifle longer than the eye; maxillary-premaxillary border a simple curve, 2.75 in the length of the head; snout very short and blunt. Premaxillary with five teeth in the outer series in a wavy line; four teeth in the inner series, the second one being much the heavier; maxillary with several (5 or 6) teeth of nearly equal size along more than half its margin; mandible with three large, graduated teeth, the middle point of the third one recurved, thorn-like; about seven small graduated teeth on the side of the jaw.

Gill-rakers of the lower arch reduced to about five minute scarcely evident papillæ.

Origin of dorsal about midway between snout and caudal; its base a little less than half the length of the head; its margin obliquely truncate, the highest ray a little more than twice the length of the penultimate. Adipose well developed; caudal lobes a little less than length of head; origin of anal equidistant from snout with the anterior part of the dorsal; ventrals reaching the anal; pectorals beyond the origin of the second third of the ventrals, equal to length of head without the opercle.

Scales regularly imbricate (except over the anterior anal rays?); caudal naked; anal in the type at least with a lobe composed of two rows of scales on the base of the anterior seven rays, these are not attached to the rays; lateral line nearly straight.

A large ill-defined vertical humeral blotch; no caudal spot; dorsal and pectoral blackish. (In life the whole after part of the body and caudal peduncle golden or orange red.)

These specimens were damaged in transportation but the third mandibulary tooth, the small second suborbital and color readily distinguish the species from the other members of the genus *Astyanax* from which it ought probably to be distinguished generically.

Brycon henni sp. nov.*

Type, 247 mm. Caldas. C.M. No. 5152.

Paratypes, 21, largest 270 mm. Caldas. C.M. No. 5153 a-f; I.U.M. No. 12902 a-e.

Paratypes, 4, 235, 240, 290 and 325 mm.; 6, 60-107 mm.; 18, largest 50 mm. Cisnero. C.M. No. 5154 a-o; I.U.M. No. 12903.

*For Arthur Henn, at the present moment exploring the rivers of Western Colombia.

Paratypes, 6, 34-165 mm. Cali. C.M. No. 5155 a-c; I.U.M. No. 12904.

Paratypes, 9, 32-110 mm. Paila. C.M. No. 5156 a-e; I.U.M. No. 12905.

Paratypes, 70, largest 83 mm. Piedra Moler. C.M. No. 5157 a-z; I.U.M. No. 12906.

To this species also belong 164, largest 74 mm. Cartago. C.M. No. 5158 a-z; I.U.M. No. 12907.

Head 3.66-3.8; depth 3.5-3.66; D. 11 (10 in one); A. $\frac{2}{21}$, $\frac{8}{22}$, $\frac{4}{23}$, $\frac{3}{24}$; scales 7 to 9-48 to 51-5 or 6; eye 4.5-5 in the head, snout 3.5; interorbital 2.75-3.

This species is associated with *B. atrocaudatus* in the Daqua River. It is readily distinguished from all other species found on the Colombia and the Pacific slopes by its short anal, its scales and the color.

The inner surface of the opercle has a large black spot and this appears as a much smaller oblique spot on the upper surface of the opercle; the caudal spot is much less sharply defined than in *atrocaudatus* and in the young is much smaller; a faint humeral bar; formaline specimens with irregular vertical lines on the sides.

A comparative account of the species of the genus Brycon with figures will appear in the final report. This species will be more fully described at that time.

Odontostille hastatus sp nov.

Type ♂ 40 mm. Soplaviento. C.M. No. 5103.

Paratypes, 25, largest 37 mm. Bernal Creek C. M. No. 5104 a-j; I.U.M. No. 12861 a-j.

Head 4+; depth 2.8-3.25; D. 11; A. most frequently 19 (18-21); scales 5.5-32 to 35-3; eye 3 in head, equal to interorbital.

Most nearly like *O. paraguayensis*, much more slender.

Compressed, dorsal and ventral profiles equally arched; preventral area rounded, with about 11 scales; postventral and predorsal areas narrowly rounded, the latter with a regular median series of about 10 scales; occipital process short and broad, its length one-sixth of the length from its base to the dorsal, bounded by three scales on each side; frontal fontanel variable, an equilateral triangle as wide as and half as long as the parietal fontanel or quite minute; skull convex, snout blunt, the mouth comparatively large, maxillary-premaxillary nearly as long as the eye; five teeth in the premaxillary, two or three in the maxillary, four broad-tipped, seven pointed teeth in the dentary in front, and with as many as four similar graduated teeth on the side; second suborbital covering the entire cheek. About ten rakers on the lower arch of the gill.

Dorsal pointed, its highest ray longer than head, reaching to within two or three scales of the adipose, its origin about equidistant from tip of snout and caudal; middle caudal rays very short; a row of scales reaching to the tip of the rays just below the shortest ones; in the male the rays of the lower caudal lobe with retrorse hooks similar to those of the five anterior anal rays in the male; anal short, its margin subtruncate (very slightly emarginate), its rays graduate, the tip of the highest (third) reaching to last fourth or to the base of the last ray; anal base 4.6 in the length, its origin behind the vertical from the last dorsal ray; origin of ventrals in front of the vertical from the anterior dorsal ray about reaching the anal; pectorals not quite reaching ventrals.

Scales thin, regularly imbricate, with as many as ten radials; lateral line complete, nearly straight; anal sheath consisting of a single row of scales along the bases of the anterior rays; caudal naked except for a basal sheath on the lower lobe of the male and the peculiar scales just below the middle rays in the male.

Scales of the back margined with dark; margins of the myotomes above the anal marked with chromatophores; no humeral spot, a silvery band; a conspicuous black spot on the end of the caudal peduncle, rounded in front, pointed on the bases only of the middle caudal rays; peduncle in front of the spot without chromatophores. Orange in life above and behind caudal spot.

One specimen from the Calamar Cienega, 32 mm. C.M. No. 5105; and three, the largest 30 mm. Soplaviento. C.M. No. 5106; I.U.M. No. 12862, may belong to this species. Chromatophores are limited to the dorsal region and to along the base of the anal; the caudal spot is smaller, oval.

Hyphessobrycon proteus sp. nov.

Type, 74 mm. ♀ Quibdo. C.M. No. 5094.

Paratypes, over 100. Quibdo. C.M. No. 5095 a-z; I.U.M. No. 12858.

Sixty-eight, largest 23 mm. Soplaviento. C.M. No. 5096; I.U.M. No. 12852.

Fifty-four, largest 45 mm. Calamar. C.M. No. 5097; I.U.M. No. 12853.

Forty-seven, largest 47 mm. Cienega at Calamar. C.M. No. 5098; I.U.M. No. 12854.

Two, Puerta Wilches. C.M. No. 5099; I.U.M. No. 12855.

One, below Buena Vista. C.M. No. 5100.

One, 39 mm. Honda. C.M. No. 5101.

Seven, largest 50 mm. Bernal Creek. C.M. No. 5102; I.U.M. No. 12856.

One, 30 mm. to base of caudal. Apulo. I.U.M. No. 12857.

Very similar to *Astyanax ruberrimus* from the San Juan and Dagua rivers from which the preserved specimens with a complete lateral line can only be distinguished with difficulty. Its formal distinguishing features are the smaller number of anal rays and smaller number of scales and the nature of the scales below the lateral line. Although the number of specimens available for study is large it is quite possible that additional collections from the upper San Juan and Raspadura rivers will throw better light on the relationship of the two species. It is quite certain that the significance of the completeness or incompleteness of the lateral line is subordinate to that of other characters. The genus *Hyphessobrycon* and *Hemigrammus* are therefore conveniences rather than entities. Certainly as at present defined they are polyphyletic.

Head 4; depth 2.25-2.66; D. 11; A. $\frac{2}{22}$, $\frac{4}{23}$, $\frac{7}{24}$, $\frac{11}{25}$, $\frac{3}{26}$, the enumerator being the number of individuals. Scales 6 or 7—$\frac{11}{32}$, $\frac{26}{33}$, $\frac{9}{34}$, $\frac{2}{35}$,—$4\frac{1}{2}$ to $5\frac{1}{2}$; eye 2.6-2.75; equals interorbital; depth of caudal peduncle equal to its length.

Compressed, oval; dorsal and ventral profiles nearly equally curved, only a slight depression in the profile over the eyes; preventral area narrow, rounded, without a distinct median series of scales; or with a regular series of about eleven scales; postventral area rounded, with three or four scales; predorsal area keeled, with a distinct median series of nine or ten scales; occipital process about 5 in the length from its base to the dorsal, bordered by three or four pairs of scales; skull smooth, convex; parietal fontanel without the groove about one and a half times as long as the frontal fontanel. Second suborbital leaving a naked area one-fifth to one-half of its own width around its entire distal margin; maxillary-premaxillary border angulated, equal to a full diameter of the eye; the mouth terminal, the longitudinal extent of the premaxillary very short. Three or four teeth in the outer row of the premaxillary, five in the inner, the two rows parallel; a broad tipped, multipointed tooth on the maxillary; five rather small, five-pointed graduate teeth in the mandible in front, none on the sides.

Gill-rakers 7 + 12.

Origin of dorsal about equidistant from snout and base of upper caudal lobe; its highest (second and third) rays about twice as high as the antepenultimate, the fin pointed, the highest ray a little longer than head; caudal lobes about 3 in the length; origin of anal behind the vertical from the last dorsal ray; anal emarginate its base about 3.5 in the length; ventral usually not reaching anal, its origin equidistant from snout with the second or third scale in front of the dorsal, pectorals sometimes falling a little short of or extending a little beyond the origin of the ventrals.

Scales very regular, no interpolated rows of scales below the lateral line; the third row below the lateral line runs to the end of the anal, the fourth to the middle of the anal, the fifth to the sides of the first few anal rays; lateral line nearly straight; caudal lobes naked; anal with a sheath of a single row of scales; a large axillary scale; lateral line variable.[5]

Silvery, a silvery lateral band; a faint humeral spot crosses the third scale of the lateral line; a large conspicuous triangular caudal spot extending on the bases of the middle caudal rays, not to their middle. Caudal lobes with cherry spots at the base becoming yellow toward the tip.

Hyphessobrycon poecilioides sp. nov.

Type, 53 mm. ♀ Cali. C.M. No. 5091.

Paratypes, 50, largest 69 mm. C.M. No. 5092 a-o; I.U.M. No. 12850.

Head 3.66-3.75; depth 2.66 ♀ -3♂; D. 11; A. 16-18; scales 36 in a longitudinal series, 12 series; usually about 9 scales with pores, rarely as many as 16; eye 4 in head, 1.66-2 in interorbital, equal to snout; depth of caudal peduncle 2.66-2.9 in the greatest depth.

Cyprinodontoid. Ventral surfaces rounded, the scales rather small, no distinct median series; about 12 scales in front of the dorsal, in a nearly regular series; interorbital but slightly convex, mouth very small, the maxillary very oblique, usually not quite equal to the eye; maxillary-premaxillary border 3 in the head; second suborbital sometimes covering the entire cheek, usually leaving a naked border behind and a naked tri-

[5] An examination of the specimens from Quibdo, on which the above description is based, shows eighteen with a complete lateral line, eleven with the line complete on one side and not on the other, and seventy-six with the line incomplete on both sides.

angle under its anterior angle; premaxillary with 3-5 teeth in the outer series; maxillary with one (sometimes none or two?) five-pointed tooth; mandible with four graduated large teeth and 2-5 small ones on the sides.

Gill-rakers 11 + 15.

Dorsal a little nearer caudal than snout, its margin rounded; caudal lobes short, about equal to length of head; depth of caudal peduncle less than its length; anterior rays of anal the longer, the margin very slightly emarginate, its origin on the vertical from or behind the vertical from the base of the last dorsal ray; ventrals not reaching anal; pectorals short, rounded, about equal to head less snout and half the eye; not reaching ventrals by about 3 scales.

Scales regularly imbricate; no interpolated rows below the lateral line; caudal naked, a basal sheath of one row of scales, along the anterior part or the entire anal; a small axillary scale.

Sides of head and body thickly covered with chromatophores; a wedge-shaped humeral spot crossing the 3d to 5th scale of the lateral line; a narrow black (in formaline) band from upper angle of gill opening to end of middle caudal rays.

Anal tubercles in male scarcely evident.

Hoplosternum magdalenæ sp. nov.

Callichthys (Hoplosternum) thoracatus (*non* C. & V.) Steindachner. Zur Fish—fauna des Cauca und der Flüsse bei Guayaquil, 14, 1880. (Cauca near Caceres.)

