

OCTOBER, 1930

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THE UNIVERSITY OF NORTH CAROLINA RECORD



RESEARCH IN PROGRESS
JULY, 1929-JULY, 1930

GRADUATE SCHOOL SERIES No. 22

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FOREWORD

RESEARCH IN PROGRESS contains a record of the research work conducted by the faculty and graduate students of the University of North Carolina for the year ending July 1, 1930. The present issue marks the tenth volume of this bulletin.

In view of the increasing size of the Graduate School and the consequent addition in bulk of abstracts which have to be printed, a change of policy has been deemed necessary. This change asserts itself in two ways. In the first place, student abstracts have been drastically cut, so that in some cases only bare statements of the topic and the results of the research work are given. In the second place, a fairly rigid division of types of faculty research has been laid down, and as a result certain significant work of a more popular and less scholarly nature has been listed in a separate section (Part II, pp. 98-101) of the bulletin.

The arrangement of the first part is by departments, and abstracts of important books, scholarly papers, and monographs are found under the department in which the work was done. Abstracts of doctoral dissertations and masters' theses also appear under the department concerned. The second part is arranged alphabetically by authors, and no attempt has been made to print abstracts.

The interest manifested in previous issues of this volume makes it a distinct pleasure to publish this record of the year's activities.

W. W. PIERSON, JR., *Dean.*

157695

RESEARCH IN PROGRESS

APPROPRIATIONS GRANTED FROM THE SMITH RESEARCH FUND

PROJECT NUMBER	APPLICANT	SUBJECT	AMOUNT
129	Abbot, W. R.-----	For copying title pages and verification of editions of translations of Du Bartas in the British Museum and the Huntington Library-----	\$14.00
130	MacNider, W. deB.-----	Traveling expenses to Washington and Philadelphia to consult the Surgeon General's Library and the Medical Library-----	60.00
131	Harrer, G. A.-----	Photostat prints-----	5.00
132	George, W. G.-----	To aid in defraying expense of reproducing colored plates for article to be published in <i>The Journal of Morphology and Physiology</i> -----	100.00
133	Matthews, A. C.-----	Mailing charges on research materials-----	25.00
134	Holmes, U. T.-----	Photostating of pages of Du Bartas-----	90.00
135	Howell, E. V.-----	Photostats of material dealing with the life of Harisse--	11.00
136	Leavitt, S. E.-----	Copying pages in connection with <i>The Star of Seville</i> ---	50.00
137	Hickerson, T. F.-----	Assistance in completing a tabular analysis of rigid frames-----	50.00
138	Taylor, G. C.-----	Purchase of manuscript in connection with a definitive edition of Du Bartas-----	100.00
139	Wilson, T. J., III-----	Purchase of a photostat of a book by Beauchamps-----	60.00
140	Lyons, J. C.-----	Purchase of a photostat of a book by Pierre Boaistuau--	36.00
141	Briggs, David H.-----	Traveling expenses in connection with material for doctoral dissertation-----	20.00
142	Saville, Thorndike-----	For assistance in a study on the characteristics of sands used in walter filtration-----	30.00
143	Drake, W. E.-----	Traveling expenses in connection with doctoral dissertation-----	25.00
144	Painter, J. W.-----	Traveling expenses in connection with doctoral dissertation-----	35.00
145	Dashiell, J. F.-----	Help in defraying expense of publishing a monograph entitled "Direction Orientation in Maze Running by White Rats."-----	145.00
146	Holmes, U. T.-----	Traveling expenses to Europe for work on Du Bartas--	200.00
147	Knight, E. W.-----	Copying parts of early nineteenth-century reports on education in Europe-----	54.51

APPROPRIATIONS GRANTED FROM THE SMITH RESEARCH FUND

PROJECT NUMBER	APPLICANT	SUBJECT	AMOUNT
148	Carmichael, Kate J.	Purchase of photostat of Medbourne's <i>Tartuff</i>	15.00
149	Holland, W. T.	Purchase of supplies needed for research on master's thesis	25.00
150	Metzenthin, E. C.	Photostating copies of manuscript pages of the <i>Heliand</i> ..	50.00

APPROPRIATIONS GRANTED FROM THE ROCKEFELLER FUND FOR
 RESEARCH IN PURE SCIENCE, 1929-1930

APPLICANT	SUBJECT	AMOUNT
Stuhlman, Otto, Jr.-----	Part payment on the following apparatus: 1. A Hilger large model quartz spectrograph..... 2. A sphero-cylindrical condenser of quartz.....	\$2,184.83
Prouty, W. F.-----	Aid to cover part of field expenses, and for chemical analyses and preparation of thin rock slides..... Aid for transportation in field work studies on the Triassic rocks of the Durham Basin, and for laboratory assistant in testing samples collected.....	275.00
MacNider, W. deB.-----	For collecting, preparation, and shipping of kidneys of lower animals from Australia and Africa, as the duck-bill Platypus, certain lizards, a tree fish, and three species of lung fishes.....	250.00
Wheeler, A. S.-----	Purchase of following rare chemicals for use in research work: nitrocymene, dihydroxynaphthalene, aminocymene, benzoyl acetone, hydrazine hydrate.....	173.00
MacCarthy, Gerald-----	Materials and apparatus needed to carry on mechanical and mineralogical analyses of beach sands of the Atlantic and Gulf coasts of the United States.....	40.00
Swartz, J. H.-----	For travel expenses to Kentucky for the study and determination by electrical methods of geological structures and stratigraphy, in cooperation with Dr. F. W. Lee, of the U. S. Bureau of Mines.....	175.00
Dashiell, J. F.-----	For purchase of white rats to continue his animal research..... For construction of a "Hampton Court" maze.....	72.50
Wheeler, A. S.-----	For purchase of a Burgess-Parr catalytic hydrogenation apparatus.....	70.00
Coker, W. C.-----	To help defray expenses of publication by the University Press of a thesis by Miss Velma Dare Matthews on the genera <i>Pythium</i> and <i>Nematosporangium</i>	400.00
Browne, Edward T.-----	For the purchase of the collected papers of Leopold Kronecker.....	75.00
Cobb, Collier-----	Travel expenses for the continuation of his work on loessal soils of the Mississippi Valley.....	150.00
Couch, J. N.-----	Travel expenses to England and the continent of Europe in continuation of his study of type material of <i>Septobasidium</i>	250.00
George, W. C.-----	For traveling expenses, incurred in the continuation of his studies on chordate blood, to Woods Hole, Mass., and Beaufort, N. C.....	150.00
Plyler, E. K.-----	For the purchase of materials, such as organic liquids and some crystals for cell windows of rock salt, fluorite, and sylvite, needed in the continuation of his studies of the organic absorption bands.....	200.00
Brooks, F. P.-----	For meeting unusual expenses in the publication of an illustrated paper on "Effect of Fatigue on Protein Consumption".....	31.67

APPROPRIATIONS GRANTED FROM THE ROCKEFELLER FUND FOR
 RESEARCH IN PURE SCIENCE, 1929-1930

APPLICANT	SUBJECT	AMOUNT
Hickerson, T. F.-----	For purchase of a Beggs deformer for measuring internal stresses and strains, for work on continuous beam and frame analysis-----	\$ 400.00
Valentine, J. M.-----	For purchase of albino rats, Murphy head lamp, and Zeigler's eye speculum-----	26.00
MacCarthy, Gerald-----	For traveling expenses involved in the collection of beach sands to use in a study of the origin of beach sands of the Atlantic coast region-----	52.00
Valentine, J. M.-----	For the construction of a special cage to be used in experiments on rats, designed to test the effect of unusual exercise on the bone and muscle structure of the legs of bipedal rats-----	25.00

PART I

RESEARCH IN PROGRESS

DEPARTMENT OF ANATOMY

W. C. GEORGE reports the following papers:

The Histology of the Blood of Some Bermuda Ascidians. *Jour. Morph. and Physiol.*, XLII. June, 1930. For abstract see *Research in Progress*, 1928-1929.

Further Observations on Ascidian Blood. *Journal of the Elisha Mitchell Scientific Society*, XLV: 239-245. 1930. For abstract see *Research in Progress*, 1928-1929, p. 6.

The Unit of Life. For abstract see p. 89.

A Simple Technique for the Preparation of Articulated Skeletons of Small Vertebrates. Presented before the North Carolina Academy of Science, May, 1930.

The dead bodies of the animals to be used are placed in an aquarium containing small young tadpoles. The tadpoles will suck away the flesh in the course of a few days. The skeleton, and frequently more or less of a bag of skin, will remain. The skeleton is then fished out of the aquarium (the skin is removed if any is present), stained, dehydrated, and mounted in balsam under a cover glass. The skeletons should be kept under casual observation while they are in the aquarium so that the process may be stopped before the ligaments have been sucked away. Preparations made in this manner have been found useful for the study of comparative osteology and, in the case of young animals, for demonstrating ossification centers.

DEPARTMENT OF BOTANY

W. C. COKER has published during the year the following:

Notes on Fungi. *Journal of the Elisha Mitchell Scientific Society*, XLV: 164, pls. 10-23 and frontispiece. 1929.

This includes notes on seventeen species of Basidiomycetes. Two new species, *Hygrophorus gomphidioides* and *Pluteolus intermedius*, and one new variety, *Tricholoma niveipes* var. *australis*, are described. *Hygrophorus sciophanus* and *Prunulus syringeus* are reported for the first time from this country, and *H. Ravenelii* and *Lentinus Micheneri* are recorded for the first time in many years.

PROFESSOR COKER gave the following talks before the North Carolina Academy of Science:

The Rediscovery of *Lycogalopsis* in Honduras.

Reports the discovery of a rare and interesting fungus, *Lycogalopsis Solmsii* in Honduras. It has been known heretofore only from Java.

The Bald Cypress.

Reported a visit to what seems to be the largest standing tree east of the Mississippi, *Taxodium distichum*, in Seminole County, Florida (13.5 ft. in diameter 18 inches from the ground). A comparison with other large trees of this and other species was made. In Lenoir County, N. C., was the next largest cypress of which we have record, about 11 feet in diameter 4 feet from the ground. Largest individuals of other species were mentioned.

JOHN N. COUCH has the following investigations under way:

The Biology and Taxonomy of *Septobasidium*.

The Development of the Spermatozoids and Eggs in Several Species of *Vaucheria*.

NANCY BLAIR ELIASON. Development of the Seed in the Morning Glory (*Ipomaea purpurea*) and in Dodder (*Cuscuta arvensis*). (Under the direction of W. C. COKER.) Presented before the North Carolina Academy of Science.

The ovule of *Ipomaea purpurea* is mainly composed of a single massive integument. The nucellus is minute and disappears long before fertilization, the embryo sac developing in the integument. The pollen tube is remarkably large and obvious, swelling into a conspicuous tip in the embryo sac. Double fertilization occurs.

Cuscuta differs from all other members of the morning glory family not only in the parasitic habit and poorly differentiated embryo but also in a comparatively large nucellus and thin integument. The embryo sac develops entirely within the nucellus as in most other plants. Fertilization occurs, but the pollen tube was not seen and must be inconspicuous.

VELMA DARE MATTHEWS: Studies on the Genera *Nematosporangium* and *Pythium*. (Under the direction of W. C. COKER.) Presented before the North Carolina Academy of Science.

A taxonomic study of the genera *Nematosporangium* and *Pythium*. Descriptions are given of all the species of these genera which have so far been described, and a report is made of the species which have been isolated by the writer. Keys are given to the genera of the family Pythiaceae and to the species of the genera *Nematosporangium* and *Pythium*. Ten species of *Nematosporangium*, of which three are new, and seven species of *Pythium*, of which

one is new, have been studied and illustrated with twenty-three plates. Several species are reported from the United States for the first time.

REBECCA WARD. Seed Development in *Hibiscus esculentus*. (Under the direction of W. C. COKER.) Presented before the North Carolina Academy of Science.

The development of the embryo sac and the embryo of okra is followed out and compared with that of cotton. The development is found to be essentially typical, except that the micropylar openings of the two integuments do not fit, thus forming a "winding" micropyle in the ovules of both plants. A distinct layer of peculiar cells on the inner surface of the inner integument of okra marks a conspicuous distinction between the nucellus and inner integument. The structure of the seed coat of okra is similar to that already described for cotton, but no stomata in the seed coat were found as recorded by Barritt for cotton (*Annals of Botany*, XLIII: 484. 1929).

DEPARTMENT OF CHEMISTRY

J. M. BELL directed the following research:

S. M. MARTIN, JR. (Master's Thesis.) The Effect of Benzoic and Acetic Acid on the Freezing Point of Benzene. (August, 1929).

There is considerable experimental evidence to show that such substances as benzoic acid and acetic acid when dissolved in benzene are associated into double molecules, but the literature on the subject is very meagre as to the degree of this association. It was the object of the investigation to determine the degree of this association over a range of concentrations. The data from molecular weight determinations by the freezing point method show the acids to be associated, the degree of association depending on the concentration. In solutions of concentrations greater than 0.25 normal the acids appear to be 100 per cent associated.

ALVIN S. WHEELER and J. G. PARK. (Master's Thesis by J. G. PARK.) Paracymene Studies XII. Paracymyl-4 semicarbazide-2 and Certain Derivatives. *Journal of the American Chemical Society*, LI: 3079. Oct., 1929.

Abstract given in *Research in Progress*, 1928-1929, p. 19.

ALVIN S. WHEELER and CHARLES L. THOMAS. (Master's Thesis by C. L. THOMAS.) Paracymene Studies XIII. Paracymylhydrazine and Certain Derivatives. *Journal of the American Chemical Society*, LI: 3135. Oct., 1929.

Abstract in *Research in Progress*, 1928-1929, p. 19.

ALVIN S. WHEELER. Parabromophenyl-4-semicarbazide. *Journal of the American Chemical Society*, LI: 3653. Dec., 1929.

Parabromophenyl urea was condensed with hydrazine hydrate. The reaction was very sluggish, as it was necessary to boil the mixture for fifty hours. The product consisted of small needles, decomposing at 254° to a claret-colored liquid. It was used as a reagent for ketones. The following derivatives, called semicarbazones, were obtained: of *acetone*, prisms, m. 174°; of *methyl ethylketone*, rectangular plates, m. 175°; of *chloroacetone*, needles, m. 182° with decomposition; of *alpha, gamma-dichloroacetone*, needles, m. 196° with decomposition; of *acetophenone*, bulky needles, m. 218°; of *benzophenone*, bulky needles, m. 205°. (This study was begun with PAUL R. BRYAN, continued with W. N. PRITCHARD, T. M. ANDREWS, and J. R. BENDER, and completed with J. G. PARK.)

DAVID R. ERGLE. (Doctoral Dissertation.) The Bromination of 1,5-Dihydroxynaphthalene. (Under the direction of ALVIN S. WHEELER.) Accepted for publication by *Journal of the American Chemical Society*.

A preliminary report was made in *Research in Progress*, 1928-1929. The investigation is now nearly completed. The work on the dibromo and tribromo derivatives has been extended and a tetrabromo derivative was discovered when the diacetate was brominated with six moles of bromine. A full abstract is reserved for the 1931 issue of this journal.

W. J. MATTOX. (Progress on Doctoral Dissertation.) The Chlorination of 1,5-Dihydroxynaphthalene. (Under the direction of ALVIN S. WHEELER.)

This dihydric naphthol gives a *diacetate* which, on chlorination in carbon tetrachloride solution, gives a *dichloro-monohydroxy-monoacetate* (A); on hydrolysis this gives the *dihydroxy derivative* (B). Compound B gives a *dibenzoate* (C). Compound A gives a *dichloro-monobenzoxy-monoacetate* (D), which hydrolyses to a *monohydroxy derivative* (E). Compound A also gives a *diacetate* (F). On oxidation with chromic acid, A gives a *monochloro-monacetoxyl-1,4-naphthoquinone* (G). Dilute acid hydrolyses G, giving *chlorohydroxy-naphthoquinone* (H). This can be reduced with stannous chloride. By reduction with zinc dust, G goes into an *acetyl derivative of a chlorodihydroxynaphthalene* (I). Compound I gives a *diacetate* (K) and a *dibenzoate* (J). The orientation of these compounds is a difficult problem.

THOMAS L. KING. (Progress on Master's Thesis.) Paracymylhydrazine-2 and Derivatives. (Under the direction of ALVIN S. WHEELER.)

A more accurate method for the preparation of this hydrazine was worked out. It was shown that only an impure product turns red in the dark and yellow in the light. New salts were prepared by combining the hydrazine with acetic acid, oxalic acid, lactic and benzoic acid. Only two aldehydes of those examined gave solid derivatives: benzaldehyde (unstable) and m-nitrobenzaldehyde (stable). Other aldehydes containing negative groups are being examined.