The specimens mentioned by Steindachner are much lighter in color and have the caudal spotted with dark, the base with a light bar followed in one specimen with an ill-defined darker band. He had three specimens, 7 cm. long. This species is quite distinct from *thoracatus* and is most nearly like *H. pectoralis* Boulenger, from the Paraguay basin.

Type, 107 mm. Soplaviento. C.M. No. 5081.

Paratypes, 59. Soplaviento. C.M. No. 5082 a-j; I.U.M. No. 12836.

Paratypes, 1. Calamar Cienega. C.M. No. 5083.

Head to end of opercle 3-3.5 in the length; depth 3.5; D. I, 8; A. I, 6. Plates $\frac{2}{2}\frac{5}{3}$, $\frac{2}{2}\frac{6}{3}$; eye 6 in head to end of opercle, 4 in interorbital (5 in *pectoralis*); origin of dorsal nearly equidistant from tip of snout and spine of adipose fin (much nearer snout in *pectoralis* of equal size), six or seven azygous plates in front of the adipose spine; caudal emarginate; pectorals reaching to third or fourth plate beyond origin of ventrals (to ventrals in *pectoralis*); distance between pectorals considerably less than the length of the coracoids (equal to or less than length of coracoids in *pectoralis*); coracoids in contact along the median line, with a narrow V-shaped naked area between them posteriorly, very heavy and overlapping in front in the male. Barbel to middle of pectoral or a little further (to tip of ventrals in *pectoralis*). Fontanel oval in young, circular in adult; occipital not reaching fontanel by two-thirds to one and one-half diameters of the fontanel.

Slaty blue-black, but little lighter below.

An Examination of the Types of Recently Described Fishes, Chiefly from the Regions Bearing on the Panama Problems

Through exchange I have been able to examine *Astyanax scierus* Fowler, and *Astyanax notemigonoides* Fowler. The former is a synonym of *Bryconamericus peruanus* (Müller and Troschel), and the latter is a synonym of *Astyanax brevirostris* (Günther). Through the courtesy of Dr. Fowler I have also been able to examine his *Apodastyanax stewardsoni*. It is synonymous with *Ctenobrycon spilurus* (C. & V.). The type of *Apodastyanax* at some time in its career has lost its ventrals.

Dr. S. E. Meek has kindly lent me some of the types of the new Characins recently described by him. His *Astyanax grandis* is the species long referred to as *Astyanax fasciatus* and which occurs in large numbers in the Atrato. His *Creagrutus notropoides* is the *Creagrutus affinis* of Steindachner. His *Deuterodon atrocaudatus* is a member of the genus *Gephyrocharax* described in the first part of this paper. His *Hemigrammus minutus* is *Hyphessobrycon panamensis* Durbin (Ellis). His *Cheirodon eigenmanni* appears to represent a new genus connecting the *Rhodsinæ* with the *Aphyocharacinæ*. It agrees with *Parastremma*, but has only a single series of premaxillary teeth.

Luciocharax striatus Boulenger (1911) from the San Juan is a synonym of *Luciocharax beani* Fowler from the Atrato.

ERRATA

This opportunity may be taken to correct a few typographical and other errors occurring in the first part of this paper. (Indiana University Studies, No. 8.)

Page 5, line 29, instead of "of Raspadura" read of Boca de Raspadura.
Page 5, lines 30 and 32, for "Quibdo River" read Quito River.
Page 8, line 34, twice for "Raspadura" read Boca de Raspadura.
Page 10, line 34, for "Raspadura" read Boca de Raspadura.
Page 12, line 38, for "4839" read 3839.
Page 13, line 27, for "1307" read 3807.
Page 17, line 23, for "a series" read several series.
Page 18, line 31, for "6819" read 4819.
Page 25, line 30, for "Raspadura" read Boca de Raspadura.

The 'University Studies' constitute a sub-series of the Indiana University Bulletin *in which from time to time are published some of the contributions to knowledge made by instructors and advanced students of the University. At present not more than two or three such numbers are issued a year. The 'Studies' are continuously numbered, and, as needed, a title-page and table of contents will be issued, for binding them in volumes.*

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INDIANA UNIVERSITY STUDIES

No. 18 a

WORDSWORTH'S MIND

BY RICHARD RICE, JR.

The 'University Studies' constitute a sub-series of the Indiana University Bulletin, *in which from time to time are published some of the contributions to knowledge made by instructors and advanced students of the University. At present not more than two or three issues are published each year. The 'Studies' are continuously numbered, and, as needed, title-pages and tables of contents will be issued for binding them up in volumes.*

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INDIANA UNIVERSITY STUDIES

VOL. XI, No. 7 BLOOMINGTON, INDIANA JULY 1, 1913

Argument

The following essay on *Wordsworth's Mind* is divided into four chapters.

WORDSWORTH'S MIND

By Richard Rice, Jr.
Assistant Professor of English in Indiana University

INTRODUCTION

The growing answer to the ancient question of what meanings nature has for man is given chiefly in three different modes of thought and by men of distinct temperaments. These three modes of thought are by no means mutually exclusive, yet each of the three thinkers, the scientist, the philosopher, and the poet, speaks of nature from a thoroughly temperamental point of view and often as if his special knowledge expressed some irremediable ignorance or lack of vision in the others.

To certain scientists, the philosopher appears to be a man who has abstracted from finite things system alone and has tried to give that reality by applying it to mental phenomena, treating them as if they were mechanical causes and effects, and so making laws of thought outside the laws of nature. Or, to the poet, the philosopher is one who has failed to give concrete form to his ideas, to see images of his thoughts, and whose observation of nature takes on some completely mental meaning which the objects of nature do not truly give rise to, nor which they could possibly embody. What this expresses is the temperamental difference between these thinkers.

It is typical of the scientist that he is apt to perceive the frequent futility and unreality of philosophic processes, of the philosopher that he sees but the mechanical and obvious methods of thought in natural science, and of the poet that he feels, on the one hand, the flat practicality of science, and, on the other, the abstraction of philosophy. Temperamentally, the scientist is interested in the external or mechanical relation of facts and objects to one another, and his knowledge of life is described and colored by the laws of these relationships. Similarly, the philosopher is interested in the intellectual relation of facts and ideas in his own mind, where he has a world of his own, self-created, in which he thinks and creates new objects of thought. The poet, as poet, is interested in facts, objects, ideas, for the sake of realizing them sensationally, so that they become the images of his feeling and of his mind. 'If you only knew nature as closely and as practically as I do,' says the scientist, when speaking to the others, 'you could not idle away your time in pursuits that do not often appear to lead to realities.' To the problem of nature, the scientist, whose temperament requires a known cause and an observable effect to enable him to understand reality, tries to give at once a useful and a sincere, if a temporarily limited, answer—limited because sincere. 'If you saw all the relations of things in the mind, which is itself the ultimate reality,' says the philosopher, 'you could not blind yourselves so frequently with mere facts or with mere feelings.' The philosopher, finding cause and effect to be but phases of creative thought, may give an answer that perhaps transcends, through force of abstract reason, the reality of knowledge. 'If you only felt and realized nature, both for its own sake and for the image that it makes of the soul,' says the poet, 'you would see reality alive everywhere with new significances.' And the poet, requiring an atmosphere of sensation before he can think at all about reality or about abstraction, finds in the objects of sense those vivid images that give shape to what is continuous and permanent in life's changing ideas.

It is the testimony of culture that the answer to the ancient question is, for any one age, unsatisfactory without the contribution of each of these men in the form he wishes to make it. For the answer tends to become permanent as it is comprehensive and reflects the varieties and the changes of thought; and it is ephemeral as it is exclusive and belongs definitely to the past. On this fact do we base the education of our youth, and by it do we see the stature of our greatest men. Poetry, science, and philosophy exhibit different views of life; but they are not in themselves mutually exclusive fields of discourse except as the smaller men of genius make them so. The great thinkers have penetrated farthest into the mystery of nature because of their comprehension of the total aspect of reality that surrounds it.

It is, however, a part of human economy that most thinkers are rather definitely in one field of thought or another, and that they are led there not by any intrinsically greater value of that field but by a personal and temperamental choice. In this essay it will be one of my aims to show the essential temperament of the poet in explaining what nature may mean to man. It may be said here that, as distinguished from the other two, from the scientist and the philosopher, the poet thinks in images or concrete symbols, instead of in unimaged facts (plain facts), or in abstract terms. He does not think in the atmosphere of empirical or systematic reason so much as in that of sensation. For the truth of his thoughts he relies not on method, but on an appeal to emotions. Poetically speaking, he gives nature reality by viewing it as shape and color and expressing it in terms of feeling, instead of in the impersonal terms of an aggregate of facts and laws. Scientifically or philosophically speaking, he makes the mistake of introjecting his own soul into nature till he sees there purposes and wills like his own, and especially does he make the mistake of seeing evolution as the expression or result of divine purpose instead of seeing purpose as the result of evolution. I have before me a scientific book, written by a geologist, on 'The Scenery of England;' also I have Wordsworth's 'Prelude.' I can turn in each book to descriptions of mountain scenery in Wales or in the Lake District. Each writer sees vividly the same objects. But the scientist is interested here in the causes and effects of forces that enable him to explain why these mountains have a certain shape; and the poet is interested here in the emotional effects of these mountains on his life, and in the emotional effects of words. The scientist's view makes an orderly objective arrangement of facts, from which ideas about beauty of mountain contour might be deduced impersonally. The poet's view is a colored impression wherein ideas originating in his own mind form themselves in external objects, which so become images and symbols of his feeling.

Such distinctions need in no way obscure the fact that the mind of any great man is a mirror of life, and that this is especially true of the artist. The poet's mind in Wordsworth is an inclusive mind, a mind in which things grow into harmony, in which the varying aspects of nature are reflected sharply and at the same time are rendered consonant. I shall here attempt to describe the most important phases of his thought about the relation of nature to man, how they developed and what their significance is in the poetic answer to the ancient question of science, philosophy, and poetry.

I

Realism and the Coloring of Imagination

Wordsworth is one of the few poets who has written poetry with the avowed aim of illustrating special theories of his art; also he is one of the few poets who has consciously traced for us his poetic growth and endeavored to let us into the secret of his genius. In additon, there is a third reason why one may hope to make a true analysis of his mind. He reflects in a manner peculiarly illuminating to his own character many varieties of the thought of his time.

He lived at the end of a period when it had been customary to make sharp distinctions between phases of artistic expression, when, for example, the language of prose was quite another tongue from the language of poetry, when the matter of poetry was regularly limited to certain well-understood fashions, and, especially, when the realistic and the romantic treatment of nature were supposed to indicate almost diametrically opposite tendencies. To merge these distinctions in form and to emphasize the supremacy of thought was the work of the revolutionary poets. It was Wordsworth, more than any other poet of his day in Europe, who helped accomplish this. Also it was Wordsworth, more than any other critic, who made it clear what are the essentials of poetic thought whether in prose or verse, what is the poetic thing to seek for in any subject, whether commonplace or mysterious, and what are the essentials of creative imagination whether realistic or romantic in temper. In him the Romantic Movement became a movement toward unity. In his romantic mind various modes of thought tended to unite and symplify; and since his time realism and romanticism, to take the fundamental distinction with which we shall have to concern ourselves, have been seen to express not opposite tendencies but rather gradations in unified artistic purpose.

But Wordsworth did not always unite these qualities perfectly. If he is now illuminating and sincere, he is again mechanical or whimsical. Indeed, if it is his greatness that he combines the vital ideas, even the most opposite, of a reactionary and revolutionary period, it is his weakness that they sometimes remain too clearly distinguishable in the alembic. He is both the maturest and the most uneven of poets. Yet for this paradox we perhaps know him the better. The sharp contrasts of his style, resulting, enable us to perceive more definitely what his poetic purposes were and how he developed them out of the ideas of his day; perhaps they admit us to points of view from which even his highest genius is not inscrutable.

Certainly a fundamental reason why the growth of his mind is closely traceable is that he both preserves the past and merges with the future. We can place him clearly and definitely in the history of thought. He had his roots in the eighteenth century and he always grew from them. He effected the greatest change in the poetical view of life; and though less 'revolutionary' than Bryon or Shelley, more nearly than they does he seem to consummate the transition from the old to the new. It is from this point of view, his relation to the tendencies of his age, that we shall first consider him.

The typical characteristic of descriptive poetry in Wordsworth's youth was derived from a strong sense of fact, from faithfulness to the eye without reflection. A surface realism, which had affected nearly every form of literature in the eighteenth century, came at last to dominate even poetic description of nature. Cowper and Crabbe mark the end of Arcadian pastoral. Poets, who thereafter proposed to describe humble and rough life, would have to make it humble and rough. The Golden Age was past in the English countryside, and the problem of being both true to nature —not to the ancients—and poetical succeeded. I have lifted the veil , says Crabbe, the veil of pastoral revery; you cannot replace it.

Crabbe, however, while destroying illusion, saw little further into reality than its vivid surfaces. Merely lifting the veil, through which the poetic eye had so long looked at nature, did not bring to him, nor could it have brought to any complete realist of that day, a great poetic vision of nature—not even a great philosophical analysis of its meaning. After Milton, no poet until Wordsworth can be spoken of as a man of vision, one to catch either on the fabric of the veil or in bare reality something of the mystery of nature and something of the secret. Pope had attempted to explain nature in a system, after the manner of a critic, not of a poet. He had contemplated nature abstractly with an analytic mind, and had perceived in the order of things an illustration of a phase of deism. His poem, within itself, made a narrow, logical, interesting, though unlikely, interpretation of man's relation to the universe. In its own light, that is, it is all as plain as day. The mystery is gone. Hence we know there is something inadequate in Pope's deism, more inadequate, perhaps, than no explanation of the mystery at all. The poets that follow Pope did not attempt any deeper interpretation. They devoted themselves to the external charm of a great variety of scenes. They saw many things, and some things poetically. They saw in the beauty of nature signs of man's relation to God. They dealt in the obvious and conventional way with the lessons of nature. But thought, except in the guise of logical reasoning, and as it may be expended on arrangement and form, is largely absent from English poetry for a hundred years after Milton.

Wordsworth brought back to poetry the element of poetical thought, the power of thinking in images, of forming ideas and images simultaneously; and this was owing to the new vision he had—rather vague at first, but growing steadily clearer—of the function of poetry as a great interpreter of nature, an interpreter comparable, on the side of thought, to philosophy.

To understand the growth of this conception of poetry in his mind—which is essential to our further discussion of his art—it is necessary to recall that it began with him not as an inspired vision, but as a rather academic theory. Had he had from the first an inspired vision of his function as a poet, he would probably never have written his first prefaces to the 'Lyrical Ballads;' though on the ground that he thoroughly believed it to be part of a poet's function to cultivate the taste by which he is to be appreciated, we may believe that he would have written something like his *final* judgment in the matter there argued. Wordsworth's theory grew rapidly clearer, but at first it was not clear and to the end reminiscences of fogginess remain in it. To begin with, he swung too violently from one extreme to the other. His early poems, which he published in 1793 immediately after his return from France, are for the most part trivial exercises in description, done in the couplet of Pope and decked out with the worst of Thomson's verbiage. 'The Evening Walk' and 'Descriptive Sketches' are so full of the artificial phrases of that *poetic diction* which Wordsworth later ridiculed, that Professor Legouis, in pointing out some twenty varieties of such diction, concludes that, with the possible exception of certain poetry of the Della Cruscan school, we have yet to meet with a poem of any value 'in which may be found so large a proportion of fantastic conceits as are collected and crowded together in the twelve hundred lines published by Wordsworth in 1793.'[1]

[1] 'The Early Life of William Wordsworth.' p. 147.

Five years later Wordsworth had gone to the other extreme, and the exaggerated simplicity of some of the 'Lyrical Ballads' (which were published anonymously) was accounted for by contemporary critics on the ground that the author was unable to write anything more elevated.

Wordsworth's theory of his function as a poet, and of his proper diction was temporarily unbalanced by this change, this too complete conversion. In democratic and revolutionary fervor he determined to choose subjects from *low and rustic life,* and then applying social rather than poetic principles to the art of writing poetry about such subjects, he tried to adopt also the language of *low and rustic life.* He did not at first recognize either in theory or in practice that 'what was needed to cure a false diction was not that of the lower classes any more than that of the higher, but a pure diction'—a diction, let me add, such as he already has in the 'Lyrical Ballads' when he forgets his theory. As Mr. Henry Dana has pointed out in an essay, as yet unpublished, from which I have just quoted, and as Professor Dowden and other critics have remarked, Wordsworth constantly changed his theory and his practise till he reached a far more conventional and, at the same time, poetical point of view. This process is one of the fundamental things in his genius, a thing Crabbe had been unable to teach him, for though Crabbe's diction is not affected it is not pure. The change in Wordsworth's attitude is seen by a comparison of the prefaces of various editions of the 'Lyrical Ballads.' These prefaces are ordinarily printed in their final form with no attention to the changes and amplifications they underwent from one edition of his poems to another. Even in the recent volume of 'Wordsworth's Literary Criticism,' the editor, Mr. N. C. Smith, late fellow of New College, prints the preface of 1802 as that of 1800, which was some twenty-four pages shorter. In this, however, he only follows the custom of practically all the complete editions of Wordsworth, old or new, though Mr. Dowden, in 1891, had pointed out this mistake, and showed the changes Wordsworth made in his poetical theory from 1798 to 1802.

The 'Advertisement,' as the preface of 1798 is called, reads in part as follows: 'It is the honourable characteristic of Poetry that its materials are to be found in every subject which can interest the human mind. * * * The majority of the following poems are to be considered as experiments. They were written chiefly with a view to ascertain how far the language of conversation in the middle and lower classes of society is adapted to the purposes of poetic pleasure. Readers accustomed to the gaudiness and inane phraseology of many modern writers * * * will perhaps frequently have to struggle with feelings of strangeness and awkwardness: they will look round for poetry, and will be induced to inquire by what species of courtesy these attempts can be permitted to assume that title. * * * It will perhaps appear to them, that wishing to avoid the prevalent fault of the day, the author has sometimes descended too low, and that many of his expressions are too familiar, and not of sufficient dignity. * * * An accurate taste in poetry, and in all other arts, Sir Joshua Reynolds has observed, is an acquired talent, which can only be produced by severe thought, and a long continued intercourse with the best models of composition.' This is practically a confession, when taken with the characters of the poems themselves, that some of them are *tours de force.* In the preface of 1800, feeling that this theory as stated, embarrassed his poetry—especially such poems as 'Lines Above Tintern,'—he changed the phrase about 'the language of conversation in the middle and lower classes,' and said the poems were written 'to ascertain how far, by fitting to metrical arrangement a selection of the real language of men in a vivid state of sensation, that sort of pleasure and that quality of pleasure may be imparted, which a poet may rationally endeavor to impart.' In 1802, he added twenty-four pages to this preface, and amended his theory of diction still further, saying that his principal object is to describe 'incidents and situations from common life' in a 'selection of language really used by men, and, at the same time, to throw over them a certain coloring of imagination, whereby ordinary things should be presented to the mind in an unusual aspect.' Here, in place of 'the conversation of the middle and lower classes,' we are now further told that the language of poetry, 'if selected truly and judiciously, must necessarily be dignified and variegated, and alive with metaphors and figures;' and that 'this selection, whenever it is made with true taste and feeling will of itself form a distinction far greater than would at first be imagined, and will entirely separate the composition from the vulgarity and meanness of ordinary life.'

'What a change in four years!' Mr. Dana remarks. 'The democrat enthusiast of 1798 who would adopt the language of the middle and lower classes, now looks for "selection," for "taste," for "distinction." The young revolutionary already begins to object to what he calls "the vulgarity and meanness of ordinary life."' That Wordsworth's taste greatly changed in practice, might be made obvious by citing the emendations he introduced into later editions of these early poems, emendations in almost every case making for more imaginative, more poetical, and less merely conversationally natural effects.

To illustrate the significance of this change more broadly, it is well to call attention, once more, to Wordsworth's connection with Crabbe. In fact, it is not too much to say that a literal following out of the principles laid down in 1798 would have resulted in verse more like that of the chief realist of the age than like anything Wordsworth truly had in his own soul to write. They each realized that the matter of their poetry had much in common. Crabbe held that the country-folk are good poetical subjects because, as he says, in this class 'more originality of character, more variety of fortune will be met with; because, on the other hand, they do not live in the eye of the world, and therefore are not kept in awe by the dread of observation and indecorum.'[1] Wordsworth says that for his poems in the 'Lyrical Ballads,' 'humble and rustic life was generally chosen, because, in that condition, the essential passions of the heart find a better soil in which they can attain their maturity, are less under restraint, and speak a plainer and more emphatic language; because in that condition of life our elementary feelings coexist in a state of greater simplicity, and, consequently, may be more accurately contemplated, and more forcibly communicated; because the manners of rural life germinate from those elementary feelings, and, from the necessary character of rural occupations, are more easily comprehended, and are more durable; and, lastly, because in that condition the passions of men are incorporated with the beautiful and permanent forms of nature.'[2] Wordsworth's statement is prior to Crabbe's, though Crabbe had given his practical illustration years before. Except, however, for this bit of similar theory and its application to the choice of subjects, their poetry is far apart.

The difference between them is the difference, as understood at that time, between the realistic treatment of a subject and its imaginative or romatic treatment. In a note prefixed to 'Lucy Gray,' a story Crabbe might well have liked to tell in a far different manner, Wordsworth says: 'The way in which the incident was treated and the spiritualizing of the character might furnish hints for contrasting the imaginative influences which I have endeavored to throw over common life with Crabbe's matter of fact style of treating subjects of the same kind.' He explains that this is not said in Crabbe's disparagement, but with a consciousness of the differ-

[1] 'The Life and Poetical Works of George Crabbe.' London, 1901. p. 55.

[2] 'Lyrical Ballads.' Preface of 1802.

ence between them. Wordsworth's theory about humble and rustic life as matter for imaginative poetry is not just Crabbe's realistic creed. While it is evident that both poets strike a similar monotonous tone in such stories as Margaret's, Michael's, Ellen Orford's, Phoebe Dawson's, where the authors are, perhaps, too much interested in the rag-tag of realistic observation, family connections of their characters, and so forth, still they are not alike even here. One is merely realistic, the other is realistic and something else. Neither is this statement of mine intended to be disparaging to Crabbe; for I do not necessarily prefer Wordsworth's trick of enveloping his peasantry in a pathetic glamor to Crabbe's repression of all glamor and his emphasis of cold fact. The point is that to contemporary critics these differences seemed especially marked.

Crabbe's realism and Wordsworth's imaginative coloring, in the treatment of low and rustic life, was the subject of Lord Jeffrey's contrast of the two, and ridicule of Wordsworth in 'The Edinburgh Review' for April, 1808. Each poet had put much of his best work before the public. Lord Jeffrey's comparisons are very fallacious, but they bring out the point that he thought Wordsworth's characters so fanciful as to bear no relation to the humble rustics of Crabbe, and his poetry to have no value as simple and realistic language, but to be merely 'prose run mad.' 'Mr. Crabbe,' says Jeffrey, 'exhibits the common people of England pretty much as they are, and as they must appear to every one who will take the trouble of examining into their condition; at the same time that he renders his sketches in a very high degree interesting and beautiful—by selecting what is most fit for description. * * * Mr. Crabbe, in short, shows us something which we have all seen, or may see, in real life; and draws from it such feelings and such reflections as every human being must acknowledge that it is calculated to excite. He delights us by the truth, and vivid and picturesque beauty of his representations, and by the force and pathos of the sensations with which we feel that they are connected. Mr. Wordsworth and his associates, on the other hand, introduce us to beings whose existence was not previously suspected by the acutest observers of nature; and excite an interest for them—where they do excite any interest—more by an eloquent and refined analysis of their own capricious feelings, than by any obvious or intelligible ground of sympathy in their situation.' The injustice of Wordsworth's early reviewers is not in their ridicule of his maundering stanzas about an idiot boy, but in their failure to comprehend that here was a developing philosophy of the poetic art, which was arriving, in spite of certain eccentricities of mere theory, at a mature and entirely reasonable judgment about both the function of the poet and the diction of poetry. They failed to see that the difference between Wordsworth and Crabbe is in something deeper than their subject-matter and their mannerisms, and that all contrast between the two poets, not taking this deeper element into account, is superficial. Crabbe said, the truth is the truth, and very interesting for that reason; Wordsworth said, the truth has always elements of beauty which it is the special province of the poet to color with his imagination, and it is interesting for that reason. Thus, though they often treated the same kind of subject, Wordsworth and Crabbe were intent on producing different sensational effects. Crabbe has no lyric quality, no note of mysticism. Crabbe does not shadow forth the 'feeling of some vast and indefinable presence beyond the finite forms described.'[1] As compared with Wordsworth especially, he does not supply a philosophy of beauty to lift us above the matter of fact. He does not see far into the new land which he discovered.