C. R. McLELLAN. (Progress on Master's Thesis.) 6-Nitro-p-cymylhydrazine-2. (Under the direction of ALVIN S. WHEELER.)

The introduction of a negative group into cymylhydrazine ought to increase the stability of the hydrazine and also give a greater number of stable derivatives with aldehydes and ketones.

FRANK C. VILBRANDT and W. E. ESKEW. Duplex Weighing Tube. *Journal of Industrial and Engineering Chemistry*, anal. II: 181. 1930.

The design of a new analytical weighing vessel obviating inherent difficulties of the upright weighing bottles and also serving as a delivery tube for samples to be transferred from balance to flask or solution vessel.

ROY F. ABERNETHY. (Progress on Master's Thesis.) The Chemical Constitution of Shrimp Oil. (Under the direction of FRANK C. VILBRANDT.)

The identification of the various constituents of shrimp oil by ultimate analysis, molecular weight determinations, and derivative preparation has disclosed cholesterol, a new organic compound not yet classified, and a fat.

JUDSON H. SANDERS. (Progress on Master's Thesis.) The Color Components in Cottonseed Oil. (Under the direction of FRANK C. VILBRANDT.)

Effort to classify the color constituents by isolation from growth conditions of seed and analysis of constituent parts of seed by microscopic study, chemical analysis, and color identification in the resulting oils. Chemical composition of seed classified indicates that growth conditions of seed according to microscopic study of fibre quality influence materially nitrogen and oil content.

JOHN BRUCE JOYNER. (Master's Thesis.) The Effect of Equipment Composition in Water Analysis. (Under the direction of FRANK C. VILBRANDT.)

The composition of the equipment used in this study included platinum, quartz, porcelain, sillimanite, and pyrex, the platinum serving as the standard for comparison. The analytical determinations were for total solids: silica,

calcium, magnesium, sodium, potassium, and sulphates, all according to standard methods with the exception of the material composition of the equipment.

Variations in results obtained in this investigation were negligible. It is concluded that apparatus composition has no appreciable effect on the values of the different constituents determined in water analysis, provided there is no chemical reaction with the equipment because of the nature of the water.

Quartz ware, sillimanite, pyrex, and porcelain are interchangeable with platinum for the determination of total solids—silica, calcium, magnesium, sodium, potassium, and sulphates—when proper precautions are taken.

HAYWOOD PARKER, JR. (Master's Thesis.) Iodine Compounds in *Penaeus Setiferus*. (Under the direction of **FRANK C. VILBRANDT**.)

Shrimp waste, preserved by cooking in brine, was investigated for total iodine and for the fractions of iodine occurring in various types of combination. Iodine determinations were made by an adaptation of the Tressler and Wells method. Values for total iodine averaged 13.9 p.p.m. Mild hydrolysis with NaOH rendered soluble 51.7 per cent of the material and 47.2 per cent of the total iodine. More severe hydrolysis rendered soluble 97 per cent of the iodine with very little increase in the total solubles. Mild acid hydrolysis left all the iodine insoluble. There were indications that a large proportion of the iodine is associated with the fats or lipid bodies. Practically none of the iodine occurs with the inorganic matter in the shells. Inorganic iodine is possibly 10 per cent of the total iodine. There were no indications of the presence of thyroxine.

E. EARL HUFFMAN. (Progress on Master's Thesis.) Pressure Factor in Cotton Mercerization. (Under the direction of **FRANK C. VILBRANDT**.)

The application of the principle of Le Chatelier in the reaction with and action on the cellulose complex of the cotton fibre with sodium hydroxide is being studied from the standpoint of effect of temperature, pressure, and concentration on the constitution, dye affinity, tensile strength, and elasticity of mercerized cotton yarn. Decrease in strength at low and high pressures with a maximum strength at one atmosphere has been noted. Mercerization under tension produces a weakening of the yarn.

PROFESSOR VILBRANDT presented the following papers:

Duplex Weighing Tube. American Chemical Society meeting in Atlanta, Georgia. April 10, 1930.

Deaeration vs. Deactivation in Boiler Waters. North Carolina Section of the American Chemical Society. Duke University, Durham, N. C. May 10, 1930.

Chemical Constitution of Shrimp Oil. North Carolina Section of the American Chemical Society. Duke University, Durham, N. C. May 10, 1930.

Iodine Compounds in *Penaeus Setiferus*. North Carolina Section of the American Chemical Society. Duke University, Durham, N. C. May 10, 1930.

Pressure Factor in Cotton Mercerization. North Carolina Section of the American Chemical Society. Duke University, Durham, N. C. May 10, 1930.

Economic Considerations in the Cotton and Cottonseed Industry. North Carolina Section of the American Chemical Society. Duke University, Durham, N. C. May 10, 1930.

FRANK K. CAMERON has published:

The Solubility of Ferrous Sulphate. *Journal of Physical Chemistry*, XXXIV: 692-710. April, 1930.

The Apparent Specific Gravity and Moisture Content of Clay. (With R. A. LINEBERRY.) *Colloid Symposium Annual, Seventh Symposium in Colloid Chemistry, Johns Hopkins University, 1930*, pp. 179-189. John Wiley and Sons, Inc., New York.

FRANK K. CAMERON has under way the following studies:

An investigation of the stresses in the interfaces between fine dust particles and the atmosphere.

Data have been collected on the electric charges.

(With HORACE D. CROCKFORD.) The System: Ferric Sulphate, Cupric Sulphate, and Water.

A set of isotherms has been collected for the system: ferric sulphate, cupric sulphate, and water. A critical study and collection of experimental data on the system: ferric oxide, sulphuric acid, and water are approaching completion.

A study is being made of the separation of aqueous soluble phosphates from insoluble phosphates by treatment of the latter with sulphur dioxide. (With A. E. HUGHES under the Robert Ober Fellowship.)

Absorption of sulphur dioxide by basic phosphates at high temperatures and at lower temperatures follows the usual formula for a first order reaction. There are complications, especially autoxidation of the sulphur dioxide at higher temperatures. At higher pressures with sulphur dioxide and water form-

ing two liquid layers, an approximate partial separation of the water soluble phosphate from the residual lime can be effected. A résumé of the work to date was presented to the Elisha Mitchell Scientific Society in May, 1930.

RICHARD A. LINEBERRY. The Ceramic Properties of Certain North Carolina Clays. (Under the direction of F. K. CAMERON.)

Eight North Carolina clays were subjected to various conditions of grinding, aging, firing, and rate of cooling. It was found that grinding greatly increases plasticity and workability. Aging at saturation at 76° C. gave the best results. Brick cooled slowly showed less tendency to crack. The hydrogen ion concentration, the breaking strength of the dried brick, and the adsorptive capacity of the clays for different dyes were found.

The second part of this investigation had for its object the clarification of the idea of plasticity, and the development of a method of measurement. A critical review of the literature showed much confusion as to the meaning of the term plasticity and as to the methods of measurement. It is suggested that the term plasticity be restricted to polycrystalline systems, since plasticity is known to be a property of a heterogeneous system with high surface tension in the liquid-solid interface of the liquid film. So restricted, the term can be directly correlated with properties subject to direct laboratory measurement.

The theories that have been put forward to explain plasticity have neglected two factors: the surface tension of the solution and the adsorptive capacity of the particles. If to a mass of particles a drop of water be added, two forces will act, viz.: the surface tension of the liquid-air interface and that of the liquid-solid interface. The "effective pressure" is the component of two surface tensions. The gas-liquid surface tension is constant for any given temperature and is independent of the nature of the solid; but the liquid-solid surface tension depends on the nature of the solid. It may be seen, therefore, that as the water is added to a mass of particles the particles will be drawn together by film action and the mass may increase faster than the volume. This relationship has been shown by means of apparent specific gravity measurements.

By these measurements a plastic substance may be distinguished from a non-plastic substance. If the apparent specific gravity-water content data be plotted, with the water content as abscissa, a characteristic curve is obtained. At first the curve is rather flat, but as more water is added the curve suddenly reaches a maximum. The highest point indicates the maximum amount of water that can be present in the form of a film over all the particles; if more water is added, the apparent specific gravity decreases. For a plastic substance the curve is steep and high; for a non-plastic substance the curve is less steep and the maximum point is lower. Fine grinding raises the apparent specific gravity because more surface is exposed. Apparent specific gravity determinations can be made quickly and easily. Hence they may be used in plant control, as well as in investigation work.

ETHEL RUTH WARD. (Master's Thesis.) The Solution Isotherms and Corresponding Solids in the System: Ferrous Sulphate, Hydrogen Sulphate, and Water. (Under the direction of FRANK K. CAMERON.) (August, 1929.)

The zero degree and 25 degree isotherms have been charted. Sulphuric acid decreases the solubility in water of ferrous sulphate. At low concentrations the stable solid phase is the heptahydrate of ferrous sulphate. At higher concentrations the stable solid is the monohydrate. The tetrahydrate is not stable at these temperatures. Apparently there is a congruent point at 25°. The investigation is being continued.

J. T. DOBBINS and HARVEY ALBERT LJUNG. Oxidation and Reduction Studies—Sulphite and Arsenate.

The modern theories concerning amphoterism and oxidation and reduction emphasize the great importance of the control of the hydrogen ion concentration—namely, that the extent of the amphoteric ionization and subsequently the oxidation and reduction potentials are a direct function of the hydrogen ion concentration.

It came to the attention of the authors, while engaged in another investigation, that it was necessary for an oxidizing and reducing agent to exist together in an acid solution. Since sulphurous acid is a recognized reducing agent for arsenate in acid solution, it was thought advisable to study this reaction in a medium whose hydrogen ion concentration, it was thought, would not be sufficiently great to bring about the reaction between the arsenate and the sulphite ions.

It has been shown experimentally that no reaction takes place between an arsenate and a sulphite over a wide range of concentration of each in solutions acid with acetic acid.

E. S. GILREATH. Progress on Doctoral Dissertation. (Under the direction of J. T. DOBBINS.)

I. Solubility of $\text{Ca}_3(\text{PO}_4)_2$ in H_3PO_4 .

The solubility of calcium phosphate in phosphoric acid has been determined at 25°, 40°, and 50.7° by other investigators. The present problem is the determination of the isotherm at 80°. The object of this investigation is to find the most favorable conditions for the production of superphosphate fertilizer by the action of phosphoric acid on phosphate rock.

An increase in temperature decreases the amount of calcium in solution and increases that of P_2O_5 .

II. The Quantitative Precipitation of Calcium Oxalate in the Presence of the Ferric Ion.

In the procedure for the volumetric determination of calcium in limestone and other ores as outlined in practically all laboratory manuals, the separation of iron before the precipitation of calcium is required.

It has been found that small percentages of iron do not affect the accuracy of the determination. Large quantities of iron produce slightly low percentages, due to the absorption of the calcium ion.

HARVEY ALBERT LJUNG. (Progress on Doctoral Dissertation.)
A System of Qualitative Analysis for the Anions. (Under the direction of J. T. DOBBINS.)

The problem as outlined in *Research in Progress*, 1928-1929, has been continued.

Group II contains those acids whose barium salts are insoluble in water: sulphate and chromate. These anions are precipitated from an alkaline solution as the barium salts and identified.

Group III contains those acids whose zinc salts are insoluble in neutral or slightly acid solution: ferricyanide, ferrocyanide, cyanide, borate, and sulphide. These anions are precipitated from an alkaline solution as the zinc salts and identified.

Group IV contains those acids whose silver salts are insoluble in dilute nitric acid solution: thiosulphate, thiocyanate, iodide, bromide, and chloride. These anions are precipitated from a solution acid with nitric acid as the silver salts, with the exception of the thiosulphate, which is precipitated as the sulphide.

H. D. CROCKFORD has published:

(With F. W. ZURBURG.) Binary Systems of Certain Nitrotoluenes with Salicylic Acid. *Journal of Physical Chemistry*, XXXIV: 214. February, 1930.

(With L. E. WARRICK.) The System: Cupric Sulphate-Sulphuric Acid-Water. *Journal of Physical Chemistry*, XXXIV: 1064. May, 1930.

The following papers have been accepted for publication by the *Journal of Physical Chemistry*:

(With MAUDE WEBSTER.) The System: $\text{CuSO}_4\text{-Li}_2\text{SO}_4\text{-H}_2\text{O}$.

(With A. E. HUGHES.) Binary Systems of Certain Nitrotoluenes with Benzoic Acid.

(With A. E. HUGHES.) The Photographing of Cooling Curves.

H. D. CROCKFORD has under way the following research:

(With F. K. CAMERON.) The System: Cupric Sulphate-Ferrie Sulphate-Water.

(With MAUDE WEBSTER.) (Progress on Doctoral Dissertation.)
Aqueous Solutions of Cupric Sulphate with Another Sulphate.

The 0°, 25°, and 55° isotherms for the system: $\text{CuSO}_4\text{-Li}_2\text{SO}_4\text{-H}_2\text{O}$ have been determined. The results have been accepted for publication by the *Journal of Physical Chemistry*. The study of the systems of cupric sulphate with nickel sulphate and cobalt sulphate are now under way.

R. W. BOST has published:

(With P. BORGSTROM.) Tin Tetraphenyl as a Phenylating Reagent. *Journal of the American Chemical Society*, LI: 1922. June, 1929.

Tin tetraphenyl was prepared by the action of stannic chloride on phenyl magnesium bromide. The resulting product was hydrolyzed and the crude product extracted with benzene. It crystallized in colorless prisms from chloroform, M.P. 225°. Reactions between tin tetraphenyl and the following compounds were studied: halogens, alkyl halides, acyl halides, sulphur, sulphuryl chloride, and nitric acid. With halogens, monoaryl halides were formed. Alkyl halides react to give low yields of aromatic hydrocarbons, while acyl halides react to give ketones. Sulphur under different conditions of time of heating, temperature, and concentration of sulphur yields diphenyl sulphide, diphenyl disulphide, and thianthrene. Nitric acid reacts violently to give nitrobenzene. The reaction with sulphuryl chloride gives a variety of products.

(With P. BORGSTROM and J. C. McINTYRE.) Action of Refining Reagents on Pentamethylene Sulphide in Naphtha Solution. *Journal of Industrial and Engineering Chemistry*, XXII: 87. January, 1930.

(With W. J. MATTOX.) (Master's Thesis.) Toly-4-Carbitioic Acid and Certain Derivatives. (August, 1929.) *Journal of the American Chemical Society*, LI: 332. January, 1930.

Toluene-4-carbitioic acid was prepared by the action of carbon disulphide on tolylmagnesium bromide. The resulting product was hydrolyzed, extracted with ether, and the ethereal solution extracted to obtain the sodium salt. The pure acid was obtained by precipitating three or four times with dilute hydrochloric acid. It is unstable and decomposes slowly, even in the dark, with the liberation of hydrogen sulphide. The sodium salt was more stable and was used in the preparation of all the derivatives.

The zinc salt crystallizes from hot toluene in the form of long red needles, M.P. 180°. The lead salt is a red amorphous powder practically insoluble in all the organic solvents, M.P. 192°. The methyl ester, obtained by the action of dimethyl sulphate on an aqueous solution of the sodium salt, is a red oily liquid, boiling at 130° at 3 mm. Diethyl sulphate reacts similarly to give the ethyl ester, a red liquid boiling at 132° at 3 mm. The n-butyl bromide reacts

with the sodium salt to give the n-butyl ester, a red oily liquid boiling at 169° at 5 mm. The methyl ester on ammonolysis yields the thioamide, a yellow crystalline compound, melting at 160°. The p-nitro benzyl ester crystallizes from hot alcohol in red plates, M.P. 71°. The p-toluide crystallizes in yellow needles from hot toluene, M.P. 168°.

He has directed the following research :

M. W. CONN. (Master's Thesis.) The Preparation and Properties of Certain Thiophanes.

Tetramethylene sulphide and pentamethylene sulphide were prepared. Their properties were studied in pure heptane solutions with the following reagents: mercuric chloride, mercuric iodide, concentrated nitric acid, potassium permanganate, hydrogen peroxide in glacial acetic acid, bromine, methyl iodide, and sulphuric acid.

W. W. WILLIAMS. (Master's Thesis.) Cyclohexyl Carbithioic Acid and Certain Derivatives.

Cyclohexyl carbithioic acid was prepared by the action of carbon disulphide on cyclohexyl magnesium bromide. The acid is unstable and possesses a putrid odor. It forms salts with the chlorides and acetates of the heavy metals, esters with alkyl sulphates and alkyl halides, and a toluide with p-toluidine. A thioamide could not be obtained. Strong oxidizing agents convert the acid into the carboxylic acid.