Crabbe's poetry is the logical product of an age of reason. Yet it is also the prophetic basis of something new. It has much of that intellectual technique which alone makes possible accurate expression of feeling. Between Crabbe the realist and Wordsworth the romanticist, there thus lies, perhaps, both the final distinction and the transition between the old and the new sentiment for nature, the old and the new poetry.

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[1] See 'Shelburne Essays,' II. 'George Crabbe.' P. E. More.

II

The Wordsworthian Note in Eighteenth Century Verse

If this account of Wordsworth's change from theoretical realism to actual romanticism has been of any service in showing his poetic temper, we may, before discussing his romanticism specifically, find it advantageous to see from what kind of sources in the past age he drew ideas and inspiration, and from that point of view note the development of his thought. For Wordsworth, like every original man of power who sets currents of thought into new channels, must have relations with the upper stream which are not wholly reactionary. If it is in his relation and divergence that we see most apparently what is new in a man's temper, if it is there he is most sharply defined for us, it is also there that we shall discover the element that links him with the past. If this sounds contradictory, it may be noted that it is but another way of stating the theory of the survival of the fittest, the only part of evolutionary principle which can be safely applied to the study of literature. Wordsworth is a reactionary. He also, like every great poet, may be said to represent, to give shape to, those ideas of the former age in his field of discourse, that were fit to survive. We should be able to define, by its typical difference from the old, what is the distinctive quality in his new note, and then perceive how faintly or clearly this Wordsworthian note may be heard here and there in pre-Wordsworthian verse.

Characteristic eighteenth century description of nature is external, casual, and purposeless as compared with the motive of Wordsworthian poetry.

> O Reader! had you in your mind
> Such stores as silent thought can bring,
> O gentle Reader! you would find
> A tale in everything.

The eighteenth century found only an obvious moral tag where Wordsworth, who believed that nothing is obvious in heaven or earth, endeavored to discover an inner thought in things. The eighteenth century stuck to objective, common-sense views. It looked at flowers and birds and shady groves, and admired them.

objectively, for their own sake, or at most for the amorous thrills they conventionally produced. And the eighteenth century, seeing mainly obvious, outward aspects, was never so perverse as to dream that

> One impulse from a vernal wood
> May teach you more of man,
> Of moral evil and of good
> Than all the sages can.

For the eighteenth century studied man at first hand, whatever it did with nature, and never forsook the sages. But Wordsworth's reaction from the preceding age lay exactly in this, that while neglecting the normal view of nature for what at first seemed, and frequently was, a strangely whimsical naturalism, he found new images for man's relation to man, and great poetic symbols of his regeneration.

As distinguished from the moralizer of the last century, 'a reasoning, self-sufficing thing, an intellectual All-in-all,' the Wordsworthian poet is retired 'as noon-tide dew,' and murmurs near the running brooks 'a sweeter music than their own.'

> The outward shows of sky and earth,
> Of hill and valley, he has viewed—

like the realist of the past age, but

> Impulses of deeper birth
> Have come to him in solitude.

New purposes, new ways of seeing, in the transitory show, the enduring. Nature is to yield—even the 'unassuming commonplace of nature' is to yield 'a wisdom fitted to the needs of hearts at leisure.' Standing by the River Wye, he has not only 'the sense of present pleasure,' but 'pleasing thoughts that in this moment there is life and food for future years.' This simple, and, at first sight whimsical, philosophy Wordsworth is always bent on involving in texture of his descriptive verse.

It was not, with him, an entirely orignal matter. Though it has in general little relation with the eighteenth century, common-sense view of nature, it is not an entirely new view, even in the eighteenth century, nor is it expressed in an entirely new spirit. Though it is Wordsworth's peculiar refinement of the eighteenth century doctrines of the Return to Nature, containing a deeper morality than they represent, much of it may still have been had from certain poets of the previous age.

The Wordsworthian note, as a term applied to certain pre-Wordsworthian verse, should denote qualities that Wordsworth might have caught from his forerunners. It is possible to list many passages. One may point to Bowles's sonnets, Cowper's 'Task,' or Akenside's 'Pleasures of the Imagination,' for general resemblances in style; and there are a score of other sources. If a poet says,

> As on this flowering turf I lie,
> My soul conversing with the sky;

or,

> Whatever charms the ear or eye,
> All beauty and all harmony,
> If sweet sensations they produce,
> I know they have their moral use;

you exclaim about these lines of William Hamilton's and John Langhorne's—'Wordsworth's philosophy!' There is 'A Fragment' of Gray's that declares,

> The meanest floweret of the vale,
> The simplest note that swells the gale,
> The common sun, the air, the skies,
> To him are opening Paradise.

'Almost Wordsworthian,' you say. And what of this?—

> Nor voice nor sound broke on the deep serene—
> But the soft murmur of the gushing rills,
> Forth issuing from the mountain's distant steep
> (Unheard till now, and now scarce heard) proclaimed
> All things at rest, and imaged the still voice
> Of Quiet whispering to the ear of Night.

This is from 'A Fragment of a Rhapsody,' written by a Dr. John Brown at the lakes of Westmoreland about 1750. 'How very Wordsworthian!' In fact Wordsworth himself has noticed much the same phenomenon, in less Wordsworthian fashion, in his 'Evening Walk.'

> The song of mountain streams, unheard by day,
> Now hardly heard, beguile my homeward way.

John Logan has a song 'To the Cuckoo,' not unlike Wordsworth's poem of that title, and Charlotte Smith's sonnet 'To Night,' which Wordsworth much admired, is as a whole a conception that might have originated in his mind, though here and there expressed with a different skill.

I love thee, mournful, sober-suited Night!
When the faint moon, yet glimmering in her wane
And veiled in clouds, with pale uncertain light,
Hangs o'er the waters of the restless main.
In deep depression sunk, the enfeebled mind
Will to the deaf cold elements complain,
And tell the embosomed grief, however vain,
To sullen surges and the viewless wind.
Though no response on thy dark breast I find,
I still enjoy thee—cheerless as thou art;
For in thy quiet gloom the exhausted heart
Is calm, though wretched; hopeless, yet resigned.
While to the winds and waves its sorrows given,
May reach—though lost on earth—the ear of Heaven!

We know that much of the descriptive poetry of the eighteenth century struck a note congenial to Wordsworth—poetry of which he *approved,* which was something like his own, or which was certainly much more like his than that of any other poet of the new school. This is instanced by his gift-book to Lady Mary Lowther. In 1819 he presented to this neighbor of his a collection of verses copied in his own hand from some twenty-four different poets. I did not examine this book, accessible in reprint through the courtesy of its owner, Mr. Rogers Rees, till I had remarked many passages among minor eighteenth century poets as having the Wordsworthian note. The selections in the gift-book were chiefly from the same authors; and the editor of the little volume points out that while the collection is 'one more refutation of the stupid remark that Wordsworth cared for no one's poetry but his own,' it also might be taken at a time when Byron was still near the zenith of his fame, as a desire to convince a young lady of taste 'that the principles of true poetry were not the Byronian principles, but rather the Wordsworthian, as exemplified in the practice of poets far older than Wordsworth.' It is true that the actual selections do not often strike the Wordsworthian note, as I have tried to define it; but they indicate interestingly his taste. One third of them are from Lady Winchelsea, whose descriptions, then uncollected, have considerably more atmosphere, more sense of place, as in the 'Nocturnal Reverie,' than can be found elsewhere in the day of Pope and Thomson, outside their verse. In the preface to Miss Reynolds's collection of Lady Winchelsea's poems, are quoted letters from Wordsworth to Alexander Dyce, which show how much Wordsworth had been impressed. As a matter of fact, her poems are only as dull as Wordsworth's own dullest. Represented in the gift-book are, among others, Waller, Wither, Marvell, Thomson, Akenside, Armstrong, Cowper, Dyer, Mickle, Beattie, all in the vein Wordsworth thought it profitable to uncover. Armstrong and Mickle are represented by descriptions of romantic forest scenery suggesting mystery and seclusion; Armstrong by that 'sublime apostrophe to the great rivers of the earth,' as Wordsworth called it, and Mickle by a passage from a poem thoroughly un-Wordsworthian in character, 'Sir Martyn'—originally entitled 'The Concubine.' The lines Wordsworth quotes describe very romantically a woodland grotto. 'The Ruins of Rome,' another thoroughly un-Wordsworthian poem is chosen from Dyer. But Wordsworth thought it 'a beautiful instance of the modifying and investive power of the imagination,' thus attaching it to his theory. Apparently he had a strong regard for Dyer and in a sonnet addressed to him he says:

> A grateful few shall love thy modest lay
> Long as the shepherd's bleating flock shall stray
> O'er naked Snowdon's wide aerial waste;
> Long as the thrush shall pipe on Grongar Hill.

It is possible, of course, to quote *very Wordsworthian* lines from 'The Fleece,' but I will save the reader this, reminding him only that Wordsworth was often *very* Wordsworthian when he was not at his best.

The Wordsworthian note in Thomson is not so apparent as a certain Thomsonian elegance in Wordsworth's own earliest poems and as is the occasional similarity of the 'Lyrical Ballads' to the purer style of 'The Seasons.' Miss Reynolds, in her study of 'Nature between Pope and Wordsworth,' remarks that Thomson knew little of the appeal of nature to the soul, but that 'he attributes to nature, in at least a partially Wordsworthian sense, the power of soothing, elevating, and instructing.' She cites the following passages in illustration:

> When heaven and earth as if contending vie
> To raise his being, and serene his soul;

> At the soft evening hour, he lonely loves
> To seek the distant hills and there converse
> With nature, there to harmonize his heart.

Wordsworth selects only from Thomson's rhymed verse, passages of great smoothness but decidedly of the Augustan age. It is possible, however, to take from 'The Seasons' certain short passages that somewhat resemble Wordsworth's earlier manner:

A faint erroneous ray,
Glanced from the imperfect surfaces of things,
Flung half an image on the straining eye,
While wavering woods, and villages, and streams,
And rocks and mountain tops, that long retain
The ascending gleam, are all one swimming scene,
Uncertain if beheld. The sky is overcast
With a continuous cloud of texture close,
Heavy and wan, all whitened by the Moon,
Which through that veil is indistinctly seen,
A dull, contracted circle, yielding light
So feebly spread, that not a shadow falls,
Chequering the ground—from rock, plant, tree, or tower.
At length a pleasant, instantaneous gleam
Startles the pensive traveler while he treads
His lonesome path, with unobserving eye
Bent earthwards; he looks up—the clouds are split
Asunder—and above his head he sees
The clear Moon, and the glory of the heavens.

This, for example, is a combination, for the reader's discernment, of seven lines from Thomson's 'Summer,' prefixed to thirteen lines from that poem in the 'Lyrical Ballads,' called 'A Night Piece.' It is a clever ear that can detect any change of tone. Of course Thomson much more resembles Cowper than Wordsworth. Certain descriptions in 'Winter' of a robin pecking at the window, of a dog waking up at a wasp-bite, of a frozen river, are much like pictures in 'The Task.' But I shall show in a moment that it is more difficult to distinguish Wordsworth's style from Cowper's than from Thomson's.

From Beattie's 'Retirement' is quoted in the gift-book a stanza that is in exact accord with many a passage in 'The Excursion;' and again, Wordsworth chose to illustrate the spirit of Solitude from Dr. Akenside's 'Pleasures of the Imagination,' where the poet's perception of Divinity in nature is something like that in the well-known passage called 'Influence of Natural Objects.' Here is the passage from the gift-book:

Oh ye Northumbrian shades, which overlook
The rocky pavement and the mossy falls
Of solitary Wensbeck's limpid stream;
How gladly I recall your well-known seats
Beloved of old, and that delightful time
When, all alone, for many a summer's day,
I wandered through your calm recesses, led
In silence by some powerful hand, unseen.
Nor will I e'er forget you; nor shall e'er
The graver tasks of manhood, or the advice

Of vulgar wisdom, move me to disclaim
Those studies which possessed me in the dawn
Of life, and fixed the color of my mind
For every future year.