PROFESSOR BOST has the following research in progress :

W. F. SMITH. (Progress on Master's Thesis.) 4-Para-Tolylthiosemicarbazide as a Ketone Reagent.

4-para-tolylthiosemicarbazide has been prepared and its action with the following ketones has been studied: acetone, methyl ethyl ketone, diethyl ketone, aceto-acetic ester, acetophenone, benzophenone, cyclohexanone, carvone, benzoylacetone, acetyl acetone, Michelor's ketone, and camphor.

PROFESSOR BOST has the following book in press with P. BORGSTROM and D. F. BROWN: A Bibliography of Organic Sulphur Compounds with Patent Literature References.

DEPARTMENT OF CIVIL ENGINEERING

T. F. HICKERSON is completing his work on the analysis of rigid structural frames, which will be incorporated in the manuscript

for a book entitled *Analysis of Continuous Beams and Rigid Frames*.

One-span, two-span, and three-span rectangular frames—as well as arch frames—with columns (a) hinged at the bases, (b) fixed at the bases, have been treated when subjected to every possible type of symmetrical and unsymmetrical loading, whether horizontal or vertical.

Basic formulas were derived in terms of a new and simplified notation from which a tabular analysis was made, in order to render the method readily adaptable to practical engineering.

The Slope Deflection Method, the Theorem of Least Work, or the Fixed Arch Theory, whichever rendered the most direct solution of the particular problem at hand, were used freely.

A Beggs deformeter apparatus, recently acquired from funds donated by the Rockefeller Foundation, has been helpful in studying the internal stress distributions in various parts of the frameworks when subjected to loadings.

PROFESSOR HICKERSON directed the following research work:

THOMAS PASTEUR NOE, JR. (Master's Thesis.) *A Critical Study of the Methods of Elasticity Applied to Statically Indeterminate Structures.*

A study of the methods of solving statically indeterminate structures leaves one with the feeling that in some manner all of the methods are interrelated. In this thesis it is shown that the work of deformation together with the law of conservation of energy form the fundamental basis for all of the methods. This conclusion was reached by virtue of the relationships existing between the elasticity of a structure and the work of deformation. A check on such reasoning was obtained by the derivation of most of the more important theories by these two basic concepts.

THOMAS BENJAMIN BENNETT, JR. *Electric Arc Welding.*

The startling claims made for arc welding are almost beyond belief. To eliminate casting and riveting—two fundamental manufacturing processes—would seem to be a wild and impossible vision, but that is exactly what arc welding will accomplish. Doubtless one's first thought will be that to bring about such revolutionary changes arc welding must be a complicated process requiring elaborate equipment and great technical skill for its operation. Fortunately this is not the case.

There is nothing mysterious about the process. The edges of the parts to be joined are brought to the proper welding temperature and fused together. The heat required to fuse the metal is developed by an electric arc.

An electric arc is nothing more than a sustained spark between two terminals or electrodes. In arc welding, the arc is formed between the work to be welded and an electrode held usually in the operator's hand.

The hand electrode may be either a metallic wire or a carbon rod. Either is held in a suitable electrode holder. When the metallic electrode is used the process is spoken of as metallic arc welding, and when the carbon electrode is used, as carbon arc welding. Both methods have their particular field of application.

THORNDIKE SAVILLE has been engaged, during the year, as consultant to the Board on Beach Erosion and Sand Movement of the U. S. Army, and in this connection has advised relative to extensive experiments on the New Jersey Coast, the construction and operation of a hydraulic model of Pensacola Harbor, the analysis of beach sands, the design of a 9,000-foot jetty in New York Harbor, and a system of beach protective works for Tybee Beach, Georgia.

He has directed studies on beach erosion and inlet closure on the North Carolina Coast for the Department of Conservation and Development.

THORNDIKE SAVILLE and RALPH M. TRIMBLE have continued their investigation of mechanical analysis of sands, especially with relation to effect of size of sample and time of sieving of beach sands.

THORNDIKE SAVILLE and FRED MERRYFIELD have been engaged on studies of probabilities and duration curves of daily stream flow and flood flows.

PROFESSOR SAVILLE directed the following research:

JOSÉ RAFAEL MARTÍNEZ-PONTE. (Master's Thesis.) Brief Preliminary Considerations Touching the Engineering Phases of Malaria Control.

An incomplete attempt to bring to sanitary engineers of Spanish-American countries a compendium of facts covering the field of malaria control works. Limitations of time constrained the author to discuss only three phases of the subject. Chapter I furnishes a description of the symptoms and development of malaria and a historical résumé of the disease, its influence, and the extent to which it has prevailed, concluding with a statement of the importance of the knowledge of malaria control for public health authorities and sanitary engineers. Chapter II furnishes the engineer with what is known at present concerning the malaria-carrying mosquito itself, and offers methods of identifying this genus of the insect. Chapter III deals with the importance of drainage as an antimalarial measure of sanitation, points out the relation between malarial and agricultural drainage, and gives the fundamental geological facts for a complete understanding of both.

H. G. BAITY, FRED MERRYFIELD, and A. B. UZZLE, JR., have continued studies on the experimental treatment of textile wastes.

This year's investigation has been confined to experiments in mutual and chemical precipitation of various dye, bleach, and processing wastes to render them suitable for discharge into streams or municipal sewer systems served by sewage treatment plants.

H. G. BAITY, FRED MERRYFIELD, and A. B. UZZLE, JR., have made an investigation of sedimentation and sludge digestion characteristics of domestic sewage heavily laden with kitchen grease.

An experimental separate sludge digestion plant was built and operated during the year at the Chapel Hill sewage treatment plant. The sewage employed contained from five to ten times the average fats content of normal domestic sewage. The data obtained are of general engineering interest, and will constitute the basis for the design of a new sewage treatment plant at Chapel Hill during the next year.

PROFESSOR BAITY directed the following research:

FRED MERRYFIELD and ARCHIBALD B. UZZLE, JR. (Master's Thesis.) The Effect of Pre-chlorination of Sewage upon Stream Quality.

This thesis is the result of a study upon the qualities of a stream, as affected by the pre-chlorination of the sewage which was discharged into it. A number of chemical, physical, and bacteriological qualities were considered over a period of four months, which was too short a time for a true interpretation of these results.

The following conclusions are drawn from the results gathered from the study to date. The pre-chlorine treatment increases the dissolved oxygen content of the stream slightly, and reduces the bio-chemical oxygen demand of the stream at least one quarter of a mile below the outfall. The odors are eliminated, the turbidity is reduced, and the general appearance of the stream is greatly improved by the application of chlorine to the sewage effluent. The number of bacteria is reduced more than ninety per cent and the reduction in B. Coli is very high.

DEPARTMENT OF CLASSICS

GEORGE HOWE has completed a paper entitled *The Development of Aeneas' Character* (soon to be published).

He has in preparation an article on Vergil's Humanity.

G. A. HARRER has published:

Serere, "To Sow." *The Classical Weekly*, XXII: 144. 1929.

He has completed (with M. H. GRIFFIN) a paper: *Fasti Consulares*, which supplements, so far as new inscriptional evidence will

permit, Liebenam's *Fasti Consulares*. (To be published in the *American Journal of Archaeology*.)

PROFESSOR HARRER has in preparation the following studies:

Characteristics of Roman Writing and Letter Shapes in the Classical Period. (Almost completed.)

Tacitus' Account of the Trial of Cremutius Cordus.

The Copying of Military Diplomas.

A Recent Military Diploma Concerning Roman Syria.

J. PENROSE HARLAND has published an epitome of a work entitled *The Use of Iron in the Bronze Age*. *The American Journal of Archaeology*, 59-60. 1930.

PROFESSOR HARLAND is continuing his work on the detailed publication of *The Excavations of Tsoungiza, the Prehistoric Site at Nemea* (the site that was excavated by him in 1927).

He is also collecting and assembling material for a comprehensive work on *The Helladic Civilization* (Prehistoric Greece).

M. H. GRIFFIN has published:

Tacitus, Agricola XLVI, and Cicero, Archias 12, 30. *The Classical Journal*, XXV: 545. 1930.

M. H. GRIFFIN has collaborated with G. A. HARRER on an article entitled *Fasti Consulares* soon to appear in the *American Journal of Archaeology*.

The following doctoral dissertation was accepted by the Department during the year:

KATE DEROSSET MEARES. *Literary Patronage in the Silver Age of Latin Literature*. (Under the direction of G. A. HARRER.)

All instances of patronage have been studied. In the Neronian period patronage flourished more than in the previous periods since Augustus. Under the Flavians the custom declined, in spite of the favorable attitude of Vespasian toward writers, and there was no recovery in the times of the "good emperors," although individual instances of generosity are not lacking.

The following master's theses were accepted by the Department during the year:

SARAH JANIE BUSH. *Marcus Aemilius Lepidus*. (Under the direction of G. A. HARRER.)

A study of the life and career of Lepidus, the triumvir, and his writings. The vocabulary and syntax of his extant letters are very like the Ciceronian.

VAN COURTLANDT ELLIOTT. A Military Diploma of 78 A.D. (Under the direction of G. A. HARRER.)

This is a complete edition of a recently discovered inscription, giving information of some hitherto unknown cohorts, dating the period of a governor of Moesia, and fixing more nearly the time of Vespasian's nineteenth imperatorship.

ELIZABETH CUNNINGHAM KENNEDY. The Reading of Pliny the Younger in the Literature of the Golden Age. (Under the direction of GEORGE HOWE.)

This study gathers together all allusions in Pliny's writings to the works of the authors of the Golden Age for the purpose of determining the extent of Pliny's reading and the uses he made of it in his own writings.

HORACE NIMS. *Legati Caesaris in Gallia*. (Under the direction of G. A. HARRER.)

All the legates are considered, and it is found that Caesar appointed men from the senatorial order of at least the rank of quaestor; that Labienus alone served throughout the whole period; and that few of the legati turned against Caesar in the Civil War.

HENRIETTA UNDERWOOD. Inscriptional and Paleographical Evidence on the Addressees of Pliny's Letters. (Under the direction of G. A. HARRER.)

The names and careers of all persons addressed in the first five books have been considered. The inscriptional evidence shows in particular that the BF family and the Morgan MS are far more correct for names than the MV group, and that Keil and Mommsen did not give enough value to the evidence of the index of B.

EVELYN LEE WAY. Inscriptional and Literary Evidence on the Subjects of Statius' *Silvae*. (Under the direction of G. A. HARRER.)

All persons mentioned in the headings of the *Silvae* are considered. Though Statius often gives facts of the public careers of his friends, he is not always precise or clear in his allusions, and sometimes he apparently disregards chronological sequence.

The following studies have been undertaken by candidates for advanced degrees:

LUCY E. AUSTIN. Characters in Cicero's Dialogues (for the doctor's degree).

PHILIP MACON CHEEK. Religious Imagery in Vergil's *Aeneid* (for the doctor's degree).

VAN COURTLANDT ELLIOTT. Epigraphical Evidence Relating to the *Scriptores Historial Augustae* (for the doctor's degree).

SARAH LETTICE FOSTER. Pliny the Younger's Reading in Greek and Latin Literature (for the doctor's degree).

LAURINE HAYNES. A Late Manuscript of Cicero's *De Officiis* (for the doctor's degree).

EDGAR B. JENKINS. *Index Verborum* of Terence (for the doctor's degree).

BEVERLY TURPIN MOSS. The Structure of *Aeneid* X (for the master's degree).

FREDERICK BOYDON NIMS. Vergil's Use of Works of Art in the *Aeneid* (for the master's degree).

MABEL ALLEN POWELL. The Followers of Aeneas (for the master's degree).

DEPARTMENT OF ECONOMICS AND COMMERCE

E. D. STRONG has been engaged in the following study:

The Amalgamated Clothing Workers of America.

A history, analysis, and interpretation of the successful efforts of the men's clothing workers of the United States to establish a union, bring peace and order into the industry, and cooperate with employers for greater efficiency in production.

W. F. FERGER is engaged in the following study:

The Idleness of Equipment in Industry.

A statistical and analytical study of the extent and causes of the wastes in industry due to the seasonal, cyclical, overdevelopment, sectional shifts, obsolescence, etc., idleness of physical equipment in American industry. A few of the more important industries are being studied intensively, and the available material on others is being examined.

J. GILBERT EVANS is engaged in the following studies:

The Problem of Production Control in Agriculture.

Land Redistribution by Governments in the Twentieth Century.

The following master's theses were accepted by the Department during the year:

STANLEY W. PRESTON. Some Economic Advantages of High Frequency Radio Transmission Methods. (Under the direction of C. T. MURCHISON.)

The chief characteristics of high frequency radio waves are contrasted with low and intermediate frequencies, and an attempt is made to evaluate their usefulness. By the use of high frequencies, long distance transmission with small amounts of power was accomplished; daylight communication became possible; radio territory was enormously enlarged; directive systems were effected; and tropical countries were given means of communication. For long distance work these waves were found to be of value, but for communication over short distances their utility is not as great. The chief sources of information have been articles appearing in current technical journals.

WILLIAM WAY, JR. The Clinchfield Railroad. (Under the direction of M. S. HEATH.)

Twenty-two railway corporations were merged into the Clinchfield Railroad in 1925 and leased to the Atlantic Coast Line and the Louisville and Nashville railroads, jointly, for a period of 999 years. The main line extending from Elkhorn City, Ky., to Spartanburg, S. C., was built to provide an outlet for coal to the piedmont section and the South Atlantic seaboard. In 1927, however, through merchandise freight increased to over fifty per cent of the traffic.

The Clinchfield is the last of numerous attempts to penetrate the Blue Ridge and Cumberland Mountains, and is the only railroad which crosses the various ridges of these ranges at right angles. The historical development of the railroad is related from the first attempt to connect Charleston and the Ohio valley until the present. The following phases are treated in detail: construction, operation, equipment, traffic, corporate proceedings, Federal control during the World War, and the lease to the Atlantic Coast Line—Louisville and Nashville system.

DEPARTMENT OF EDUCATION

EDGAR W. KNIGHT has published during the year:

Reports on European Education. McGraw-Hill Company, 1930. (Cloth, ix + 315 pages.)

An account of the influence of observations of European education in the early part of the nineteenth century upon education in the United States; deals especially with the observations and impressions reported by John Griscom, in 1819, on his year in Europe; by Sarah Austin's translation of the report of the Frenchman, Victor Cousin, in 1831, to the French government on education in Prussia; and by Calvin E. Stowe, in 1837, to the legislature of Ohio on education in Europe. The volume contains all of Stowe's report and parts of Griscom's and Cousin's.

Notes on John Chavis. *North Carolina Historical Review*, July, 1930.

Brings together a complete bibliography on this prominent ante-bellum Negro preacher and teacher. The article shows that there is no evidence for the tradition that Chavis was a student at Princeton, but shows that he was a student at Washington Academy, now Washington and Lee University, in Virginia.

A. M. JORDAN has completed the following studies:

Study of Factors Affecting Changes in Attitude of Children Towards Cheating.

The purpose of this investigation is to discover the factors that cause children to change their scores on tests devised for detecting the presence of cheating. In carrying out this plan, 297 children located in grades IV, V, VI, and VII have been tested in arithmetic reasoning, completion, and information. In all three tests, the double testing technique has been employed. The three tests combined give a highly reliable test of cheating. It is also planned to give these tests one year from the time of their first administration in order to discover what changes in scores have taken place.

Several types of causes of cheating are being investigated. The first of these has been an attempt to observe the children directly in their classroom and in their play in the hope of finding some lead. In seven of the classrooms the writer has made observations for about eighty hours. In the second place, censuses have been taken of the friends of the children at four-month intervals, and will be taken throughout the year. In the third place, all the children have been tested with the Sims socio-economic tests of cultural background. Records of the children's educational advancement in the form of Stanford achievement tests have also been collected.

The results thus far are meager. As far as they go, they indicate that cheating is less dependent on socio-economic background than was found by May and Hartshorne.

The following doctoral dissertation was accepted by the Department during the year:

WILLIAM E. DRAKE. Higher Education in North Carolina Before 1860. (Under the direction of E. W. KNIGHT.)

During the colonial period no institution of higher education was established in North Carolina, although attempts to establish a college were made which ended in failure because of economic, political, and religious conditions in the colony.

During the Revolutionary period, under the leadership of William R. Davie, influenced perhaps by the work of Franklin in the University of Pennsylvania, the charter of the University of North Carolina was granted (in 1789). As a result of the eighteenth century rationalistic movement, strong scientific in-

terests and liberal tendencies were early apparent in the curriculum and in the control of the University. However, teachers for the new curriculum could not be found and the institution, which had opened in 1795, returned to the classical fold in 1804. During the presidency of Joseph Caldwell (1804-1835) the University remained a small, local, and somewhat monastic institution. But strong foundations had been laid and, following the election of David Lowry Swain as president in 1835, the University developed rapidly and by 1860 was approaching national significance.

After the Jacksonian era a new spirit in higher education was aroused which resulted in the establishment of Davidson by the Presbyterians in 1837, Wake Forest by the Baptists in 1838, and Trinity by the Methodists in 1859. Attempts by the Quakers, Episcopalians, German Reformed, and Lutherans to establish colleges resulted in institutions of only academy rank.

Strong classical interests dominated the curriculum of all the ante-bellum colleges, although the period from 1840 to 1860 showed a developing interest in science. Students were taught to memorize rather than to reason and to be submissive rather than active. The materials and methods of the colleges were not attractive to the students; and in their interests, manners, and morals they showed rebellious tendencies against the authorities.

In the field of the higher education of women the period was one of controversy in which the state manifested an indifferent attitude. Salem Academy, founded by the Moravians in 1802, and Greensboro Female College, chartered by the Methodists in 1838 and opened in 1846, stand out most prominently among the schools established for girls.

The following master's theses were accepted by the Department during the year:

W. E. ABERNETHY. A Survey of the Educational Progress of Catawba County from 1923 to 1929. (Under the direction of M. R. TRABUE.) (August, 1929.)

This study analyzes the progress in consolidation of the schools of Catawba County since 1923. For evaluating the schools the following measures were used: the number of districts, the number of teachers per school, the type of school building and its value per classroom unit and per child enrolled, the length of the school term, the distribution of enrollment by grades, the grade load per teacher in the elementary schools, the training and certification and salaries of teachers and principals, the enrollment and rating of each high school, retardation in the sixth and seventh grades, and the high school curriculum. These data are presented and interpreted by means of tables and graphs. As determined by the criteria set, marked progress has resulted from consolidation. The survey indicates the need for further consolidation.

NORA BEUST. The Technique Employed in Formulating the American Library Association Graded List of Books for Children's General Reading. (Under the direction of M. R. TRABUE.)

The purpose of the present study is to discover and to describe the techniques necessary in order: to bring the "Graded List of Books for Children" compiled by the Elementary School Library Committee of the National Education Association up to date; to enlarge the list; to index the material so that it may easily be used; to eliminate material that has been superseded by more recent books; to annotate each title so that teachers may gain definite information as to subject matter and format of the book; and to divide the books into three reading age groups. It was concluded that the 1922 edition of the "Graded List of Books for Children" contains much out-of-date material, and that a wealth of new material has been added to the "List."

GEORGE HERBERT ELLMORE. *The Junior College in American Education.* (Under the direction of E. W. KNIGHT.)

This study traces the development of the junior college movement, and evaluates the institution as an integral and necessary part of the present American educational structure. Experience with the junior college is leading to a more reliable statement of its purposes. Evidence has been accumulated to show that the junior college is able to make a desirable and important contribution to the program of higher education by affording superior provision for the intellectual, physical, social, and economic needs of first- and second-year college students, and by relieving the university of much lower divisional work and of considerable extension work.

It is evident that direct legislation has not kept pace with the development of the public junior college, and its future is dependent upon the provision for adequate state aid.

ELWOOD C. HUNTER. *A Survey of the Academic Achievements of Pupils in the White Schools of Currituck County, 1929-1930.* (Under the direction of M. R. TRABUE.)

This study represents an attempt to make objectively a partial evaluation of the efficiency of instruction in the Currituck County Schools. Measures of achievement from both subject-matter and mental tests for each age-group, grade, school, and county at large are compared with the average scores obtained elsewhere in the nation. Each individual school is compared in achievement with every other school in the county with respect to age and grade. Special needs of teachers and pupils are revealed and recommendations for improvements in the types of instruction given are made.

ALFRED BURMAN HURT. *Educational Development of Ashe County.* (Under the direction of E. W. KNIGHT.) (August, 1929.)

This study traces the development of public education in Ashe County from its earliest beginning to 1928. It shows that a few public schools were established shortly after the passage of the first public school law of North Carolina in 1839, and that by the opening of the Civil War a fairly creditable school

system had been developed, but that after this period the early interest in schools was not excelled until after 1900.

The study shows that at the present time Ashe County, as compared with the other counties of the state, ranks near the bottom in the various phases of its school system. But of especial significance is the increase of the high school enrollment from 99 in 1920 to 576 in 1927.

Ashe County needs to launch an intelligent program of consolidation, make provision for adequate supervision of classroom instruction, enforce the compulsory attendance law, and reorganize the curriculum so as to meet more adequately the needs of the rural population that these schools serve.

LINDA SHUFORD MCINTOSH. A Comparison of Two Methods of Teaching Problem-Solving in Arithmetic. (Under the direction of M. R. TRABUE.) (August, 1929.)

The purpose of this study was to determine the relative merit of two methods of teaching problem-solving in arithmetic: (1) giving the pupils a number of concrete problems; (2) presenting to the pupils a group of problems without numbers, and in the same class period making the transfer to problems with numbers. The method of parallel groups was used for the investigation; and the experimental teaching, involving twenty-eight children, was carried on for five weeks in the fourth grade of the Chapel Hill School. For equating the groups, and measuring the progress of each, appropriate tests were given.

The results of the study are inconclusive and either method may be regarded as capable of producing progress when used in the training of fourth-grade pupils.

CLAYTON G. LAWRENCE. Education in Elbert County, Georgia. (Under the direction of E. W. KNIGHT.)

The purpose of this study was to trace the history of education in Elbert County, Georgia, from the settlement of the county to the present. During the latter half of the eighteenth century, the religious organizations, parents, private tutors, private schools, and academies afforded the chief educational opportunities. Private schools predominated until after the Civil War, but a creditable school system was in the making. The state system of schools was formulated in 1870, put into operation in 1873, and progressed steadily until 1900. Among the twentieth century developments in education are the improved constitutional and legislative provisions, the establishment of public high schools, and the consolidation of schools.

The county-unit plan is suggested as a possible solution of many of Elbert's educational problems, and specific recommendations are proposed.

DEPARTMENT OF ENGLISH

ADDISON HIBBARD has completed and turned over to the University of North Carolina Press for publication a collection of short

stories illustrative of different geographical divisions, different attitudes of mind, different regional dialects of the South from 1840 to the present. This collection will be published under the title of *Stories of the Old and New South*. The introduction to the volume sets forth certain conclusions as to the nature of local color interests in the South gained from a reading of twelve or fifteen hundred stories with this background.

G. C. TAYLOR has published :

Shakespeare's attitude toward Love and Honor in *Troilus and Cressida*. *Publications of the Modern Language Association*, XLV : 781-7. September, 1930.

W. D. MACMILLAN, III, has published :

Some Burlesques with a Purpose, 1830-1870. *Philological Quarterly*, VIII : 3. July, 1929.

A study of the burlesques of Planché, showing that they present a combination of eighteenth century methods and subject matter with Victorian morality and elegance.

Sheridan's Share in *The Stranger*. *Modern Language Notes*, XLV : 2. February, 1930.

A note suggesting that Sheridan's share in Benjamin Thompson's translation of Kotzebue's *Menschenhass und Reue* was probably nothing more than the addition of songs and dances and cutting the dialogue.

A. C. HOWELL has completed the following studies :

John Dunton and a Seventeenth Century Imitation of the *Religio Medici*.

Shows that the probable author of the *Religio Bibliopole* was Benjamin Bridgewater, that John Dunton reissued it after Bridgewater's death as *The New Practice of Piety*, and that it was popular enough to secure a number of editions and a translation into German. Points out the fact that it is in reality largely plagiarized from seventeenth century religious works.

James Howell and the *Religio Medici*.

Shows that in addition to the borrowings already noted in the *Epistolae Ho-ellenae*, James Howell's *The Vision, or a Dialogue between the Soul and the Body*, shows evidence of acquaintance with Browne's *Religio Medici*.

PROFESSOR HOWELL has in preparation :

Lamb's Imitation of the Style of Sir Thomas Browne.

LOUIS WRIGHT has held a Guggenheim Fellowship during the year for research, chiefly in England, where he has been collecting material for a study of the literature and culture of the English middle class during the Renaissance.

PROFESSOR WRIGHT has published :

A "Character" from Chaucer in a Seventeenth Century Satire. *Modern Language Notes*, XLIV : 364-368. 1929.

PROFESSOR WRIGHT has completed the following papers :

Social Aspects of Belated Morality Plays. (Accepted for publication in *Anglia, Zeitschrift für Englische Philologie*.)

The Middle Class Concern over Learning in the Renaissance. An essay read before the Philological Club of the University of North Carolina and the Philological Association of Emory University. (Accepted for publication in the *Philological Quarterly*.)

Handbook Learning of the Renaissance Middle Class. (Accepted for publication in *Studies in Philology*.)

John Wesley : Scholar and Critic. (Accepted for publication in the *South Atlantic Quarterly*.)

RAYMOND ADAMS has published during the year :

A Bibliographical Note on *Walden*. *American Literature*, II : 166-168.

Announces the discovery of the hitherto unknown 1862 and 1863 editions of Thoreau's *Walden*.

A Thoreau Checklist, 1908-1930, Supplement to Catalogue No. 1, *Ye Bibliophile*, Chappaqua, N. Y.

Lists all the books devoted to Thoreau published since Francis H. Allen's (1908) *A Bibliography of Henry David Thoreau*.

For the Lakeside Press, Chicago, PROFESSOR ADAMS has edited Thoreau's *Walden*, one of a series of four American books issued during 1930 in limited editions as examples of the best American bookmaking.

Henry David Thoreau, a Forgotten Biography, by Joseph Palmer. Privately published. Chapel Hill. 1930.

The first separate printing of an early biographical sketch of Thoreau not recorded in any bibliography.

For the *Dictionary of American Biography* PROFESSOR ADAMS has written articles on the following:

Isaac Hecker.

Nathaniel Augustus Hewit.

George Parsons Lathrop.

He is engaged on a biography of Henry Thoreau and on numerous lesser Thoreau projects.

RICHMOND P. BOND has completed the following studies:

—Iad: A Progeny of the *Dunciad*. *Publications Modern Language Association*, XLIV: 1099-1105. December, 1929.

He is engaged upon the following topics:

English burlesque poetry in the first half of the eighteenth century.

Joseph Addison as man of letters and affairs.

The preparation for publication of various unpublished poems and letters by major English figures.

WILLIS POSEY has completed a study entitled:

Thackeray's *Animus Against Bulwer-Lytton*.

He has in progress a study of Tasso's English Literary Reputation.

The following doctoral dissertations were accepted by the Department during the year:

ARTHUR PALMER HUDSON. *Folk-Songs of Mississippi and Their Background—A Study, with Texts*. (Under the direction of G. C. TAYLOR.)

The material constituting the subject of this study is a collection of 156 ballads and songs (207 texts), chosen, with reference to their values as examples of the qualities and the varieties of folk-song, from a much larger number of folk-songs recovered by the editor, or by others under his direction, from oral circulation among the white people of Mississippi.

The purpose actuating the study of these folk-songs is to indicate their relation to the lives, character, and interests of the people of Mississippi; their connections with Old World tradition and with indigenous American culture; and their qualities as folk literature. The study is organized into (1) the essential facts about the folk backgrounds of the songs and (2) introductions to the main types of folk-songs presented, showing how subgroups of songs and particular songs are related in theme, specific traits, or other respects, to the background previously outlined and to important features of Old World and American folk-song.

Though the pre-Mississippi history of a considerable number of the texts is set forth in the proper places, for the song collection as a whole the general problem of provenience is closely related to the sources of the white population of Mississippi. These sources are considered from the standpoints of geography and of race; of the motives and circumstances of white immigration to Mississippi as indexes of the character and social conditions of those who determined the culture of the state; and of the distribution of immigrants in localities that developed distinctive community traits. Two chapters entitled, respectively, "Traits of Mississippi Life Sketched by Travelers before the Civil War" and "Ballad-Singing Communities and Ballad Singers" complete the background.

The ballads and songs are presented in eight divisions, each division with an introduction, each song with a head-note:

I. English and Scottish popular ballads in Mississippi (27 in number, in 70 texts); II. other imported ballads and songs (32, in 35 texts); III. ballads and songs of American origin (32, in 35 texts); IV. ballads and songs of the West (7); V. ballads and songs of outlaws, criminals, and vagrants, (15, in 17 texts); VI. ballads and songs of the Civil War (13); VII. jocose, nursery, and dialogue songs (13, in 16 texts); VIII. songs used in games (17, in 18 texts).

An appendix entitled "The Language of the Ballads and Songs" discusses the degree of speech representation present in the songs; sounds, including rhymes; grammatical forms; and vocabulary, including comments upon archaisms and two word lists.

The conclusions drawn from the study are that the folk-songs presented have had wide oral circulation among the people of Mississippi; have sustained an intimate relation to the lives, character, and interests of the folk who sang them; exhibit features in part inherited from Old World traditions and in part growing out of the conditions of American life; and possess qualities as popular literature that make them comparable in variety, richness, and poetic excellence with the best extant collected American folk-songs.

The study is equipped with a bibliography and with indexes of the songs by titles and by first lines.

WALTER FULLER TAYLOR. *Economic Unrest in American Fiction, 1880-1901.* (Under the direction of HOWARD M. JONES.)

This study investigates the reaction of American fiction to the contemporary economic struggles. The chief historical factors that caused the writing of sociological fiction were the rapid growth of large-scale business, including railroad and other monopolies; the growth of a large class of urban poor; and the depression of the Western farming districts.

These and accompanying industrial developments are treated in at least sixty-five books of fiction and also in some semi-fictional and reportorial work. The works of fiction may be conveniently divided as follows: (1) the "novel of propaganda" is an attempt to convert the reader to some view held by the author. In *A Member of the Third House*, for example, Hamlin Garland

indicts the corruption of politics by business men; (2) the exposé of poverty, using material similar to that of Jacob Riis's *How the Other Half Lives*, is a picture, humanitarian or purely scientific, of the lives of the urban poor; (3) the Utopia—e. g., Bellamy's *Looking Backward*—presents or satirizes a communistic ideal society; (4) the "study" dispassionately presents for discussion some economic problem or the reactions of certain characters to economic conflicts. An example is the second volume of Howell's *A Hazard of New Fortunes*. (5) A type of novel, mainly non-didactic, employs industrial struggles as material for its plot. An example of this kind is Norris' *The Octopus*.

In using the novel to present ideas, the novelists succeed best in the disclosure of industrial evils, such as the corruption of politics by monopolies or the distress of the submerged poor. There is little criticism of the competitive basis of American business; rather a general attack on the abuses of competition in unwise speculation and the misuse of great wealth. There is a thorough-going distrust of combinations, whether of capital or labor. In searching for remedies for the manifest evils they portray, the authors are consequently forced back upon the advocacy of palliatives like coöperative ownership or of an effort to renovate the motives of kindness and brotherly love.

The following master's theses were accepted by the Department during the year:

ALEXANDER YANCEY BOWIE. English Periodicals 1750-1760. (Under the direction of W. D. MACMILLAN, III.) (August, 1929.)

This thesis discusses English periodicals from 1750 to 1760 from a standpoint of content, and notes the interests portrayed, the tendencies in the periodical literature of the period, and the position occupied by the productions of the decade in the development of the periodical movement in England. Six leading periodicals of the decade are considered: the *Rambler*, the *Covent-Garden Journal*, the *Adventurer*, the *World*, the *Connoisseur*, and the *Idler*; minor periodicals of the same period are briefly mentioned.

It was found that the periodical literature of the period shows a mastery of the use of satire approximating that of Addison in the earlier decades of the century, and that the periodical production of the period is in line with the developments leading to the magazine which was later to replace the essay periodical.

ALLEN DEXTER BUTLER. The Bible in Thomas Hardy. (Under the direction of JOHN M. BOOKER.) (August, 1929.)

The thesis attacks the problem of the biblical knowledge Hardy acquired through his environment and his studies; the number, range, and frequency of the biblical quotations and allusions in his works, and the ways he employs them; his indebtedness to the Bible for plots, themes, and characters; and, finally, the biblical influence upon the style and artistry of his prose and poetry.

The study shows that there can be no doubt about Hardy's intimate familiarity with the Scripture. He absorbed it from his environment; he studied it regularly while a youth and during his mature years; he was more interested in it as a book of literature than as a book of theology. In his works he quoted directly from it (the King James Version) 175 times and alluded to it 335 times. Twelve of his poems and one of his novels have themes drawn directly from the Bible.

JAMES E. CARVER. *Byron and Shakespeare*. (Under the direction of HOWARD M. JONES.) (June, 1930.)