While Dr. Akenside lets this recollection of early sympathy with an insight into the meanings of nature remain an entirely moral pleasure, Wordsworth combines the idea with a more vividly sensuous picture of his own emotion:

Wisdom and Spirit of the universe!
Thou Soul that art the Eternity of thought!
That giv'st to forms and images a breath
And everlasting motion! not in vain
By day or star-light, thus from my first dawn
Of childhood didst thou intertwine for me
The passions that build up our human soul;
Not with the mean and vulgar works of Man;
But with high objects, with enduring things,
With life and nature; purifying thus
The elements of feeling and of thought,
And sanctifying by such discipline,
Both pain and fear—until we recognize
A grandeur in the beatings of the heart.
Nor was this fellowship vouchsafed to me
With stinted kindness. In November days,
When vapours rolling down the valley made
A lonely scene more lonesome; among woods
At noon; and 'mid the calm of summer nights,
When, by the margin of the trembling lake,
Beneath the gloomy hills homeward I went
In solitude, such intercourse was mine:
Mine was it in the fields both day and night,
And by the waters, all the summer long.

This is the complete expression of Wordsworth's sense that nature is a divine teacher. But I do not think he was so much influenced in these ideas by Akenside as by certain 17th century poets like Henry Vaughan, whose poem, 'The Retreat,' in 'Thalia Rediviva,' 1678, may have suggested the ode on 'Intimations of Immortality.' Also, the recently published poetry and 'Meditations' of Traherne, though Wordsworth never read them, are, it is interesting to note here, of a more Wordsworthian spirit than anything in the eighteenth century. The spirit of Akenside's poetry is, as a whole, far from Wordsworth.

It is Cowper of whom one naturally thinks in connection with Wordsworth as a descriptive poet. And he is, I believe, the poet of the eighteenth century to whom Wordsworth is most largely indebted not, perhaps, in great matters, but in that 'wisdom fitted to the needs of hearts at leisure,' of which he speaks so frequently in 'The Prelude.'

Though the recluse of Olney spent most of his life thinking about religion, this came from worry over his soul, not from emotional meditation about the beauty of nature. Walter Bagehot applies to him Wordsworth's description of Peter Bell—

> A primrose by the river's brim,
> A yellow primrose was to him,
> And it was nothing more.

and says that to Cowper nature is simply a background, a space in which the work and mirth of life pass and are performed. Though this is not quite all the story, it serves to sharpen the difference between his view of nature and that of Wordsworth for whom the whole aspect of nature was the special revelation of an immanent and abiding power, also of a pervading art.[1] Cowper delineated the outer aspects of landscape and there left it. Wordsworth is not satisfied unless he describes the reflected, highly wrought feelings which objects excite in a self-conscious mind. To such a mind Cowper's verse may have well been a source of rest and refreshment, and certainly Wordsworth knew ideas of Cowper's so thoroughly that they became a part of his own poetic creed. Not only this, he knew lines by Cowper so well that they influenced his style. In fact the resemblance between the best style of each poet is so close in certain descriptive passages that I doubt if the reader will, in spite of considerable study, recognize, in the following concoction from 'The Task' and 'Lines Written above Tintern,' real changes of style, though the authorship of the passage changes hands several times:

> The day is come when I again repose
> Here, under this dark sycamore, and view
> These plots of cottage-ground, these orchard-tufts,
> Which at this season, with their unripe fruits,
> Are clad in one green hue, and lose themselves
> 'Mid groves and copses. Once again I see
> These hedge-rows, hardly hedge-rows, little lines
> Of sportive wood run wild: these pastoral farms,
> Green to the very door; and wreaths of smoke
> Sent up, in silence, from among the trees
> That screen the herdsman's solitary hut.
> While far beyond and overthwart the stream
> That, as with molten glass, inlays the vale,

[1] 'Literary Studies.' 3 vols. London, 1895. Vol. I. 'William Cowper.'

The sloping land recedes into the clouds.
Displaying, on its varied side, the grace
Of hedge-row beauties numberless, square tower,
Tall spire, from which the sound of cheerful bells
Just undulates upon the listening ear,
Groves, heaths, and smoking villages, remote.
                    Scenes that soothed
Or charmed me young, no longer young, I find
Still soothing, and of power to charm me still.
And witness, dear companion of my walks,
Whose arm this twentieth summer I perceive
Fast locked in mine, with pleasure such as love,
Confirmed by long experience of thy worth
And well tried virtues, could alone inspire—
Witness a joy that thou hast doubled long;
For thou art with me here upon the banks
Of this fair river; thou my dearest Friend,
My dear, dear Friend; and in thy voice I catch
The language of my former heart, and read
My former pleasures in the shooting lights
Of thy wild eyes—Oh yet a little while
May I behold in thee what I was once.

There are many poets besides Cowper who strike now and then a Wordsworthian note, but in Cowper there is undoubtedly a large fund of poetical matter which Wordsworth assimilated and transformed by his own experience to his own purposes.

We have now pointed out some of the changes in Wordsworth's mind relative to poetical diction and subject matter, and the relation of his poetry to certain verse of a somewhat similar tone in the previous age. The next step in our analysis will be to note turns which he represents, both more clearly and more subtly than the other romantic poets, in the tendencies of the whole period.

III

Wordsworthian Romanticism

From the foregoing description of the Wordsworthian note in eighteenth century verse, it may appear that typical Wordsworthian sentiment for nature is too thoroughly moralized to be romantic sentiment. Too thoroughly, or, perhaps better, too soon. Wordsworth's spiritual frugality, as Mr. Hutton called it, would not allow his imagination to run long at will before withdrawing it to the moral aspect of the case. He meditates, says Mr. Hutton, but he does not allow himself to dream. 'He hoarded his joys, and lived upon the interest which they paid in the form of hope and expectation.' This does not describe the temper of a romanticist. For while we commonly associate a delight in remote and wild scenery, such as Wordsworth had in abundance, with the romantic temper, we commonly think of it as delight purely for its own sake—a purposeless or spendthrift delight, not the pleasure of a man who hoarded his joys. *Romantic purposelessness,* we feel, is a logical phrase; *romantic moral purpose* seems like a contradiction in terms.

But there is only a seeming contradiction here. The Romantic Movement was a moral purpose; and the moral purpose in Wordsworth's poetry is the poetry itself, as is always true of any great art. Not to have a moral purpose in this sense, at once debars poetry from being great art, because it debars it from meaning anything whatever that is inherent in the meaning of art. Thus if the current phrase, romantic purposelessness, means anything at all, it means not art for art's sake, but it means that the purpose of a certain form of romantic poetry is to have no purpose and *thereby* fulfil an aim of art. The absurdity of this is not wholly dissimilar to the absurdity of any statement that defines Wordsworth as no romanticist because of his moral purpose.

Another method of certain critics of setting Wordsworth outside the current of romantic tendency is to define romanticism so specifically that it does not apply to any of the great figures of the Romantic Movement. I do not quarrel with definitions of romanticism, as such; but I do quarrel with the application to the tendencies of the Romantic Movement of a definition of romanticism that does not fit them. For example, if we have been asked to accept, as a definition of romanticism, the revival of the mediaeval spirit of wonder and awe about nature, and then are told that, when applied to the *Romantic Movement*, the definition does not permit us to see widely where this spirit of wonder may lead, there is reason to quarrel with this manner of application. Such a definition would, in itself, obviously give one little to say of Wordsworthian romanticism, and Professor Beers, to take a case in point, keeping strictly within the limits of such a definition, can dismiss Wordsworth in a phrase or two. In fact, it is part the irony of definitions that the limits of his book on English Romanticism do not allow him to come into intimate relations with any of the great poets of the romantic period except Keats and two lesser great ones, Scott and Coleridge. It is possible that Professor Beers would say in reply that so far as poets of that period were essentially romantic they were not great. And I am well aware that there is little honor to be had among the critics nowadays through belonging to the romantic school. Has not a certain group of ardent Wordsworthians, with Matthew Arnold as chief, delighted to show by one academic means or another that Wordsworth was not of the monotonously adolescent, the youthfully stale, tribe?

I, however, shall make no attempt to rescue Wordsworth—and I claim to be an ardent Wordsworthian as well as a romantic—from the stream of tendency in his age. His own attempts to rescue himself often landed him rather too high and dry. In spite of any mere definition of the romantic spirit, such as Professor Beers takes, or any merely academic similarities such as I have been detecting between Wordsworth and his unromantic predecessors, Wordsworth himself is a romanticist.

Does not poetic energy, in Coleridge, Shelley, Byron, for example, spring from an emotional egotism that seeks its *milieu* of sympathy and expression in surrounding nature, especially in its wilder or less obvious aspects, discovering there symbols for a readjustment in the relationship of man with nature and of man with society? Is not this a tendency evidenced in the larger proportion of their serious work, 'The Ancient Mariner,' 'Promethus Unbound,' and 'Manfred,' being but prominent instances? If this is a true analysis, then Wordsworth is the poet *par excellence* of this tendency; and it is, I believe, the chief tendency in the Romantic Movement.

But if anyone must quarrel with this statement, let me say the same thing finally in another way: Will not Wordsworth's relation to romanticism show the relation of the new movement, (whatever you choose to call it—naturalism, if you like), to romanticism? And, similarly, does not our analysis of this new movement show its relation to romanticism? Does it not, moreover, disclose the round of thought through which the romantic mind typically moves?—emotional egotism begetting the necessity for self-expression, discovering in turn its sympathetic subject-matter, its milieu in the wilder or hidden aspects of nature—mountain grandeur, or a hill farm, as the case may be—and once more discovering there its justification, or at least the symbols for readjustment of the society from which it is partially alienated. I believe that this represents fairly well the typical round of romantic thought in the age of which we are speaking. If applied there to the various forms of poetical romanticism, one may see in the light of its analysis the interrelations of what is most typical in each, in Rousseau, Goethe, Wordsworth, Byron, for example, to say nothing of a dozen others who are interpreters of nature in this period of great poetry.

This round of thought, which I hold to be *comparatively analytical* of the Romantic Movement, is illustrated both in Wordsworth's incidental poems and in his more conscious description of his own mind in 'The Prelude.' Most of his poetry was written in accordance with some theory of his *function* as a poet, or was evolved out of some theory of the function of poetry. Which is probably a reason why Wordsworth himself did not often distinguish between the good and the bad, all his verse seeming to him but the lights and shades of a vast composite picture. But in 'The Prelude' more than in the incidental poems, one feels that he contemplates nature through the veil of theory, and that while this is in itself stimulating and interpretative, it does not afford so simple a view of the workings of his mind as can be had elsewhere. Hence we shall make our approach to 'The Prelude' and to the view which it gives of his romantic mind, through less self-conscious evidences.

The round of thought, as I have called it, corresponds in most cases, and especially in Wordsworth's, to the actual growth of the poet's mind. It represents the attempt of the peculiarly sensitive and emotional mind to adjust itself, through a series of experiments or reactions, to the conditions which the world imposes. The attempt rarely succeeds; and I hear some one reminding me that it could not be a romantic attempt and succeed, since the romantic attitude precludes any final adjustment with society. This is true, but it does not mean that the romanticist is a social failure. While he rarely develops his consciousness for social relations in a way to make the longings of his soul concordant with conventional possibilities, his failure to achieve that sort of success is due to his being bent on enlarging his consciousness for *ideal* social relations beyond all possibility of concordance with actual social conditions. He is too far in advance of his age to be anything for it but a prophet without honor. He is not a popular leader. In him there always remains the element of difference, of strangeness, and it is this he rejoices in. It is this that distinguishes him from the crowd, that feeds his egotism. All this is typical of the romantic attitude, and not inconsistent with the attempt to modify the conventional and the stale by comparisons with the individual and the unobvious. It cannot have 'success,' for success is a word coined by the blind present.

Now, as applied to the view of nature, the fundamental characteristic of Wordsworthian romanticism is its attempt to make by readjustment a balance between the conventional and the individual in art. Is not this what Pater's definition of the romantic element in art, as strangeness added to beauty, has in mind? And is not Wordsworth's aesthetic doctrine of adding strangeness to beauty, in such a way as to make them more consonant, part of the same principle? For that is his aesthetic doctrine. It is the purport of his prefaces, of many of his utterances in verse, and of casual discussions of the function of poetry in his letters. He explains it in one way when he says it was his intention to throw over incidents of common life 'a certain coloring of imagination whereby ordinary things should be presented to the mind in an unusual aspect.' He illustrates it in such a poem as 'Lucy Gray' and in the note we have already remarked which he prefixed to it. In a letter to Christopher North, in 1800, he quotes the following lines,

> And even the boding owl
> That hails the rising moon has charms for me,

in order to show that what was once regarded as merely strange and grotesque, and not to be naturally admired in poetry—such a thing as the owl's cry—will in time be naturally admired; in other words that it will lose the ideas of mere strangeness once attached to it. And, Wordsworth then says, 'a great poet ought to . . . rectify men's feelings, to give them new compositions of feeling, to render their feelings more sane and permanent, in short, more consonant to nature, that is, to external nature and the great moving spirit of things. He ought to travel before men occasionally as well as at their side.'