This thesis attempts to point out the existence of Shakespearean influence in the work of Byron, and to show its nature. It takes up the matter of Byron's expressed opinion of Shakespeare as discovered through Byron's reading and cultural background in an attempt to judge of his fitness as a Shakespearean critic. From an extensive list of citations in Byron's poetry and letters wherein Shakespeare is either quoted or closely paraphrased, it is pointed out that many are slightly incorrect, indicating that Byron was quoting almost entirely from memory. Finally, it points out that in all stages of the development of Byron's hero Shakespearean influence is present. The plays from which Byron drew most extensively were *Macbeth*, *Hamlet*, *Othello*, *King Lear*, and *Henry IV*.

ELIZABETH CHESLEY. *The Pirate as a Literary Figure in the Nineteenth Century Novel*. (Under the direction of HOWARD M. JONES.) (August, 1929.)

This study of the pirate in the nineteenth century English novel attempts to discover in what respects he is a creature of literary convention and in what particulars he is modeled after his historical prototype. The pirates of Defoe, because they represent the portrayal of the buccaneer by a contemporary of his, are compared with those of Sir Walter Scott, Michael Scott, Captain Frederick Marryat, Robert Louis Stevenson, and a group of minor writers. The conclusion of this study is that the nineteenth century literary pirate is modeled closely upon the conventional figures of the Byronic hero and the rogue.

ELEANOR RUTH COKER. *Parental and Filial Relations in Shakespeare's Plays*. (Under the direction of G. C. TAYLOR.)

In this study the writer proposes to discuss the four main parent-child relationships, those of father to son, mother to son, father to daughter, and mother to daughter, and the reciprocal forms of these relationships as they are manifested in Shakespeare's plays.

It was concluded: that Shakespeare shows least originality in handling parent-child relationships in comedy; that he shows almost equal interest in the relationships of father to son, mother to son, and father to daughter, with

a slight preference for the first two; that the reason for the neglect of the relationship of mother to daughter is to be found in literary tradition and the feeling of the time rather than in personal prejudice; that the conditions of family life as found in Shakespeare's plays are not based on his own life and experience; that he shows a decided interest in heredity; that the precocity of his child characters may be due to the fact that children in that day were precocious, or that he himself was not closely associated with children while he was writing plays; that Shakespeare shows the influence of Marlowe in the conceptions of some parent-child relationships but exhibits greater interest in and superior handling of these relationships; and, finally, that parental and filial relationships form a necessary basis for Shakespearean drama.

ELSIE MAE CREW. *Learned Women in England from 1760 to 1830.* (Under the direction of HOWARD M. JONES.) (August, 1929.)

The present study is concerned with distinguished women in English life and literature, 1760 to 1830. The lives and works of three typical women writers are presented with a view to determining the characteristics they exhibit which may be considered typical of the peculiar views or class distinctions they represent. Contributions of other women are considered more briefly. Elizabeth Montagu is chosen as representative of the period from 1760 to 1789 in which the Bluestockings flourished; Mary Wollstonecraft as representative of the period of the French wars, 1789 to 1815, because she is the only woman of the time who may justly be considered a revolutionary figure; and Hannah More as representative of the conservative forces which were at work through the whole period, but which came to triumph from 1815 to 1830. In the study three conclusions are reached: (1) the seventy years under survey reveal little change in theory but much in practice in regard to the status of learned women; (2) the change came not so much as a result of conscious effort on the part of women as a natural outcome of the movements of the time; (3) in the field of literature, women were often inferior, sometimes equal, and seldom superior to men.

COLLIE GARNER. *The Relation of More's Utopia and Bacon's New Atlantis to the Advancement of Learning in Their Times.* (Under the direction of A. C. HOWELL.) (August, 1929.)

This thesis is an attempt to relate More's *Utopia* and Bacon's *New Atlantis* to the intellectual background of the times in which they were written and to point out probable reflections of current educational philosophy contained in these works. The humanistic movement is sketched briefly with particular reference to More's part in it; the development of educational philosophy during the sixteenth century is traced in its broad outlines; the ideas in the *Utopia* and the *New Atlantis* which have an educational implication are indicated, and their relationship to current philosophy established. Attention is

also given to the reception and influence of the two books. In general, the relationship of the works to the philosophy of their times is negative. The *Utopia* is a reaction against scholasticism; the *New Atlantis* is an exposition of a new intellectual method.

KATHERINE JENKINS. *Browning's Criminals*. (Under the direction of JOHN M. BOOKER.) (August, 1929.)

This thesis presents a study of Browning's criminals from the philosophical and the psychological standpoint. The thesis gives a definition of crime and a discussion of the method used in the study, Browning's interest in crime, the criminal types, Browning's philosophy of evil expressed in the poems dealing with crime, and an analysis of the criminal in Browning and in the Victorian novelists. Browning was interested in the criminal as material for character study and as a means of expressing his philosophy of evil; through his portrayals of criminal characters he presented a philosophy of optimism, by showing that good always triumphs over evil; his analysis of the criminal was different from the usual analysis of the Victorian age, and he sympathized with the criminal without sentimentalizing over him.

FRANCIS MARION KINARD. *The Machiavellian Villain on the Elizabethan Stage*. (Under the direction of A. C. HOWELL.) (August, 1929.)

An interpretative study undertaken with the purpose of defining the Elizabethan dramatists' conception of the practical applications of the philosophy of Machiavelli's *Prince* as they represented it on the stage. Excluding Shakespeare, the study attempts to make an analytical study of all predominantly Machiavellian characters on the stage before 1600. Nine characters are pointed out as being predominantly Machiavellian villains. From their study a summary of the stage representation of Machiavelli is made; further conclusions are drawn that the dramatists probably chose the type as a supplement to the Senecan elements, and that the popularity of the type rests on the same appeal that accounts for the popularity of the Senecan elements, possibly augmented by association of the Machiavellian policy with contemporary politicians.

CHARLES YATES MCDANIEL. *Washington Irving's Interest in the Drama*. (Under the direction of GREGORY PAINE.) (August, 1929.)

The purpose of this thesis is to study Washington Irving's interest in and connection with the drama, for most of his earlier biographers have neglected to give adequate treatment of this one of Irving's greatest interests.

His activities as a playwright are traced and discussed under the following heads: adaptations for amateur presentation, opera plots translated and reworked, collaborations with John Howard Payne, Payne's plays with which Irving was connected in an advisory capacity, and original dramatic projects commenced by Irving but never completed.

Irving's dramatic criticism, found in the *Jonathan Oldstyle* letters, the *Salmagundi* papers, the *Conversations with Talma*, the *Journals*, and his private correspondence is also discussed.

It has been found that Irving was a frequent but discriminating attendant at the theatre; that he was a reader of plays; that he was a friend of several of the most prominent actors of his time; that he wrote plays in collaboration with Payne that reached the stage; that he commenced two original projects; that he was a penetrating critic of the dramatic art.

MARY KATHRYN MONROE. *The Country Clergy in English Prose Fiction, 1740-1830.* (Under the direction of HOWARD M. JONES.) (August, 1929.)

The prose fiction of the century gives a realistic presentation of the actual conditions existing in the body of the clergy, especially in the ranks of the oppressed and inferior clergy. Beginning with Richardson's *Pamela* in 1740, the country clergyman is traced in this thesis through many of the major novels, and more of the minor ones. As a general rule, the clergyman, being a real figure in the village life, is realistically described. In the novels from Richardson through Scott, the descriptions of the eighteenth century clergyman have been chosen to show his personal appearance, his scholastic training, his reasons for taking orders, his attitude toward his profession, the attitude of his parishioners toward him, his life in the home, and his ability to cope with the world and its problems. The study attempts to show that these descriptions in the novels are truly characteristic of the real eighteenth century clergyman of the Church of England.

TELFAIR B. PEET. *The Roaring Forties of the London Stage; or, Melodrama from 1840 to 1850.* (Under the direction of W. D. MACMILLAN, III.) (August, 1929.)

A study of melodrama in London from 1840 to 1850 and of theatrical conditions as they concerned this dramatic form, including a partial list of the melodramas of the decade.

The paper gives a brief survey of theatrical customs, some account of the theatres of importance in the history of melodrama, with consideration of stage mechanics, the audience, managers, authors, and actors of the period, with comments on acting in melodramas. Representative melodramas are analyzed in detail. A list of 614 melodramas given during the decade concludes the paper. The melodrama of the times has been found to be primarily "domestic drama," though there is also present a slight element of romantic melodrama.

MARIE ELLIS RIESS. *Essay-types in Shakespeare's Dramas.* (Under the direction of A. C. HOWELL.) (August, 1929.)

Evidence of Shakespeare's familiarity with the following types of essays is found in his dramas: the character, the paradoxical essay, the aphoristic, the

philosophical, and the familiar. Shakespeare varies his use of the character considerably through dramatic necessity, and his characters are marked by their freedom, wit, and variety of expression. In the paradoxical essay he employs devices and effects used by other writers: mock encomiums, incongruous comparisons, absurdly logical arguments, and deliberate misinterpretation of beliefs. His aphoristic essays are similar to Bacon's early ones: that is, either a succession of aphorisms or an epigrammatic sentence elaborated by means of example and citation of authority. They almost invariably round off in a broad generalization. His philosophical essay introduces the Socratic argument, and is apt to come to its conclusion as an inevitable result of the preceding argument. His familiar essay is not unlike Montaigne's in tone, language, and scorn for ignorance, superstition, and fear.

SALLIE E. SCOTT. Stoicism in the Poetry of Wordsworth.
(Under the direction of NORMAN FOERSTER.)

Stoical elements as they are found in the poetry of Wordsworth may be grouped under four heads: Stoicism arising from nature; Stoicism arising from the human will; Stoicism founded on habits and training; and Stoicism developed through circumstances.

A number of the poems of Wordsworth are shown to be stoical in tone, most of them occurring between the years 1800 and 1814. In the poetry of the earlier period the stoical elements are drawn chiefly from certain phases of nature; personal and political experiences caused a stiffening of the moral tone in the poetry of 1802 and 1803; and the poetry of the later years is based upon the desire to show that man, through training and self-discipline, may arise above externals.

G. F. SENSABAUGH. The Element of Wonder in American Romanticism. (Under the direction of NORMAN FOERSTER.)

This thesis is primarily a study of the works of Poe, Longfellow, Emerson, Thoreau, and Whitman. Its purpose is to illuminate the significance of two words widely confused in the Romantic Movement, "wonder" and "awe."

For basic definitions authoritative dictionaries have been used, and the definitions have been supported by illustrations from literature.

In American literature Poe and Longfellow are the leading exponents of wonder of the remote; Poe dealt extensively in both the melodramatic wonder of the Gothic novelists and the dreamy wonder of Coleridge; Longfellow dealt often in the dreamy wonder of Coleridge essentially, touching only slightly the wonder of the here and now. Emerson typifies wonder of the present and actual, but his wonder is less evident than his awe; Thoreau nearly balances wonder and awe; Whitman, however, never experiences awe but has wonder for everything.

The sense of wonder is found to be a prominent motif in the work of those writers commonly acknowledged to be the more romantic, and the sense of awe to be associated with more classic writing. Hence "wonder" and "awe," care-

fully distinguished, are valuable terms in the differentiation of romanticism and classicism.

This work is a preliminary survey rather than an exhaustive treatment.

ARNOLD L. WILLIAMS. Christopher Marlowe and the Raleigh Circle. (Under the direction of G. C. TAYLOR.)

The first purpose of this paper is to synthesize the information available regarding the relations of Marlowe with the Raleigh Circle. Several manuscripts were examined in an effort to determine the membership of the Circle and to ascertain as far as possible what connections Marlowe had with the various members. Thomas Hariot is shown to have influenced the religious thinking of Marlowe. Several correspondences between the opinions of the two men are noted, and all are in such minor and unusual matters as to make the conclusion that Marlowe was influenced by Hariot inescapable. It cannot be shown that Raleigh had a similar influence on Marlowe. Several evidences of Marlowe's political connections with the group are noticed.

The paper arrives at these general conclusions: (1) Marlowe was a member of the group known as the Raleigh Circle. (2) Marlowe was not as closely connected with Raleigh as with the other members of the Circle. (3) His religious thought was influenced by Hariot and possibly by Raleigh. (4) He had political dealings with Raleigh and Percy, though we can not know their nature or extent until new evidence is discovered.

DEPARTMENT OF GEOLOGY

COLLIER COBB has presented the following papers during the year:

The So-called "Oil Domes" of the North Carolina Coastal Plain. Presented at the North Carolina Academy of Science, Durham, May 10, 1930.

Indications of oil are frequently reported from the coastal plain of North Carolina, and these are sometimes explained by the shingle workers in the swamps as juniper tar, iron rust, scum from rotting vegetation, or even as grease from rotting fish; it is just possible that any one of these explanations may be correct.

At least one geologist has described the lakes of Craven and Jones counties as occupying the summits of salt domes and affording a sure indication of oil. This man failed to note that they represent remnants of swamp areas that have gradually closed up through the growth of vegetation and the accumulation of mosses and leaves in the waters of the swamps. The method may be studied at its best in the making of the Dismal Swamp of Virginia and North Carolina, with Lake Drummond occupying the highest part of the swamp from north to south.

Phenomena as reported from this district are always observed in peat deposits in marshes where partial decomposition of plants has taken place amidst much moisture, and this may account for the presence of ozokerite in some of the peat mosses of Russia. But attempts to obtain inflammable oils, burning gas, tar, etc., from the destructive distillation of peat have never been successful in a practical way. The fields of Karafuto, Japan, indicate that nature's processes are more successful than anything that man has been able to do in his laboratories.*

A series illustrating the origin of oil from peat deposits would run something like this: (1) eastern North Carolina; (2) certain Russian bogs and swamps; (3) Norota and Botesa fields of Karafuto; (4) Ichigo oil field of Niigata; (5) some of the oil fields of Louisiana.

It may be many millions of years before the "oil" in North Carolina swamps may become petroleum; and this is hardly possible, even after millions of years, unless the whole region could become submerged, covered to a great depth with clays, sands, and gravels, and metamorphosed by blanketed-in heat, or by mountain building processes, which no student in geology would dare predict.

Changes in the Use of the Loess-loam Wheat Soils of the Mississippi Valley. Presented before the Elisha Mitchell Scientific Society.

The soils in the upper portion of the valley, so long used in raising wheat, are now used as grazing lands, and are the chief source of the dairy products of the North Central States. They also have on them excellent apple orchards.

Similar soils in the middle portion are devoted largely to horticulture, while these soils in the lower portion are given over to truck farms, producing vegetables that support several large canning industries of the Middle West.

Further Studies of Cave Dwellings along the Little Tennessee and Nantahala Rivers. Presented before the Elisha Mitchell Scientific Society.

The paper gave illustrations of cave dwellings and petroglyphs, with comparisons between them and rock inscriptions from Mongolia, Hokkaido, Arizona, and Venezuela.

PROFESSOR COBB has, during May and June of 1930, pursued his study of the Mississippi loesses and loess-loams as far north as the mouth of the Missouri River.

G. R. MACCARTHY read the following paper during the year:

A Mechanical Analysis of Atlantic Beach Sands. Before the North Carolina Academy of Science.

* See Collier Cobb, Aeolian Sand and Oil-Bearing Strata in Sakhalin. *Journal of The Elisha Mitchell Scientific Society*, XLV: 1:140-141. November, 1929.

PROFESSOR MACCARTHY is engaged on a continuation of the work on the mechanical and mineralogical composition of beach sands, and a study of the relation of isostasy to continental growth.

The following master's thesis was accepted by the Department during the year :

THOMAS LINGLE KESLER. The Geology of the Catawba Mountain (Virginia) Area. (Under the direction of W. F. PROUTY.)

This area lies between Salem and Catawba, Virginia, and contains formations of the Cambrian, Ordovician, Silurian, and Devonian periods. Lithology and paleontology of the beds were studied for correlation purposes. Structure of the formations was also investigated. It was discovered that: the Cambrian period is represented by one, the Ordovician by seven, the Silurian by one, and the Devonian by three formations in this area; the following expected formations are not present—Lenoir, Helderburg, Oriskany, Hamilton, and Chemung; the Devonian seas were not here so favorable to life as they were farther to the northeast; the Ordovician seas were more consistent in their presence and organic environment than those of the Silurian or Devonian; the structure of the formations is rather symmetrically synclinal; and two major reverse faults are the only outstanding structural features present.

DEPARTMENT OF GERMAN

E. C. METZENTHIN has continued his study of Old Germanic MSS in preparation for his investigations in European libraries. During the summer of 1930 he spent three months in Europe for research in this field, especially endeavoring to find Germanic MSS of the ninth and tenth centuries in order to compare their lettering and general make-up with that of the four extant MSS of the Old Saxon Epic, the *Heliand*. He brought back photostats which will enable him to continue at home his comparative study. His aim is to fix definitely time and place of origin for the *Heliand* MSS.

Besides this main project, he will complete the gathering of material for his treatise on Goethe and the Lutheran Church in America.

The following master's thesis was accepted by the Department during the year :

LORENZO JAMES BELL. Novalis' Conception of the Golden Age. (Under the direction of K. J. BROWN.)

This thesis examines Novalis' conception of the Golden Age and traces the chronological development of this conception in his four most important phil-

osophical works. The first of these, *Blütenstaub*, gives a general introduction to the conception. *Glauben und Liebe* discusses the political phases of the Golden Age and concludes that a synthesis between monarchy and republic is a necessary prerequisite to this Age. The *Lehrlinge zu Saïs* applies the principle of synthesis to man's relations to nature and declares that there must be a reconciliation of the duality of nature and civilization. In *Die Christenheit* the religious features of the Golden Age are studied. The future religion is to result from a synthesis of Catholicism and Protestantism, and the former unity of church and state is to be restored.

It was concluded that: Novalis' conception of the Golden Age is intimately connected with all his writings; it is based upon the belief that there must be a synthesis between all conflicting forces in every field; and its nature is progressive rather than reactionary, with an interest in the future rather than in the past.

DEPARTMENT OF HISTORY

R. D. W. CONNOR. The Rehabilitation of a Rural Commonwealth. An address delivered before the American Historical Association, at Durham, N. C., Dec. 31, 1929. Published in the *American Historical Review*, July, 1930.

W. W. PIERSON, at the meeting of the American Historical Association, read a paper entitled The Foreign Influences on Venezuelan Political Thought, 1830-1929, which will be published.

M. B. GARRETT and W. W. PIERSON have ready for the press the translation of *Qu'est-ce que le Tiers Etat?* of Abbé Siéyès. PROFESSOR GARRETT translated the pamphlet and PROFESSOR PIERSON prepared the introduction, which is in most part devoted to the political theory of Siéyès.

EDWARD J. WOODHOUSE is engaged on the following :

1. A source book on Municipal Government and Administration in North Carolina ;
2. A monograph on the Law of Municipal Corporations in North Carolina ;
3. A study of the Historical and Legal Basis of County Government in North Carolina ;
4. The Evolution of the Constitution and Government of North Carolina ;
5. A syllabus on Historical Jurisprudence based on courses taught in that field for eight years at Smith College and the University of North Carolina ;

6. A treatise on Government, Law, and Society, involving political, legal, and sociological theory.

The following doctoral dissertations were accepted by the Department during the year :

C. B. ALEXANDER. An Abstract of the Public Career of Richard Caswell. (Under the direction of R. D. W. CONNOR.)

This dissertation presents the public career of Richard Caswell. The loss of most of the personal papers of Caswell prevents any elaborate presentation of the intimate relations of his life.

The study, therefore, is limited to his public career, which extended over the period from 1754 to 1789, and covers fully his services in the General Assembly, in the French and Indian War, in the Continental Congress, in the five provincial congresses of North Carolina, in the army, and as governor during six terms, 1777-1780 and 1785-1787.

Caswell was the most prominent leader in North Carolina during the War of Independence and was governor when the new state government was organized. This study is the first attempt to present an adequate account of his career and to estimate its significance in the history of the state.

JAMES WELCH PATTON. The Brownlow Régime in Tennessee. (Under the direction of J. G. DE R. HAMILTON.)

This study describes the career of the Reconstruction governor of Tennessee, William Gannaway Brownlow. As carpenter, Methodist circuit rider, newspaper editor, governor, and United States Senator, Brownlow presents an interesting and at times a grotesque and fantastic career. In early life a Southern Methodist, almost fanatically defending the institution of slavery, he became, in 1865, a member of the Methodist Episcopal Church and an advocate of emancipation. This sudden change was occasioned by his belief that the policies advocated by the Southerners were detrimental to the best interests of the State of Tennessee. In his estimation, the only salvation for Tennessee lay in the Union, and he sacrificed everything to this end. In doing this he was at times inconsistent, frequently severe in his measures, and always extreme in speech and action. During his administration the history of Tennessee is that of a confused and bewildered commonwealth, with its former political leaders suppressed by a small group of hitherto unknown and inferior Republicans, who had arisen to positions of power and prestige during the war, and by a larger group of Negroes. Corruption and graft flourished, and the state became almost bankrupt. Brownlow did not profit financially from this speculation, but he gave it his tacit support in the carelessness with which he made appointments to office. On the other hand, this study tends to justify the harshness and severity of his administration by showing that such a course was necessary in order to reconcile the state with the radical party in Congress and thus avoid the terrors of military reconstruction which were experienced by the other Southern states.

CARL HAMILTON PEGG. *The First Republican Uprising in France.* (Under the direction of M. B. GARRETT.)

This study discovers the origin of republicanism in France and traces its development as far as the massacre of the Champ de Mars. By the summer of 1790 a few members of the academic class were professing republican ideas which gradually made converts, but no organized republican party existed before the flight to Varennes. Out of this crisis a republican party suddenly emerged, but the National Assembly and the Jacobin Club threw themselves athwart its path and strove to paralyze it. From June 25 to July 17, 1791, the republican leaders devoted their energies to the task of indoctrinating the people. This is an exciting and crucial period in the life of the party. During these days Condorcet, Thomas Paine, and Siéyès participated in a great debate relative to republican principles. Faced with the imminent possibility, after July 10, that Louis would be restored to the throne, the republican leaders sought to overawe the Assembly. The massacre of the Champ de Mars was the result. The republican party was dismembered and a decided reaction toward monarchy set in. But republicanism was too much in harmony with the spirit and logic of the Revolution to remain long suppressed.

The following master's theses were accepted by the Department during the year:

ROBERT WALLER ACHURCH. *The Colonial Policy of the French Legislative Assembly.* (Under the direction of M. B. GARRETT.)

Among the major problems which confronted the deputies to the legislative assembly during the trying years of the Revolution was the colonial question. From the very beginning of the Revolution the colonies had been drawn into the uncertain influences of the Revolution being staged in the mother country; and they were the source of important and significant policies determined upon by the national assemblies of this period.

This monograph traces the development of the colonial policy determined upon by the legislative assembly.

JOHN BAUGHAM HARRISON. *France On the Eve of the Reign of Terror.* (Under the direction of M. B. GARRETT.) (August, 1929.)

This study is an attempt to discover in the conditions in France in the spring and summer of 1793 the causes for the inauguration of the Terror. An analysis was made of the military and the economic situations of the country at that time. It was discovered that the military situation was not especially serious. The evidence was unanimous, however, that the economic condition of the country was alarming.

The conclusion was drawn, therefore, that the political reaction, the establishment of the instruments of the Terror, was the result of the intense class hatred caused by the great inequality in the distribution of wealth and the economic crisis at that time.

It was also concluded that the Terror was necessary, not to save the country from foreign oppression but from reaction and internal disruption. It was a "dictatorship of distress."

EDWARD M. HOLDER. Community Life in Wachovia 1752-1780. (Under the direction of R. D. W. CONNOR.) (August, 1929.)

This thesis attempted to interpret the life of the first generation of Moravians in North Carolina. An effort was made to characterize attitudes and evaluate accomplishments rather than to relate events. The body of the work is treated under four topics: religious organization, economic development, civic relations, and social life.

The diaries and other records of the Moravian congregations, preserved in the archives of the church in Winston-Salem, have provided the source of material. They have been made available in recent years through the published translations of Miss Adelaide L. Fries.

With regard to the position of the Moravians in the American Revolution, there is a deviation from the traditional point of view. The evidence found in the records of the Moravians themselves proves their allegiance generally to the American cause, and shows that statements to the contrary have been based on hearsay or misunderstanding. There are few other interpretations that may be regarded as novel.

HENRY McCLAIN OWL. The Eastern Band of Cherokee Indians Before and After the Removal. (Under the direction of R. D. W. CONNOR.) (August, 1929.)

The Eastern Band of Cherokee Indians, who live among the foothills of the Great Smoky Mountains of western North Carolina today, was once a part of the original Cherokee tribe that owned most of the Alleghany region. This thesis traces the entire story of these people from their traditional origin down to the present day. To accomplish this task, it was necessary to discuss the whole tribe as it existed before the compulsory removal of 1838. The scenes of the story change in 1838 because the United States unfortunately caused the tribe to separate that year by forcibly removing the greater part of the people to the Indian Territory in the west. More than a thousand tribesmen escaped and fled to the Great Smokies during the roundup and removal and hid there as fugitives until their great benefactor, Colonel William H. Thomas, arranged for them to purchase lands for the present reservation. The population of this remnant of the tribe in 1929 is 3,146. Their economic, social, and political life from the removal until the present time is also discussed.

ALEXANDER SILLIMAN SMITH. Anglo-German Relations in the Far East, 1895-1900. (Under the direction of M. B. GARRETT.)

This study shows that Germany by her colonial policy in the Far East forced England to change her entire foreign policy; that in making this change

England attempted to join forces with Germany in order to preserve the peace of the world; and that Germany declined because of her colonial ambitions.

CHANDLER SHAW. Anthropological Observations of Tacitus.
(Under the direction of W. E. CALDWELL.)

This study is an endeavor to view the account of the barbarian peoples related by Publius Cornelius Tacitus in the *Germania*, the *Agricola*, the *Annals*, and the *Histories* in the light of modern anthropology, and to determine whether Tacitus' observations are of outstanding value as anthropological documents. All relevant material from Tacitus' works bearing on primitive tribes has been brought together, and has been classified according to the various phases of life. At the end of the thesis this picture is compared with the observations of modern anthropologists. The problem for investigation is to judge whether Tacitus is a qualified observer of primitive peoples, and whether he faithfully describes the matters of greatest scientific import or merely jots down chance references to spectacular events. The conclusion reached is that in spite of Tacitus' silence on many important phases of life, and in spite of a few passages that are simply satirical flings at Roman society, Tacitus' account is a fairly true, though limited, picture of the barbarians living on or beyond the borders of the Roman Empire, and that his observations compare favorably with the descriptions of barbarians given by the anthropologists of our own day.

RUTH BLACKWELDER. The Attitude of the North Carolina Moravians Toward the American Revolution. (Under the direction of R. D. W. CONNOR.)

The founders of the Moravian Church considered war and military service inadmissible, but the church left the matter to the conscience of the individual member. Their experience in Europe, however, demonstrated to the Moravians that their numbers increased when they suffered persecution for refusing to engage in war, and this fact confirmed them in their convictions.

As the Moravians were industrious colonists, England was anxious to encourage their migration to America; accordingly, in 1749 Parliament passed an act exempting them from personal military service. During the French and Indian War the Moravians in North Carolina fortified their settlement, but refused to engage in battle.

Throughout the decade 1765-1775, the Brethren in Wachovia took no part in the protests against the royal government. After the Declaration of Independence, however, they promptly transferred their allegiance to the new state government.

During the War of Independence the older Brethren declined to engage in battle, but fed the soldiers, cared for the wounded, served in political positions, and paid the triple taxes required by the state; they objected to being classed as Tories. Others who had joined the Unity shortly before the Revolution, had no conscientious scruples against oaths and military service; therefore, they

took the state oath and served in the army. The Brethren as a whole became known as loyal citizens who, though refusing to bear arms, contributed money and provisions which were just as necessary as were soldiers for the battlefield.

SCHOOL OF LAW

CHARLES T. McCORMICK published during the year the following articles:

Some Phases of the Doctrine of Exemplary Damages. *North Carolina Law Review*, VIII: 129-151.

The Borderland of Hearsay. *Yale Law Journal*, XXXIX: 489-504.

He is now engaged in the preparation of a general textbook on the subject of the Law of Damages.

A. C. McINTOSH has published during the year:

North Carolina Practice and Procedure in Civil Cases. West Publishing Company, St. Paul, Minn. 1200 pp.

The discussion is intended to cover the whole field of civil practice in North Carolina, with a comparative study of statutes and cases from the State Supreme Court, and references to cases from other courts for comparison.

The subjects treated are: courts and jurisdiction, parties, venue, process, pleadings, trial, judgments, appeals, execution, provisional remedies, special proceedings, motions, and costs.

M. T. VANHECKE has published the following articles:

Parol Trusts in North Carolina. (With B. THORN LORD.)

A critical discussion of the extent to which a trust in land may be created in North Carolina without a writing.

North Carolina Annotations to the American Law Institute's Restatement of Contracts. (With WALTER HOYLE, Research Assistant.)

A critical discussion of the relationship between the decisions and statutes in this jurisdiction and the codification of the law of contracts as embraced in the Restatement.

DEPARTMENT OF MATHEMATICS

J. W. LASLEY is studying certain osculants associated with a given plane curve.

Some of these, tangent and circle of curvature, have become everyday terms in mathematics; others, such as the four-point parabola, the four-point equilat-

eral hyperbola, and the five-point conic, are almost unknown to current mathematical literature. The net and pencils of conics of which these osculants may be regarded as members, properties of these, and other osculants and their interrelations form the basis of this study. Abel Transon in 1841 found a construction for the four-point parabola. This construction can be extended to each member of the pencil of three-point parabolas by replacing the axis of aberrancy employed by Transon by a line called the axis parallel. A construction for the four-point equilateral hyperbola is thus found, giving simple constructions for its axis and asymptotes. This construction is generalized so as to extend to each member of the pencil of three-point equilateral parabolas. The equations of these loci are obtained referred to a local reference frame. Some of the relations between these osculants are pointed out.

E. T. BROWNE has completed the following studies :

On the Separation Property of the Roots of the Secular Equation. Accepted for publication in the *American Journal of Mathematics*.

If A is a square matrix whose conjugate imaginary \bar{A} is the same as its transpose A' , A is called *Hermitian*. If we denote by I the *unit matrix*, $A - \lambda I$ is called the *characteristic matrix* of A . The equation $L_i(\lambda) = 0$ of degree i obtained by equating to zero the principal minor determinant of order i standing in the upper left hand corner of $A - \lambda I$ plays a very important role in analysis. In particular, if A is real, this equation is called the *secular equation*, since it was first used by LaPlace in the determination of the secular inequalities of the planets.

It is well known that the roots of $L_i(\lambda) = 0$ are all real and that in general the roots of $L_i(\lambda) = 0$ separate those of $L_{i+1}(\lambda) = 0$. However, in case the former equation has a multiple root, the sense in which this *separation* takes place is not exactly clear, since a root of multiplicity m of $L_i(\lambda) = 0$ may be a root of multiplicity $m-1$, m or even $m+1$ of $L_{i+1}(\lambda) = 0$. In this paper a study is made of the separation property in the case where $L_i(\lambda) = 0$ has multiple roots.

The Characteristic Roots of a Matrix. Presented before The North Carolina Academy of Science.

If A is any square matrix of order n and I is the unit matrix, the equation in λ obtained by equating to zero the determinant $|A - \lambda I|$ is called the *characteristic equation* of A . The roots of this equation are called the *characteristic roots* of A . Although no definite statement can be made as to the nature of the characteristic roots of the general algebraic matrix A , Bendixson, Hirsch, Bromwich, and others have given upper limits to the roots. Some of these are given in terms of the matrix itself, while others are given in terms of the characteristic roots of auxiliary matrices. The author gives an upper limit in terms of the elements of the matrix itself, which for the general complex matrix can never give wider limits and usually gives narrower limits than those of

Hirsch and Bromwich. The theorem is as follows: If $S_i (T_i)$ is the sum of the absolute values of the elements in the i th row (column) of a square matrix A , and if $S (T)$ is the greatest of the $S_i (T_i)$, the absolute value $|\lambda|$ of a characteristic root λ of A cannot exceed $(S + T)/2$.

From the theorem there are derived as corollaries upper limits to the numerical values of the real part and of the imaginary part of λ . Hirsch's and Bromwich's criteria follow as special cases of the criteria here given.

ERNEST L. MACKIE has derived the Euler-Lagrange necessary condition for an isoperimetric problem minimizing the quotient of two arbitrary functions. Presented before the Mathematics Section of the North Carolina Academy of Science.

The following master's theses were accepted by the Department during the year:

MARGARET BRUTON. The Study of the Lorentz Transformation. (Under the direction of ARCHIBALD HENDERSON.)

The Lorentz Transformation, which plays a classic rôle in the Special Relativity Theory, is made the particular study of this paper. The leading methods of solution, from Einstein to Pars, have been analyzed and compared.

The Lorentz Transformation effects a correlative connection between rectilinearly moving systems in uniform translation with respect to each other. The characteristic feature is that time is reckoned differently in the two systems.