The revived Gothic taste, interested in grotesque exteriors, did not attempt to render objects more consonant to nature; it only accentuated their strangeness. Wordsworth's art was a deeper and a simpler art. It is made to stand, in Walter Bagehot's well known essay on 'The Pure, the Ornate, and the Grotesque,' as the example of the pure; and it is true that though it looks frequently, as all romantic art does, to the strange and the remote, it was with a clear vision and in a spirit which, far from accentuating these things by strange colors, sought rather to harmonize them with fundamental tones of nature. It is true that Wordsworth could not long at a time maintain the perfect balance of qualities that purifies art, and that though, in contrast to Tennyson and Browning, he may be best characterized by the word pure, he might appear in contrast with certain Greek poets or with Goethe as uneven and whimsical, yet I do not feel that his whimsicality is an immature whimsicality or that his lack of balance is youthful. These things are too largely results of his theories of art, not of the vagaries of mere romantic youth. When Matthew Arnold said that the element of immaturity in the romantic poetry of the first quarter of the nineteenth century might seriously undermine its claim to permanence in our literature, I think he had in mind the expression of that over-enthusiasm of youth, which is so captivating in its freshness, but so capricious and unsatisfying, even so stale, in time. It was a sort of immaturity that found an adequate vehicle for its emotions in the lure of the bizarre and the remote. Wordsworth's poetry tends to purity and permanence, in so far as he did not emphasize such things for their own sake but tried to render them consonant with the rest of nature. It tends to whimsicality and lack of balance, in so far as the illustrations he chose were those of a theorist pressing his theory to extremes.[1]

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[1] I have in mind here the contrast made by such poems as 'Lucy Gray,' 'A Slumber Did My Spirit Seal,' 'The Solitary Reaper,' with such poems as 'Strange Fits of Passion Have I Known,' 'To My Sister,' 'Goody Blake and Harry Gill.' A comparison of the finest of Wordsworth's lyrics with those of Goethe that might appropriately be set beside them is another way of defining the Wordsworthian romanticism. The lyrics of both poets are equally *Gelegenheits-gedichte*, having, as Goethe put it in regard to his poems, their root and base in reality. 'Of poems conjured out of the air I make no account,' he says; and also this: 'The young poet must do himself some sort of violence to get out of the mere general idea.' Both men write from this point of view, but with what different result. Wordsworth's peculiar personal experience remains his own—and a trifle peculiar still; Goethe's takes on more of the universality, less of the idiosyncracy of art. Take two poems with the same final idea, 'The Daffodils' and 'Heidenröslein;' the first will tell from now till eternity Wordsworth's peculiar experience, the second is a universal symbol, struck out with far simpler and far greater skill. One may not generalize, however, from such illustrations. It would be hard to say, for example, in regard to the question of man's relation to nature as symbolized in 'The Prelude' and in the second part of 'Faust,' which poet is more idiosyncratic in his answer.

As was the case with nearly all the romantic poets, Wordsworth's over-sensitive, over-passionate youth remained vivid in recollection to the end of his life. As we shall see more definitely in our study of 'The Prelude,' his lasting interest in his early sensations was one of his chief characteristics. The continuity of his sensational states he felt to be his inspiration and the secret warrant of his poetic genius. Nevertheless, another chief characteristic may be said, paradoxically, to be the restraint he imposed on this undercurrent of sensation; and it is this restraint that gives him his power, that preserves his insight, and (once more) that enables him to render his feelings consonant to nature.

Without this self-imposed restraint, which Mr. Hutton calls his *spiritual frugality,* he would have indulged his youthful romantic fancies to their full extent. All through 'The Prelude' there runs a strain of half-regret over his maturer view of life and its displacement of the haunting vividness of boyish impressions. As it was, he by no means lost his enthusiasm for the strange, for mere strangeness' sake. The boy who loved melancholy November days, when vapors rolling down the valleys made a lonely scene more lonesome, who liked to contemplate a 'lonely yew tree far from all human dwelling,' and rejoiced secretly in 'the sublime attractions of the grave,' is not greatly modified in the young man who crosses the Simplon in 1790, or by any means forgotten in the old man who explores Iona and the Cave of Staffa in 1833. All through his life desolate places, the romantic spell of isolation, attracted him strongly. The Kirkstone pass, which thrilled him with its windswept, barren aspect; the top of Scawfell, or of Blackcomb—'dread name derived from clouds and storms;' Wallace's Tower; Kilchurn Castle—a ruin embodying 'the memorial majesty of time;' Glen Almain where Ossian 'lies buried in this lonely place;' in fact every nook and corner of the wild districts he roamed about have for him their peculiar glamor. While it is a glamor to which some of the romantic poets of his day abandoned themselves too completely, we cannot help wishing that Wordsworth might have expressed it with more fervor and with more poetry, as Byron did; and that he might not have exercised so often that restraint which made him prone to lose the romantic spirit in a dull and vague morality.

Wordsworth's own experience in life no doubt led him to distrust the enthusiasm of youth and to assume a moral attitude about its most innocent manifestations. In the 'Ode to Lycoris,' speaking of the medley and prodigal excess of sensation in youth, he concludes

That, as we downward tend,
Lycoris! life requires an *art*
To which our souls must bend.

He was quite unwilling, except in a few rare moments, to describe his early experiences joyously for their own sake, letting them go unrelated to his endless self-analysis. No doubt this is a fault, and yet one that compensates itself. For from the same source springs the poet's essential genius. The doctrine is this: As the romantic mind enlarges, and the round of experience tends to complete itself, the hour of thoughtless youth with all its aching joys and dizzy raptures, when the sounding cataract haunted him like a passion, is seen in relation to the other stages of life. The romantic appearance of things, sensational objects once enjoyed solely for their own sake, the mountain, the deep and gloomy wood, their colors and their forms, needing no remoter charm by thought supplied, or any interest unborrowed from the eye, must now be harmonized with other meanings till the poet may feel a new and more powerful enthusiasm—

a sense submlime
Of something far more deeply interfused,
Whose dwelling is the light of setting suns,
And the round ocean and the living air,
And the blue sky, and in the mind of man;
A motion and a spirit, that impels
All thinking things, all objects of all thought,
And rolls through all things.

It is in this view of things that he sees Nature's symbols for the relation of man with man. It is this view of things that all objects of all thought take their place as part of nature, not in the scientific but in the humanitarian and poetical sense. Poor Susan, the Highland girl, the old Cumberland beggar, Michael, Margaret, these are the objects of his reverence because he has had a vision of things that invests them with the beauty of Nature's brotherhood. He sees them, therefore, not so much as indivduals, as part of the great scene which stretches, before and after, beyond the limits of our ken.

Wordsworth here surpasses the sense of mystery and wonder which led him to this view of nature; and the romantic mind, which seeks eternally the eternal mystery, may, in its widening consciousness, surpass any definitions with which we have once hedged it about. English romanticism was not bent on retaining grotesque traces of its origin. Like all soundly progressive art, it moves toward a balance of its qualities. The romantic art of Byron attains this balance when he writes of the sea, the Coliseum, the Lake of Geneva. There, emotions are rendered consonant with Time itself. Keats, on the other hand, attains the balance of his romantic qualities most perfectly in a far land of enchanted poesy, where he looks not on Nature and Time but from

> Magic casements opening on the foam
> Of perilous seas in fairy-lands forlorn.

Shelley attains the quality I have in mind through a sort of rarification of all its elements. He renders our feelings consonant to nature only by etherializing them to suit a world self-created on the clouds of his imagination. Of them all, Wordsworth's is the form of romantic art where the element of emotional wonder best meets the beauty and strangeness of reality, finding there not a fanciful explanation of itself, but a harmony with the world of real facts and feelings.

IV

The Round of Thought in 'The Prelude'

Our final examination of Wordsworth's mind should regard chiefly 'The Prelude; or, Growth of a Poet's Mind; an Autobiographical Poem.' This poem refers specifically to the first twenty-eight years of the author's life and was written between 1799 and 1805, though not printed till just after his death in 1850.

Its purpose is to record the growth of the poetic consciousness; to show how emotional egotism becomes a form of poetic energy that seeks its *milieu,* its means of expansion and expression, in surrounding nature; to show how objects become for the poet images of thought and symbols of the great relationship of nature with man and of man with his fellow beings. Because all this is embodied in a round of peculiarly individual experience, it becomes generally true to man and to nature, and takes on many widening significances that touch vitally the poetic thought of the day. For whether this round of individual romantic experience is reflected momentarily and spontaneously as in a song of Burns, or whether it is elaborated intellectually and fantastically as in a drama by Goethe or Byron, it presents, as we have already suggested, the same common traits—emotional egotism, intense sympathy with nature, triumphant discovery there of the symbols for social readjustment. These things seem to be part of nearly all contemporary genius.

I make this statement not as a thesis to be defended, but merely in the hope of clarifying rapidly again what is meant by the phrase in my heading, *the round of thought.* Though I hold that this round, as I have described it, is typical, not only of Wordsworthian thought, but of most romantic thought as well, I do not wish here to contribute further to the discussion of what is romanticism; I wish only to base my analysis of 'The Prelude' on principles that may be seen to have widening significances. It seems the more necessary to point this out, when it is considered that the poem has its source in the peculiarly personal and private feelings of a thorough individualist, and that, in finding the origin of his round of thought in his intense egotism, I am individualizing the ideas of the poem rather than relating them to contemporary ideas. Obviously it is not Wordsworth's egotism *per se*, but what it leads to, which makes up the resemblance between his ideas and those of the other romanticists. Since the poem takes its color from the egotism of the author, it is that I shall first attempt to describe.

'The Prelude' is, as I have indicated, not a philosophy or a narrative of thought for its own sake; it sounds the depths of a strong and passionate mind, and does this in the language of passion. No other document in the world is more intimate, more personal, more conscious of self. The 'Confessions' of Rousseau is a record not more faithful to human feelings. Like that great book, the poem shows the author's sense of his superior difference from others, his pride in his difficult originality, his fear, at the same time, of not being understood, his hope for a democracy of understanding made possible by the unifying influences of nature of which he studies to be the faithful interpreter. Hence we may be sure that the narrative is also intended to be the means of explaining his other poetry. These things make up the blended strain of egotism that, so to speak, motivates the whole; and it is from this that 'The Prelude' has its chief characteristics, whether faults or virtues.

It has been noticed, for example, that much of it is tedious and unpoetical, due to Wordsworth's inability to perceive that not all his faithfully recorded observations are discoveries of his own, and that he could not attempt to lead a life of continuous poetical thought, without as continually growing numb to the difference between mere meditation and poetic vision. Mr. Arthur Symons and many others, with a decided opinion as to what is and what is not poetry, have therefore concluded that most of 'The Prelude' should have been done in prose. As it stands, it is a journal in verse, and unquestionably too much of the verse is prose. Yet to Mr. Symons it might be answered that if Wordsworth were really unable to tell poetry from prose, it is fortunate that he wrote in the form he did since he might never have been quite sure when to make the formal change, as he approached those passages of sublime and passionate thought, or those fine single lines, in the midst of his narrative. Whichever way you take it, as much of the fault as remains is to be attributed to his egotism. For though Wordsworth's egotism is, of course, a form of poetic energy, it is not of that sort which forces in a poet a recognition of the fact that what he writes instinctively may be also mechanical in character, and that the soul may have its prose as well as its poetry.[1]

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[1] See the Chapter on Wordsworth in 'The Romantic Movement in English Poetry,' by Arthur Symons, N. Y., 1909.

But if his egotism rendered him frequently unsusceptible to the lights and shades of his art, one must surely add that the poem is the one surpassingly vivid analysis of the function of poetry. By this I do not at all mean that Wordsworth is a poorer poet and a better critic. I intend to express part of the paradox of his poetic nature, the paradox of his now blinding, now illuminating egotism. In his weaknesses he has his strength, in his faults their compensation. An emotional egotism, occasionally blinding him to the differences between prose and poetry, making him feel that whatever he writes is *per se* poetry, makes him also supremely faithful in the analysis of his emotions. It leads him always finally into the sanctuary of his mind and in such a way that we there understand with him what are the great functions of his art.