EDWARD CALEB COKER, JR. Dimensionality in Projective Geometry. (Under the direction of J. W. LASLEY, JR.)

In this paper there is given a connected account of the various points of view on the subject of dimensionality in projective geometry. Both the geometric and the analytic approaches are discussed and harmonized. The notion of one-to-one correspondence is shown to play a prominent rôle. Proper standards of measurement for dimensionality are laid down. It is shown that a configuration does not have a definite dimension which remains invariant, however we may regard the space, but that the dimension of a configuration usually varies with each element that generates it. Dimensionality, then, is not an inherent property of forms or classes of configurations as such, but is a property of the order in the class.

HARRY LESLIE DILLIN. Infinite Series. (Under the direction of ERNEST L. MACKIE.)

A short historical treatment of infinite processes, beginning with the time of Newton and Leibnitz and ending with the various methods of testing series of constants for convergence and divergence, forms the first part of this study. Proofs are given that convergent series obey the fundamental laws of algebra.

In the next part series of functions are considered from the standpoint of uniform convergence. The existence of an interval of convergence is established for real power series, a special class of the above, and it is shown that within any closed interval contained within this interval, which may be open, a power series defines a continuous analytic function.

Some time is also given to Taylor's expansion for two or more variables, Fourier series, infinite products, and methods of summation of particular series. A brief interpretation is given of the "sum" of certain divergent series with illustrative examples.

ROBERT LEE GARRETT. Reduction of Quadratic Forms to Canonical Form. (Under the direction of E. T. BROWNE.)

This paper gives some methods of reducing a quadratic form to a form involving no product terms and only square terms. Six methods are treated; among these are included the methods of Darboux, Lagrange, Kronecker, the reduction by means of an orthogonal transformation, the reduction used by Gundelfinger in formulating the law for determining the number of positive and negative coefficients, and the method given by Kowalewski. A comparison of these various schemae is made. Some of them are practical methods for reduction; others are less useful from the standpoint of application but valuable as existence theorems, and the proofs are elegant.

JOHN ALVAH LEE SAUNDERS. Methods of Interchanging Point and Line Equations of Plane Curves. (Under the direction of J. W. LASLEY, JR.) (August, 1929.)

This paper treats a number of methods of interchanging different types of point and line equations, with illustrations. Any equation in two variables may represent a point locus or line locus depending on whether the variables are interpreted as point or line coördinates. Therefore, any property of an equation has a twofold interpretation. This fact leads to one of the most far-reaching principles of mathematics known as the "principle of duality." This thesis gives methods by which a locus may be represented by either kind of equation, to permit its study from either or both points of view.

JAMES JEREMIAH SLADE, JR. The Coördinates of Geometry. (Under the direction of J. W. LASLEY, JR.)

A brief and connected account is given of the principal coördinate systems used in the analytical investigation of geometrical relations. The metrical types which are based on our intuitive appreciation of physical space are discussed first. Then is taken up the problem of the analytical representation of non-rigid transformations which give rise to descriptive and projective geometries. A synthetic derivation of a coördinate system for pure projective geometry establishing a connection logically between the numbers of analysis and the elements of geometry is developed at length. The paper ends with an

account of the coördinate systems for multidimensional spaces and manifolds in which the element is taken as any configuration which admits of analytical expression.

GEORGE RICHARD TROTT. Some Properties of Functional Determinants and their Application to Elementary Mathematics. (Under the direction of E. T. BROWNE.)

In this paper a study is made of the more important properties of the so-called *functional determinants*, i.e., the *Jacobian* and the *Hessian*. The definition of a functional determinant is given. This is followed by proofs and applications of the more fundamental theorems concerning such determinants, i.e., those theorems which a student is most likely to encounter in his further reading. For the purpose of simplicity the Jacobian and the Hessian are considered separately.

LOTTIE CROSLAND WILSON. Various Types of the Equations of Curves with Application to Elliptic Motion. (Under the direction of A. S. WINSOR.)

An attempt is made to study the properties of motion in elliptic orbits under central forces. The first part deals with intrinsic equations, pedal and polar reciprocal curves, Legendre's formulas, Cartesian and Cassinian ovals, all studied for use in the Inverse Square Law Case. The second part takes up the problem of two bodies in parabolic orbits and the equation analogous to Kepler's for the Direct Distance Law.

DEPARTMENT OF PHARMACOLOGY

WILLIAM DE B. MACNIDER has completed the following papers during the year :

Urine Formation During the Acute and Chronic Nephritis Induced by Uranium Nitrate. A Consideration of the Functional Value of the Proximal Convolute Tubule. *American Journal of the Medical Sciences*, CLXXVIII: 4:449. 1929.

(This was a Harvey Society Lecture for 1928-1929, and is to be found in *The Harvey Lectures, 1928-1929*. Williams and Wilkins, Baltimore.)

The Factor of Age in the Reaction of the Individual. *Southern Medicine and Surgery*, XLII: 314. 1930.

The Nephrotoxic Action of Repeated Injections of Uranium Nitrate in the Dog. A Functional and Pathological Study. Presented before the International Physiological Congress, Boston, August, 1929. *The American Journal of Physiology*, Vol. XC, No. 2. October, 1929.

PROFESSOR MACNIDER has the following problems under investigation:

The susceptibility to injury and the mechanism of repair of the uriniferous tubule in the dog kidney.

The insulin-like action of white snake root.

A consideration of the factor of the age of an animal in its ability to effect epithelial repair.

The stability of the acid-base equilibrium of the blood in puppies as contrasted with adult and senile dogs.

A consideration of the instability of the acid-base equilibrium of the blood in pregnant dogs. The prophylactic value of ascertaining such a disturbance as an indication of the commencement of certain pregnancy toxæmias.

The histology of the kidney in *Protopterus ethiopicus*, *Polypterus senegalus*, and *Periophthalmus kohltreuteri*. (Aided by the Laura Spelman Rockefeller Grant for Research.)

PROFESSOR MACNIDER, as the recipient by award of the New York Academy of Medicine of the Gibbs Prize for Research, plans to utilize the fund in further research in Chronic Nephritis.

DEPARTMENT OF PHYSICS

OTTO STUHLMAN, JR., and O. P. HART. Relative Intensities of Arc and Spark Lines of the Electrodeless Discharge in Mercury Vapor.* Read before the American Physical Society, Washington, April 25, 1930.

Excitation of discharge took place in a 12.5 cm. spherical bulb placed inside a helical coil 14.5 x 44 cm. when the latter was supplied with damped high frequency current. Three sets of spectrograms were taken—(A) radiation intensity as a function of pressure with frequency and potential constant. (B) Intensity as a function of frequency with potential and pressure constant. (C) Intensity as a function of potential with frequency and pressure constant. Spectrogram series A showed that as the air pressure was decreased (0.026 to 0.0005 mm.) the intensity of the arc lines increased, whereas the intensity of the spark lines decreased. Series B showed that as the frequency of the excitation current was increased the intensity of the arc lines increased. No spark lines were observed at low air pressure (0.0002 mm.). Series C showed that as the potential between the terminals of the coil was increased the intensity of the arc lines increased. No spark lines appeared at this pressure (0.0002 mm.). At low air pressure and with increasing potential the triplet 4358,5460,4047 first

* Cf. abstract of doctoral dissertation of O. P. Hart, p. 58.

appeared followed by the singles 5790,4347,3906 in order of decreasing intensities.

OTTO STUHLMAN, JR., M. D. WHITAKER, and M. L. BRAUN. High Frequency Electrodeless Discharge Characteristics. Read before the American Physical Society,* Washington, April 25, 1930.

These discharges are classed as primarily due to electrostatic and to electromagnetic fields. Excitation by damped and by undamped frequencies are considered. The investigation involved the production of the glow discharge in mercury vapor as a function of frequency, pressure, current, and visual intensity. With a predominant electrostatic excitation and damped frequencies no simple relation was found to exist between visual intensity of the discharge and pressure, current, and frequency. However, consistent irregularities, characteristic of the gas and the mode of excitation, were obtained. With continuous wave and predominant electromagnetic excitation the minimum currents necessary to initiate, and sustain, the glow discharge were investigated at pressure ranging from 0.1 to 2.0 mm. For each frequency there exists a critical pressure at which the current through the coil required to initiate the glow discharge, and the current required to sustain it, are at minimum values. The ratio of these two currents is not constant for all pressures, but generally increases with increase in pressure. A characteristic transition from spark discharge at high pressure to arc discharge at lower pressures occurred near 0.025 mm.

OTTO STUHLMAN, JR. The Motion and Bursting of Gas Bubbles Rising Through Liquids. Read before the Elisha Mitchell Scientific Society, May, 1930, and before the North Carolina Academy of Science, Durham, May, 1930.

Gases were bubbled through distilled water at various temperatures. With the source a capillary opening, and bubbles rising at a constant rate, but from a sufficient, constant depth so that their terminal velocities were constant, it was found that the bubbles on passing through the surface of the liquid burst into three fragments. The height-distribution curves for each fragment showed in general a Maxwellian distribution. The maximum height obtained from the curves when plotted against the temperature of the water showed a minimum near 35° C. Of the three fragments examined for height-distribution, one showed no change in average height as a function of temperature. The experiments were repeated with benzene. Here the height as a function of temperature showed no minimum. Other liquids are under examination and by means of these it is hoped to interpret more in detail the results for water.

PROFESSOR STUHLMAN has the following studies under way:
Intensity Distributions in the Electrodeless Spectra of Gases.

* Cf. the doctoral dissertation of M. L. Braun, p. 57, and the master's thesis of M. D. Whitaker, p. 59.

The Molecular Structure of Water. (With HENRY ZURBURG.)

Intensity Distributions in the Ultra-Violet Electrodeless Arc Spectrum of Mercury. (With HENRY ZURBURG.) (Progress on master's thesis).

Studies in the Application of Negative Resistance Methods. (With H. B. MULKEY.) (Progress on master's thesis.)

E. K. PLYLER and T. R. BURDINE. The Infra-Red Absorption of Some Organic Liquids. (Master's thesis by T. R. BURDINE.) *Physical Review*, March 15, 1930.

The infra-red absorption spectra of fourteen organic compounds, including seven alcohols and seven miscellaneous compounds, have been studied in the region from 1μ to 7.5μ . The bands in the region from 1μ to 3μ have been classified as overtones or combination bands of the assumed fundamental bands for the alcohols at about 3.00μ , 3.4μ , 6.8μ , and 9.8μ . By the use of Sappenfield's work for the region from 1μ to 2μ , and that of Weniger from 7.5μ to 10μ , and the present work a fairly complete idea of the infra-red absorption spectra of the alcohols has been obtained. The intensity relations have been discussed briefly and it was shown that they were in general in accordance with combinations attributed to the different bands. The bands of the miscellaneous organic compounds have been classified, but all the bands have not been included, as only the fundamentals at 3.4μ and 6.8μ were used. A probable reason for the similarity of the infra-red spectra of many organic compounds in the region from 1μ to 3μ has been suggested.

E. K. PLYLER and J. P. STEELE. The Infra-Red Absorption Spectra of Organic Nitrates. (Master's thesis of J. P. STEELE.) *Physical Review*, August 15, 1929.

For abstract see *Research in Progress*, 1928-1929, p. 73.

E. K. PLYLER has under way the following research:

The Infra-Red Absorption Spectra of Water Vapor. (With W. W. SLEATOR of the University of Michigan.)

The absorption bands of water vapor have been measured with very high resolution of an infra-red grating spectrometer and a large number of lines not previously observed have been found. The experimental work has been completed and calculations are being made on the data, especially with the idea that the arrangement of the atoms in a molecule may be found.

The Effect of Temperature on the Absorption Bands of Crystals.

A study is now in progress on the effect of temperature on the infra-red absorption bands of crystals. It has been found that an increase in temperature causes a change in position and intensity of the bands. In some bands the

intensity increases and in others it decreases. The further work of the problem consists in finding how certain types of bands change and then seeing if an adequate explanation of the observed facts can be given.

The following doctoral dissertations were accepted by the Department during the year :

MILTON L. BRAUN. Current, Frequency, and Pressure Relationships for the Initiation and Maintenance of the Electrodeless Glow Discharge in Gases. (Under the direction of OTTO STUHLMAN, JR.) *Physical Review*, October 1, 1930.

A differentiation is made between the glow discharge and other forms of the so-called electrodeless discharge. Characteristics of the glow discharge as excited by undamped oscillations in hydrogen, nitrogen, oxygen, and carbon dioxide are studied with particular emphasis on the relationship between pressure, frequency, and the current required to initiate the discharge. There is found a critical current, I_c , and a critical pressure, P_c , for each frequency. It is also found that the critical current is an inverse function of the square of the frequency, governed by the following relation,

$$I_c = a \lambda^2 + b$$

where λ is the wave-length in meters, a and b being experimental constants which have been evaluated for the respective gases. It is also noted that the ratio of the critical current to the critical pressure is constant for all frequencies, and is expressed by the relation

$$I_c = k P_c$$

the experimental constant, k , varying with the nature of the gas. Certain contrasts which arise as a result of the work of B. Davis on the electrodeless ring discharge are discussed.

J. FENTON DAUGHERTY. The Infra-Red Absorption Spectra of Benzene and Its Halogen Derivatives. (Under the direction of E. K. PLYLER.) *Physical Review*, XXXIV: 1549. 1929.

The infra-red absorption spectra of liquid benzene and its halogen derivatives have been measured from 1.00μ to 7.50μ . The near infra-red bands of benzene at 2.17μ , 2.45μ , and 2.705μ have been found to agree very well with the results of other observers, and several weak bands have been found which have not been previously noted. In the region from 1.00μ to 3.00μ cells of various thicknesses were employed. From 1.00μ to 1.25μ a cell 5.25 mm. thick was used, from 1.45μ to 2.00μ a cell 3.35 mm. was employed, and in the region from 2.00μ to 2.80μ the cell was 0.74 mm. thick. The region at 3.30μ has been studied in detail and different maxima have been found at 3.285μ , 3.315μ , and 3.435μ . The cell thicknesses used in this region were 0.74 mm., 0.225 mm., and 0.12 mm., and it was found that the thinnest cell brought out the separate maxima most clearly. The region from 5.00μ to 7.50μ shows five bands for benzene at 5.06μ , 5.56μ , 6.20μ , 6.74μ , and 7.16μ , the cell thickness being 0.24 mm.

The general absorption of the halogen derivatives is quite similar to that for benzene; however, the bands differ somewhat in position of the maxima and in the weaker bands. The more intense bands in the near infra-red have been classified as overtones or combination bands, and the agreement between calculated and observed bands is satisfactory.

OLIVER P. HART. Relative Intensities of Arc and Spark Lines of the Electrodeless Discharge of Mercury Vapor. (Under the direction of OTTO STUHLMAN, JR.) Read before the North Carolina Academy of Science, May, 1930.

This investigation attempts to determine the relationship, with other factors constant, between (1) intensity and pressure; (2) intensity and potential; and (3) intensity and excitation frequency for arc and spark lines of mercury in the electrodeless discharge.

Excitation of discharge took place in a 12.5 cm. spherical bulb surrounded with a helical coil of 25 turns of heavy copper wire when the latter was supplied with damped high frequency current.

Three sets of spectrograms were taken. (A) Intensity as a function of pressure with temperature, potential, and excitation frequency constant. (B) Intensity as a function of potential with temperature, excitation frequency, and pressure constant. (C) Intensity as a function of excitation frequency with temperature, pressure, and potential constant.

The intensity-pressure spectrograms disclosed a maximum intensity for arc lines at 8 microns. The spark line intensity increased exponentially. The pressure spectrograms are recommended for study of the mutual influence of arc and spark spectra. They are also recommended for detecting and measuring quantitatively the amount of impurity in a substance.

The intensity-potential spectrograms, besides showing the intensity distribution of arc and spark lines with varying potential, disclose a method of easily distinguishing between spectra from atoms according to the degree of ionization.

The following master's theses were accepted by the Department during the year :

KARL Z. MORGAN. The Effect of External Resistance in the Plate-Filament Circuit of Radiotrons. (Under the direction of OTTO STUHLMAN, JR.) Read before the North Carolina Academy of Science, May, 1930.

Resistances of several megohms were placed in the plate-filament circuit of various types of radiotrons and results were obtained showing the relation between plate-filament current and the total electromotive force in the circuit. From the relations thus obtained values were computed for the potential drop across the plate and filament and, by the use of these values, other current-potential curves were constructed. The current-electromotive force curves con-

sisted of two approximately straight lines with a slope equal in magnitude to the sum of the external resistance and the resistance to the flow in the tube of the primary stream of electrons. These two portions of each curve were connected by two vertical lines indicating zero resistance. The computed curves of the current as a function of the potential drop across the plate and filament were made up of two curved portions similar in form to parts of the curves obtained when no external resistance was in the plate-filament circuit. These two broken curves were separated by jumps in current and potential, the magnitude of which depended on the external resistance, the grid potential, and the type of tube used.