This is not mere criticism. It is a new kind of creative poetry. It cannot be described facilly in the way Mr. Symons has described it as 'a talking about life, not a creation of life—a criticism of the imagination, not imagination at work on its own indefinable ends.' Such a statement only serves to raise the question whether poetical imagination is ever at work on indefinable ends, so far as the poet himself is concerned. Wordsworth is always a philosopher even when most a poet, just as he is most romantic, as I have tried to show previously, when most intent on a definite purpose. The question, however, is a proper question and demands an adequate answer. It seems to me a question Wordsworth himself must have raised or been conscious of; and I believe that the adequate answer to it, as I hope to make evident, is 'The Prelude' as a whole, his creative poetical philosophy. For 'The Prelude' is two things: it is not only talking about life, a criticism of the imagination, an attempt to create the taste whereby the poet's teaching is to be relished; it is also a creation of life in just so far as it makes the emotions of the poet poetically vivid to our imagination. That is really all that any poet has ever done for us, and in 'The Prelude' Wordsworth has done it supremely. The accomplishment of this twofold purpose is the result of his blended egotism, which, as a form of high poetic energy, is both critical and creative in character.

'Never forget,' he wrote to Lady Beaumont, shortly after finishing 'The Prelude,' 'what, I believe, was observed to you by Coleridge, that every great and original writer, in proportion as he is great or original, must himself create the taste by which he is to be relished; he must teach the art by which he is to be seen.' This is typical of Wordsworthian doctrine, and 'The Prelude' is full of teaching, but not of teaching for teaching's sake.

'The Prelude' describes the way in which the poet finds in certain aspects of nature the symbols for his emotional expression. It shows how he learns gradually what these symbols may signify in recollection and meditation, and how it is the poet's duty to be faithful to these meanings which have been widening his consciousness and thereby indicating his function in the world. It is the poet's attempt to recreate the mood, the atmosphere, in which he lives, and in which he must be studied. From this point of view it is both creative and critical. It defines once more for us the round of thought through which the romantic mind moves, the round of wonder, of search, of realization that only becomes wonder anew and further search. And if it defines this chiefly for the poet, one can still see how, in other terms and by means of other symbols, it could be done for the scientist and for the philosopher, who are also wonderers, searchers, and romanticists. It is a poem with many widening significances, and just because it is thus lifelike, like the enlarging consciousness of egotistical and individual man, it is both a creation of life and a great criticism of life—which are essentials, not of poetry alone, but of all great art.

The leading ideas in 'The Prelude,' the aspirations and duties which unite to govern Wordsworth's mental growth, may be presented in terms of that round of romantic experience which we have previously noticed. Wordsworth describes himself as a child different from all others, extra-sensitve to the voices of the air and the sights of the hills, dwelling apart in a land of exhilirated fancy, full of inexpressible imaginings, always at play in his own mind which he perceives to be a fine and rare place, a secret retreat. Many children have this experence, but it usually discontinues before ministering greatly to the egotism and self-consciousness of adolescence. Wordsworth had very early a sense of thought enlarging in many unusual directions; but the step which separates him from his companions is his recognition, when still not much more than a boy, that his rarer mind is the result of natural influences, and that he owes, as a foster-child, from now on, an intense spiritual loyalty to nature. To explain what this means, what spirit and nature mean in this sense, is the poet's initial motive. For a time, his college education seemingly interrupts his communion with his native hills. But on his return from Cambridge, his next discovery is that he has new powers of comprehension. His fancy is tempered, it possesses a new energy—things strike his mind as ideas, and simultaneously ideas find in things their symbols. It is the blending of poetic fancy and philosophic imagination. It is personally, for the poet, the recognition of his calling. The poet's peculiar form of energy which I call, from inability to invent a better phrase, his emotional egotism, has discovered the milieu for its expression.

A new and intense sympathy, bred partly of the loneliness of his soul among men, becomes with him a vision, perhaps more immediate than any poet has ever had, of the meaning of natural beauty for man. Having once caught a glimpse of this, nothing more in heaven or earth appears obvious to him. Hidden secrets, to which he alone has the key, lie all about him. This is the second phase of his egotism. The milieu of its expression is therefore everything in nature, especially what has not been much noticed before or thought to be poetical. That which completes his experience is the discovery here of a further meaning. Nature, which is consonant in all its parts and with man, having for him stores of companionship, thus becomes the uniter of man with man, the great symbol of the consonance of all human purposes. This is the social thesis. Hence the long description of the poet's sojourn in revolutionary France, the conversations, the arguments, the final recognition that the humanitarian ideas of the Revolution—equality, fraternity, liberty—must remain mere theoretical ideas unless taught by nature to the heart, unless seen to be vitally a part of nature. It was undoubtedly this sojourn in France that, as Professor Harper has said in his essay on 'Rousseau, Godwin, and Wordsworth,' 'enabled him to gather into the solidity of a system those faint impulses of love for humanity which were stirring in him already. . . . Had those months of his life been spent at Cambridge or in London or in the Lake Country, he could never have written the "Prelude;" there would have been no "Excursion," no fragment of a "Recluse," and from all his best poetry we should miss the deepest note. Not only so, but the underlying principle, which is profoundly philosophical, which is political, which is democratic, would be lacking."'[1]

So at the end, he returns to those simpler influences of his native hills, now understanding how nature is both to be reconciled with reason and how she is the source of emotion. The poet who understands this, who dedicates his life to understanding it, 'may become a power like one of Nature's.'

[1] 'Proceedings of the American Academy of Arts and Letters.' No. V : 1912.

This will serve to indicate the course and expansion of Wordsworth's thought, and to have perceived this here will bring us more intelligently into the mood of the poem. Obviously it is impossible that thought separated from the images over which the poet has spread it should be poetic thought. Indeed, a chief difference between prose and poetry is that whereas prose thought, the thought of criticism, let us say, may be abstracted without essential change of meaning, poetic thought requires the images and the atmosphere of sensation which have created it. Critical thought is thus more purely intellectual; poetical thought has more reality in so far as it has sensational texture. Wordsworth, as a critic, might well have written his biography in prose. As a poet, he required an atmosphere of sensation in which—not 'to feel,' as some one has put it, but—to think. It is this atmosphere which makes Wordsworth's Essay on Man, in 'The Prelude,' poetry.

To distinguish the mood of 'The Prelude' from that of certain other contemporary romantic poems which are also lyric biographies, one might say that Wordsworthian thought neither moves through the ether of a luminous void, nor, adapting the phrase of another critic, through so heavy an air as to overwhelm it with its own sensibility. Wordsworth surrounds himself, to adopt his own famous phrase, with an atmosphere where emotion is recollected in tranquillty. 'The emotion,' he adds, 'is contemplated till, by a species of reaction, the tranquillity gradually disappears, and an emotion kindred to that which was before the subject of contemplation is gradually produced, and does itself actually exist in the mind.' It is in this manner than he defines the essence of poetry, and it is in this manner that he contemplates his own life. Thought, once passionate, here discloses itself in vivid and permanent images, which are tempered, not distorted, by the sharp recollection of feeling.

This is the mood of 'The Prelude' as a record of the poetical temper, a record of the poet's 'trances of thought and mountings of the mind,' whereby he shakes off the burden of his own 'unnatural self.' It tells how, inspired by nature, he could see the 'auxiliar light' coming from his mind, 'which on the setting sun bestowed new splendor;' how he could feel his expanding soul, as it mirrored itself in external things—'forms, images'—his vital soul, 'where the immortal spirit grows like harmony in music,' and gives 'to forms and images a breath and everlasting motion.' It is a description of how poetic power feels to the poet.

With high seriousness Wordsworth felt his genius to be a gift of nature, carrying with it a debt to art. Because of his unusual sensitiveness to natural beauty, cultivated by correspondingly unusual opportunities to observe it in his native district, poetry was to him a duty growing out of his genius; and his genius was the foster-child of the hills. Hence there is a fine poetic egotism in his worship of nature. It meant to him self-realization; it was the source of his character. Every artist, who says in the cant phrase that he is devoted to his art, has in reality some special object of devotion there, which, if it were exactly known, would be the index of his artistic character. Wordsworth's chief object of devotion was the very highest which artistic egotism can conceive—the influences that appeared to him to have formed and purified his mind. Nature, which thus spoke 'perpetual logic' to his soul, and by an unrelenting agency did bind his feelings 'even as in a chain,' was in a supremely vivid way the *milieu* of his consciousness.

> I had a world about me—'twas my own;
> I made it, for it only lived to me,
> And to the God who sees into my heart.

At the point in the third book where these lines occur, Wordsworth says he has retraced his life up to an eminence, and told a tale which may not falsely be called the glory of his youth. This glory is the constantly discovered power to image in nature his innermost emotions. It is precisely what he refers to at the beginning of the first book when he says that liberty to roam at will through the country-side would avail nothing, 'but for a gift that consecrates the joy.' In other words, this glory is the fact that he is a poet. Hence he at once exclaims here, on this eminence—

> Of genius, power,
> Creation and divinity itself
> I have been speaking, for my theme has been
> What passed within me. . . .
> O Heavens! how awful is the might of souls,
> And what they do within themselves while yet
> The yoke of earth is new to them.

So intensely, so consciously has he lived under Nature's influences, and so vivid is the recollected pleasure of his emotional experiences, that this inner mind, this correspondent creative force is only 'a gift that consecrates the joy.'

Vivid emotional memory—the ability to live and think at the top, so to speak, of one's total experience, conscious of it all, faithful to it all—is the chief trait of creative genius. I have heard it said by a man who asked George Meredith how does genius *feel?*

that he answered: 'It feels as if all my knowledge of my characters and all my own experience of life were simultaneously prepared for me to draw from; I select, and what I select is at my fingers' end to write.' The first books of 'The Prelude' are, in a way, an analysis of this power to continue vividly the consciousness of past sensational states. They contain the explanation of what Wordsworth means when he says poetry is emotion recollected in tranquillity till the tranquillity disappears. They are his definition of genius.

With the poet the secret of it all lies in associative power, in making past sensational states permanent by imaging them in external nature. He carefully explains that the 'airy phantasies that had been floating loose about for years' are to be endued with outward life. For poetry without images is an 'unsubstantial structure,' melting 'before the very sun that brightens it, mist into air dissolving.' The dissipation of poetic energy by the pleasure of mere feeling, by the failure to endue feeling with structure and form, is the disease of youth. Wordsworth confesses that he suffered from this sort of vacuity, that he was for long

> Baffled and plagued by a mind that every hour
> Turns recreant to her task; takes heart again,
> Then feels immediately some hollow thought
> Hang like an interdict upon her hopes.

A hollow thought is, of course, a thought unimaged. In such a mood he feels 'like a false steward who hath much received and renders nothing back.' 'Was it for this,' he cries in self-reproach, 'that one, the fairest of all rivers, loved to blend his murmurs with my nurse's song?'

A thousand inspiring memories of his childhood crowd upon him, of that time when all things struck the eye over-vividly, when 'the sky seemed not a sky of earth,' when the wind had a real and haunting voice, when there were mysteries for the imagination in every sound and object. So vivid then were things that they seemed to be a part of him, indistinguishable; so vivid is the recollection of them still, in spite of the wide vacancy between him and them, and 'such self-presence' have they in his mind, that, musing on them, he seems 'two consciousnesses, conscious of myself and of some other Being.' In one of the finest passages in poetry—that beginning,

> Wisdom and Spirit of the Universe!
> Thou Soul that art the eternity of thought—

he gives thanks to Nature for the impressions of his boyhood that created in him the poet's power of filling objects with spirit and idea. It is to the 'visions of the hills and Souls of lonely places,' which haunted him among his boyish games, that he owes his emotional memory, this faculty that keeps the poetic impulse fresh within him.

This education was constant. Nature spoke 'rememberable things,' and 'daily the range of visible things grew dear' to him. Gradulaay, beyond those 'incidental charms' which first attached his heart to the country-side, he began to see the unity and meaning of nature—'that universal power and fitness in the latent qualities and essences of things.' This came to him 'strengthened with a superadded soul,' with his inheritance, that is, from the other world—his share of divinity. Wordsworth's extremely poetic idea that this early imaginativeness may be taken as a sign that poetry is a prenatal inheritance, and normal in each of us till other things suppress it, is embodied in his great Ode and here somewhat explained. In him, he says, 'this infant sensibility, great birthright of our being,' was augmented and sustained. With the true poet, the haunting imagination of childhood continues into maturity and lets the soul remember how she felt when yet a part of immortality. In conversation about the Ode, he once said: 'I record my own feelings at that time—my absolute spirituality, my "all-soulness," if I may so speak;' and in a note on the Ode he has written: 'I was often unable to think of external things as having external existence, and I communed with all that I saw as something not apart from, but inherent in, my own immaterial nature. Many times while going to school have I grasped at a wall or a tree to recall myself from this abyss of idealism to the reality.' It is from this period that the poet inherits his imaginative faculty. 'Let this be not forgotten,' says Wordsworth at this point in 'The Prelude,' that I still retained my first creative sensibility. * * * A plastic power abode with me. * * * An auxiliar light came from my mind, which on the setting sun bestowed new splendor * * * and the midnight storm grew darker in the presence of my eye.'

> From Nature and her overflowing soul
> I had received so much, that all my thoughts
> Were steeped in feeling; I was only then
> Contented, when with bliss ineffable
> I felt the sentiment of Being spread
> O'er all that moves and all that seemeth still;

O'er all that, lost beyond the reach of thought
And human knowledge, to the human eye
Invisible, yet liveth to the heart.

This marks the first great development in his poetic thought about nature. In this consciousness of his relation to nature and to the eternity of thought, he gives shape to a type of pantheism. His mind, growing from out the past and merging with the future, appears to him a time-link, a thought of eternity taking shape in the present. He looks now in all things for the universal, the moral.

Even the loose stones that cover the highway,
I gave a moral life; I saw them feel,
Or linked them to some feeling; the great mass
Lay bedded in a quickening soul, and all
That I beheld respired with inward meaning.

And it is here that he exclaims—'I had a world about me—'twas my own. I made it, for it lived only to me, and to the God who sees into my heart.' This is the function of the poet, to relate the transitory to the everlasting, to infuse objects with that part of the eternity of thought which has its course through him. Whatever experience Wordsworth deals with is illuminated by this view of the function of art which nature has taught him. It is the mirror of his philosophy of life. Hence he describes it so carefully before describing the active experiences of his life in Cambridge, London, the Alps, France, and those of his return to seclusion in England.

At Cambridge, in the midst of the butterfly crowd of undergraduates, in the medley and smattering of knowledge, he discovered that he had already in his mind independent solaces 'to mitigate the injurious sway of place or circumstance.' Turning his mind 'in upon herself,' not in morbid introspection, but to perceive the light that was not darkened there, he spread his thoughts with 'a wider creeping,' till he felt

Incumbencies more awful, visitings
Of the Upholder of the tranquil soul,
That tolerates the indignities of Time,
And from the centre of Eternity
All finite motions overruling, lives
In glory immutable.

Serenity, spaces of solitude, an atmosphere for communication with spiritualities, were his need. So he endeavored to maintain his own mood amid the inconsequentialities of the place, studying in everything to see the moral and the universal, learning among the manners of the crowd to judge of men and moral laws.

But while he seemed to feel at college something of the quiet and repose of books and the stability of learning—finding, for example, in the abstractions of geometry a refuge from his poet's mind so continually 'beset with images and haunted by herself'—he yet never came to regard books and learning, as Lord Byron regarded antiquity symbolized in the Coliseum, as a 'long-explored but still exhaustless mine of Contemplation.' Art, except as it expressed his own feelings for nature, except therefore, as it was his own creation, never long retained the lure of romance for him. Books—philosophy, fiction, poetry, did not sufficiently stimulate the emotions he required. The study of literature at Cambridge was 'the dangerous craft of culling term and phrase;' and though he says, 'I was a better judge of thoughts than words,' philosophy was 'words for things'—

> The self-created sustenance of a mind
> Debarred from Nature's living images,
> Compelled to be a life unto herself.

Here in books was not the atmosphere of sensation. His whole experience at Cambridge is written against the background of Cumberland.

That experience, however, matured him socially. His view of nature was now bound to include man and society, as his sub-title for 'The Recluse' indicates—'Views of Man, Nature, and Society'—and, on returning in the summer vacation to Hawkshead, he discovers that he cares for his hills with more 'human-heartedness.' In one sense, all this means is that, viewing the beauty of the world and feeling at the same time the friendliness of men, he became abstractly enthusiastic over human nature. Whether this is a more or less poetical feeling than, let us say, the love of a particular youth for a particular maiden, depends entirely on how it is imaged, on what symbols it creates. It is certainly a characteristic defect of Wordsworth's humanity that it lacks the intimate touch of Burns, and often attains, in an effort to portray men in an unusual aspect, only to a fanciful and whimsical symbolism.

But there is another aspect to this, as I have previously suggested, which is part of his pantheism. Something of mystery surrounds his characters, of the same mystery that haunts the rocks and the clouds about them. Even when the poet's peculiar coloring of imagination individualizes them, it also relates them at the same moment to the landscape from which they spring. They are, so to speak, re-absorbed; or else they wander across the speaking face of nature not wholly distinguishable from it. Certainly, it is a delightful and whimsical piece of imagination that makes Wordsworth trace his human-heartedness (in the eighth book, called 'Retrospect—Love of Nature Leading to Love of Man') to his early enthusiasm for the character and life of shepherds.

> 'And shepherds were the men that pleased me first.'

He proceeds to tell how, as a rambling school-boy, he met a shepherd in the fog, looking twice his real size, 'his sheep like Greenland bears;' and how, 'as he stepped beyond the boundary line of some hill-shadow, his form hath flashed upon me glorified by the deep radiance of the setting sun.' This is perhaps the height of romanticism. And thus, Wordsworth concludes, was man

> Ennobled outwardly before my sight,
> And thus my heart was early introduced
> To an unconscious love and reverence
> Of human nature; hence the human form
> To me became an index of delight,
> Of grace and honor, power and worthiness.

The merest roadside traveler or passer-by rarely lives in his poems in a poetical way without some touch of fancy which makes him slightly unsubstantial, as the characters in a dream are unsubstantial. And here is a secret of his art. His thought, in absorbing objects, in rendering them part of itself, so acted that, in his own words,

> Bodily eyes
> Were utterly forgotten, and what I saw
> Appeared like something in myself, a dream,
> A prospect in the mind.

This eighth book is Wordsworth's own analysis of his round of experience and thought. From the time when the animal activities of boyhood and all their trivial, though vivid, pleasures began to droop, and nature 'prized for her own sake' became his joy—in this period until he was twenty-two—man was subordinate to nature. 'A passion, she, a rapture often, and immediate love ever at hand; he, only a delight occasional, an accidental grace, his hour being not yet come.' Nevertheless, it is his passion for nature which, through nature's endowing man with sublimity, leads him to a larger humanitarianism. So that ultimately—that is at twenty-two, we suppose—when for him man stood in the midst of the galaxy of the universe, 'outwardly, inwardly contemplated, as, of all visible natures, crown, though born of dust,' he appears to be the abstraction and ideal of nature.

Hence it becomes easier to understand why Wordsworth's experiences in revolutionary France, described in the ninth, tenth, and eleventh books, brought to him both disillusionment in regard to this glorified type, natural man, and also further conviction of the majestic and beneficent influence of nature over the individual devoted to contemplation of her true meanings. Without the disillusionment—without his intimate knowledge of the Revolution, that is—he could not have had the final motive for writing 'The Prelude.' Without his previous store of experience, on the other hand, he could not have perceived, in the way he did, the relation of the promise of revolutionary ideals to their failure, the relation of visionary speculation to the crop of facts. He saw clearly, for example, that man, guided by certain abstract principles to certain specific actions, committing crimes in the name of Liberty and Nature, does not prove nature's teaching specious. What he does prove is the necessity of longer and more careful contemplation of nature. So, when Wordsworth's indulgent belief in the inherent goodness of mankind finally turns to bitterness and confusion, when again his resources in reason and in abstractions turn to intellectual despair, it is only his boyhood in the Lake Country and his sisters' affection and character that seem to him the stable part of his existence. He seeks their influence once more and is slowly restored. 'In Nature still glorying, I found a counterpoise in her (his sister) which, when the spirit of evil reached its height, maintained for me a secret happiness.'

It is into this secret happiness that he now retires, not necessarily through disappointment in the world, but from a desire to contemplate the world in tranquillity. He also perceives that for him, as a poet, wide experiences and the sight of many things can be only a background, not the immediate inspiration of his genius. Continued search for novelty lays the inner faculties asleep; and he makes a conscious effort to shake off the habits of thought that he perceives arise from an inhibitive multiplicity of impression. His final poetic regeneration he describes by saying:

> I shook the habit off
> Entirely and forever, and again
> In Nature's presence stood, as now I stand,
> A sensitive being, and a *creative* soul. . . .
> From Nature doth emotion come, and moods

Of calmness equally are Nature's gift:
This is her glory; these two attributes
Are sister horns that constitute her strength.
Hence Genius, born to thrive by interchange
Of peace and excitation, finds in her
His best and purest friend; from her receives
That energy by which he seeks the truth,
From her that happy stillness of the mind
Which fits him to receive it when unsought.

The meaning of the title of these two books, the twelfth and thirteenth, is now clear—'Imagination and Taste, How Impaired and Restored.'

Objects—all that one sees with the eye—are significant for the poet only when associated with emotion. They are the images of the soul. And so it is that Whitman, who could not have seen as deeply as he did without Wordsworth, says, 'We know the soul only by you, you faithful solids and fluids!' Wordsworth's final explanation of the development of his poetic consciousness is nothing more than that. He tells how emotional memory is augmented and sustained by means of objects—that is, of images. He recalls here, for example, how certain scenery vividly associated in his mind with the time of his father's death, not only haunted his memory then, but how even now, over twenty years later, when similar external conditions are reproduced,

when storm and rain
Beat on my roof, or, haply, at noon-day,
While in a grove I walk, whose lofty trees,
Laden with summer's thickest foliage, rock
In a strong wind, some working of the spirit,
Some inward agitations thence are brought,
Whate'er their office, whether to beguile
Thoughts over-busy in the course they took,
Or animate an hour of vacant ease.

There is this function of the poet—to let nature become an *image* of the inward mind. There is something more which this may lead to: the perception of the Infinite Mind in all objects of all thought. At the end of the poem, he describes how, standing on a ridge of Snowdon at night, he perceived, in a scene of transcendent beauty—moonlight over a sea of mountain tops swathed in mist. Nature as 'the emblem of a mind that feeds upon infinity,'

a mind sustained
By recognition of transcendant power,

recognitions in created images, that is,

> In sense conducting to ideal form,
> In soul of more than mortal privilege.

Thus this Infinite Mind is, in a very real way, the ideal type of the poetic mind which strives through ideal forms to transcend mortal privilege.

> One function, above all, of such a mind
> Had Nature shadowed there, by putting forth,
> 'Mid circumstances awful and sublime,
> That mutual domination which she loves
> To exert upon the face of outward things,
> So moulded, joined, abstracted, so endowed
> With interchangeable supremacy,
> That men, least sensitive, see, hear, perceive,
> And cannot choose but feel. The power, which all
> Acknowledge when thus moved, which Nature thus
> To bodily sense exhibits, is the express
> Resemblance of that glorious faculty
> That higher minds bear with them as their own.
> This is the very spirit in which they deal
> With the whole compass of the universe:
> They from their native selves can send abroad
> Kindred mutations; for themselves create
> A like existence; and, whene'er it dawns
> Created for them, catch it, or are caught
> By its inevitable mastery,
> Like angels stopped upon the wing by sound
> Of harmony from Heaven's remotest spheres.

This is the greatest function of the poet, to make this objectively clear, so that it can be seen, heard, felt. It is what nature herself is doing for those who can perceive it directly with their senses; and the poet, who can lead mankind to a closer sensation of it, may therefore 'become a power like one of Nature's.'

Wordsworth's pantheism is thus seen to be part of his own character as a poet, likewise an explanation of the beauty of the world, and finally and always a theory of art. So that in the end the question he asks of nature is the eternal question of the artist, the question that saves antiquity for us and makes the past indispensable: What images has nature to make clear the meanings of the soul, not alone the soul of man, but the Infinite Soul of which that is a part? 'The Prelude' is Wordsworth's answer to this question. In many respects it is the answer that Goethe makes in 'Faust,' that Spinoza makes in his 'Ethics,' that every great philosopher and poet has somewhat understood and contributed to. But Wordsworth's original contribution to the answer was not so much a vision of divine purpose in external nature and in the moving unity of things, as it was his power to relate men's immediate surroundings—ordinary things—to their spiritual life. It is this part of the answer that has transformed poetry since his day.