MARTIN DEWEY WHITAKER. The Photometric Characteristics of the Electrodeless Discharge in Air and Mercury Vapor. (Under the direction of OTTO STUHLMAN, JR.) Read before the North Carolina Academy of Science, May, 1930.

A spherical bulb containing air and mercury vapor was placed in a solenoid carrying high frequency currents of damped amplitude. The visual intensity of the resultant discharge was studied under various conditions of pressure, frequency, and current. The visual intensity of the discharge was compared with an arbitrary standard by means of a flicker photometer. No simple relation was found to exist between visual intensity of the discharge and pressure, current and frequency, but consistent irregularities were observed. The visual intensity of the discharge was at maximum value at a pressure of about 3 microns for all values of the exciting current, but the minimum measurable intensity shifted from higher to lower pressure as the exciting current was decreased. Periodic breaks were found to exist in curves showing visual intensity as a function of exciting current. Maximum values of visual intensity were found for wave lengths of 252, 358, and 490 meters.

DEPARTMENT OF PSYCHOLOGY

J. F. DASHIELL has published during the year :

Direction Orientation in Maze Running by the White Rat. Presented before the International Congress of Psychology. *Comparative Psychology Monographs*, VII, No. 2, 72 pp. April, 1930.

The rat when running a maze shows some direction-orienting tendency that operates independently of specific stimuli to particular local movements, and enables it to pursue pathways never before trod, yet without wrong turns. To isolate this function was the problem of several different researches, from 1925 to 1929, using principally an open-alley type of mazes with criss-crossing pathways. Systematic elimination of all exteroceptive cues (visual, auditory, olfactory) reduced the phenomenon to one of intra-organic controls, and these were found to be dependent upon direction of first entrance into maze. Hypothetical explanations include: persisting segment of initial orientation,

compensatory corrections, and forward-going locomotor tendency. On the negative side the paper furnishes clear evidence against a theory of learning as a chained sequence of discrete action-units.

Variations in Psycho-motor Efficiency in a Diabetic with Changes in Blood-Sugar Level. *Jour. Comparative Psychology*, X: 189-197. April, 1930.

At intervals through normal days a diabetic patient was tested in strength, in cumulative adding, in color perception-time, and in serial discrimination; and with these results were compared tests made during the conditions induced by underdosage of insulin and by overdosage. (1) Deterioration was observed in all four functions during both abnormal conditions; (2) in hypoglycemia the deterioration was more rapid and profound; (3) it did not parallel rate of change in blood-sugar level; (4) deterioration is apparently mainly in the higher nervous centers.

Personality Traits and the Different Professions. *Jour. Applied Psychology*, XIV, June, 1930.

Ratings of personality traits by teachers in five professional schools on the basis of supposed importance for success in the respective professions, showed almost as much correlation between the ratings by teachers in different professions as between those by teachers within each alone. Implications follow as to the nature of 'profession,' of 'trait,' and of the properly trained rater.

Some Simple Apparatus for Serial Reactions. *Jour. Experimental Psychology*, XIII: 352-357. August, 1930.

For the measurement of continuous reactions of serial types four pieces of apparatus, devised and successfully used by the writer, are described. Variety in the features of the four makes them usable singly or in combination for different sorts of experimental problems.

An Experiment on Social Influences upon Individual Work. *Jour. Abnormal and Social Psychology*, XXV: 190-199. July-September, 1930.

Three types of thought functions (computation, analogical thinking, and serial associations) were tested under five different social conditions: individuals working together non-competitively, working competitively, working alone simultaneously, working alone non-simultaneously, and working under spectators' gaze. Findings include: no clear 'social facilitation'; isolation of the rivalry factor; differentiation of the simultaneous and non-simultaneous 'alone' situations.

PROFESSOR DASHIELL is completing:

An Experimental Study of the 'Forward-Going' Tendency in Animal Locomotion.

A Theoretical Analysis of the Legal Concept of 'Intent.' (With R. H. WETTACH.)

The following doctoral dissertation was accepted by the Department during the year :

KEY LEE BARKLEY. The Development and Demonstration of a New Method for Determining the Relative Efficiencies of Advertisements in Magazines—With Three Subsidiary Studies: Commodity Preferences, False Recalls, Sex Differences. (Under the direction of H. W. CRANE.)

This research develops a new method for determining the relative efficiencies of advertisements in magazines. The traditional methods of determining the efficiencies by use of the per cent of recall, or the average rank or order of recall, are to be considered inadequate. Some method is needed which will give consideration to both these factors simultaneously. The formula developed in this work meets that need as far as possible at present.

The history and development of the following formula used in this work are traced:

$$\frac{N^2}{\text{Sum R}} \times \frac{100}{gn} = E$$

Where

N = Number of recalls

Sum R = Sum of the ranks

gn = Number of subjects in the experimental group

100 = Standard number of reference

By its use the resulting indices of efficiency are rendered in terms of what they would have been under theoretically like conditions if a group of one hundred subjects had been used, but it makes no correction for a difference in the size of the advertising section. Another statement of the formula which is projected as final, but which must wait until further research is done for definite determination of all its elements, is as follows: $\frac{N^2}{\text{Sum R}} \times \text{GK} = E$ where

the symbols are the same as given above, except GK which means "group constant." This statement makes corrections for differences in size of the group of subjects used and in numbers of advertisements. GK is determined in a special manner as explained in the paper and corrects for differences in the experimental conditions. The formula as last stated renders the resulting indices of efficiency in terms of what they would have been under the stated conditions if a group of one hundred subjects and an advertising section comprising one hundred advertisements had been used. All the elements entering to determine GK have not been satisfactorily demonstrated; and since the conditions of the experiments herein reported did not necessitate the use of GK, the results have been given as determined by the former statement of the formula.

In addition, three subsidiary studies were completed. In order to determine what commodities were preferred by the groups of subjects, the twenty advertisements with the highest indices of efficiency in each group were selected and studied. The order of preference was as follows:

1. Automobiles and automobile accessories.
2. Foods.
3. Clothing.
4. Commodities for entertainment.
5. Articles for personal use.
6. Miscellaneous.

The second study was a consideration of the false recalls, that is, those recalls of advertisements not actually in the magazines. Possible reasons were given for the listing of these advertisements.

The third study was of the differences between the reactions of men and women to the same advertising materials. A correlation of $\text{plus } .737 \pm .0245$ was found between the reactions of men and women to the whole group of advertisements. It was found that men reacted more readily and frequently to advertisements concerning automobile accessories, business and work, clothing for men, and materials for shaving. Women reacted more readily and frequently to advertisements of food, household furnishings and household supplies, moving pictures, and clothing for all the family. The conclusions show no significant difference between the reactions of men and women to advertisements of general interest, but a notable difference between the reactions of men and women to advertisements of certain selected commodities, which may be explained on the basis of a difference in the training.

DEPARTMENT OF PHYSIOLOGY

FREDERICK P. BROOKS has completed during the year the following investigations:

The Effect of Fatigue on Protein Consumption, *Proceedings of the Society for Experimental Biology and Medicine*, XXVII: 37.

This was a study by means of urinalysis of the effect of fatigue on the protein consumption by medical students. Twenty-four hour specimens from 70 individuals over periods of 105 weeks gave results that indicated a fatigue effect, but the results were not conclusive.

(With F. C. VILBRANDT and R. F. ABERNETHY.) The Vitamin Content of Shrimp Oil. Presented before the Elisha Mitchell Scientific Society.

The results indicate that shrimp oil has a vitamin D content of high potency, but somewhat less than that of high grade medicinal cod liver oil. This study is being continued.

PROFESSOR BROOKS is continuing his investigation of the chemistry of cholesterol and is working on a colorimetric quantitative method for the determination of chloral.

DEPARTMENT OF ROMANCE LANGUAGES

WILLIAM M. DEY has in preparation an article on Stendhal as Judge of the Literature of his Time.

STURGIS E. LEAVITT has published :

Apples of Hesperides in the *Estrella de Sevilla*. *Modern Language Notes*, XLV : 314.

He has in preparation :

The *Estrella de Sevilla* and Andrés de Claramonte.

A study of the sources and date of the play; discussion of the question of interpolations; the life and works of Claramonte; and conclusions regarding the extent of his participation in the composition of the *Estrella*.

Spanish-American Literature in the United States.

An investigation of the growing interest in this field, from vague gropings in the early nineteenth century up to the present time. A bibliography of translations, critical articles, school texts, etc., will be included.

URBAN T. HOLMES has in press :

Old French *Yonec*. In *Modern Philology*.

Old French *mangon*. In *Modern Language Notes*.

A Study in Negro Onomastics. In *American Speech*.

He has completed :

A History of Old French Literature (Origins to 1300), issued in mimeographed form by the University Book Exchange, Chapel Hill.

The Works of Guillaume de Salluste, Sieur du Bartas, vol. I. (With J. C. LYONS and others.)

The Germanic Influences on Old French Syntax.

The Idealistic Philology of Karl Vossler. A paper read at the meeting of the Modern Language Association, December 28, 1929.

PROFESSOR HOLMES has in preparation :

A History of the French Language. (With A. H. SCHUTZ of the Ohio State University.)

H. R. HUSE is completing a study on problems of language learning. It contains a critical review of experiments that relate directly to language study, and a summary of certain experimental data on learning and recall.

N. B. ADAMS has published during the year :

A Spanish Romanticist Parodies Himself: *Los hijos del tio Tro-nera*. *Publications of the Modern Language Association*, XLV: 573-577. 1930.

PROFESSOR ADAMS presented the following paper :

Some Literary Treatments of the *Pastelero de Madrigal*. Read before the Philological Club.

He has in preparation studies on Juan Eugenio Hartzenbusch.

J. CORIDEN LYONS has had accepted for publication :

1. A Neglected Manuscript: Guillaume Colletet's *Vie de Maurice Scève*. *Modern Philology*, XXVIII: 13-27. 1930.

2. Conceptions of the Republic in French Literature of the Sixteenth Century. (To appear in the *Romanic Review*). Preliminary sketches of this study were read during the year before the Comparative Literature Section of the Modern Language Association and before the Philological Club.

PROFESSOR LYONS has been engaged during the year on the following projects :

1. An edition of the works of Salluste du Bartas. (In collaboration with U. T. HOLMES and others.)

2. Further investigation in the field of popular literature in France in the early sixteenth century.

RALPH S. BOGGS has completed the following research :

Seven Folktales from Porto Rico. *Journal of American Folklore*, XLII: 164:157-166. 1929.

Texts collected by the author and notes.

Index of Spanish Folktales. *Folklore Fellows Communications*, No. 90. 216 pp.

A Study of the Personality of the Folktale Hero. Accepted for publication in the *Journal of American Folklore*.

A Comparative Survey of the Folktales of Ten Peoples. *Folklore Fellows Communications*, No. 93.

A Selective Bibliography of Dominican Literature. *Bulletin Hispanique*. (In press.)

He has in preparation a book on the Anthology of Spanish Folktales in English Translation, and studies on the Old Spanish dictionary and Spanish bibliography.

WILLIAM CALLIER SALLEY published during the year:

Notes on the *Burlador*. (With M. L. RADOFF.) *Modern Language Notes*, April, 1930.

The following doctoral dissertations were accepted by the Department during the year:

MYRON IRVING BARKER. *The Style and Literary Tendencies of Stendhal in His Novels*. (Under the direction of W. M. DEY.)

In this study no attempt was made to decide whether Stendhal wrote well or poorly. Many of Stendhal's lexicographical and stylistic devices, such as his choice of words, repetition of both words and phrases, vocabulary, slight tendency toward the use of archaisms, the constant use of asides, the rarity of word coinings and alliteration, are discussed. Stendhal's method of correcting his style shows that, instead of actually correcting the manner of presentation of his material, he expanded certain passages in the same style in which they were originally written. Stendhal wrote rapidly, but sought clarity regardless of the arrangement of his words and phrases.

The lyrical elements in Stendhal's writing have been commented upon as well as his sociability. In spite of much adverse criticism he remained essentially a sociable writer, never forgetting his reader and constantly addressing him by means of asides set off in parentheses. Stendhal showed definite romantic traits, especially in his treatment of characters. His reference to nature is very sparing in comparison with the amount of writing, but what references there are to it show him to be a romanticist in the *Rouge et Noir* and the *Chartreuse de Parme* but a naturalist in *Lucien Leuwen*. Stendhal shows tendencies toward both realism and naturalism—the naturalism of Zola—and seems to have a desire to shock his readers. The plot in the novels is their weakest part: there is very little action considering their length, and it is usually poorly motivated. The plot is merely a very frail thread to hold together Stendhal's rapid flow of ideas.

The general conclusions reached are: Stendhal was more interested in his ideas than he was in manner of presentation; there are tendencies in his novels so conflicting that it is impossible to assign him a place in any definite literary movement or school; his disposition was such that he was very careless in his use of words or phrases and, unfortunately, unable to correct his work, but nevertheless attained his goal—*clarté*.

WILLIAM CALLIER SALLEY. *The Attitude of the Spanish Romantic Dramatists toward History.* (Under the direction of N. B. ADAMS.)

This study seeks to establish the attitude of the Spanish Romantic dramatists toward the employment of history in the drama. In this endeavor an examination is made of the use of history in the drama by the authors of the Siglo de Oro, of the drama of the early nineteenth century in France, and of representative authors of the Romantic period in Spain.

Very few expressions in regard to the use of history are made by the Spanish Romantic dramatists. History had been employed on the Spanish stage from a very early date and therefore was not an innovation on the part of the Romanticists. They continued its use, differing from the Siglo de Oro manner of treatment mainly in putting stress on the subjectivity of historical characters presented on the stage, a procedure not followed by the earlier playwrights. Like the authors of the Siglo de Oro and those of the early nineteenth century in France, the Spanish Romanticists felt free to change a legend or the facts of history to suit their dramatic purposes. Although there are some plays of this period which present a faithful picture of the epoch portrayed and really enter into the spirit of the time, the majority have no true historical atmosphere. The Spanish Romantic dramatists were deeply interested in history, particularly in the past of their own country; but as a rule they display no deep insight or knowledge of the situation or characters which they present. The interest of the Spanish Romantic dramatists in history was due in a large measure to patriotism.

STERLING AUBREY STOUDEMIRE. *The Dramatic Works of D. Antonio Gil y Zárate.* (Under the direction of N. B. ADAMS.)

This thesis is an attempt to fill a lacuna in the history of the Spanish drama of the first half of the nineteenth century. This study seeks to classify Gil y Zárate's plays, to arrive at their sources where possible, and to place their author in his correct milieu.

Because numerous literary historians have not been correctly informed concerning some of the important facts of Gil y Zárate's life, the study begins with a short biography, based largely on unpublished documents. Since this playwright was a critic as well as a dramatist, a careful outline of his dramatic creed, taken from his *Manual de literatura* and several periodical articles, has been inserted. This is used in order to check his practice against his theory. A detailed study of his comedies, tragedies, *dramas*, and translations and adaptations is presented. Gil y Zárate began his career with the immature *Cómico-manía* but soon developed into a most careful composer of comedies of manners. When the classical tragedy became the fashion, he composed *Blanca de Borbón* and *Rodrigo*, although he suffered reverses at the hands of the ecclesiastical censor. Because of the unwarranted criticism, he turned his efforts to translations, and produced nine that vary from slavishly literal versions to most liberal adaptations. By far the most important part of his work is com-

posed of *dramas*, plays that combine both the elements of tragedy and those of comedy. In this class *Carlos II el Hechizado* and *Guzmán el Bueno* are pre-eminent: the first, because it is an example of violent, Romantic melodrama, and the second, because it is in all respects his best play and one of the best historical dramas of that period. Naturally, these plays are studied in considerable detail.

In short, it is found that Gil y Zárate followed the prevailing taste of the public at the moment when he was writing.

The following master's theses were accepted by the Department during the year:

JAMES HOBART ALLRED. A Comparison of Benavente's *Los Intereses Creados* and *La Ciudad Alegre y Confiada*, with Beaumarchais's *Le Barbier de Séville* and *Le Mariage de Figaro*. (Under the direction of S. E. LEAVITT.) (August, 1929.)

This thesis asks if there may be more than an accidental similarity between two of Beaumarchais's and two of Benavente's plays.

Los intereses creados resembles *Le Barbier de Séville* in plot, characters, comic effect, purpose, and spirit. The subjects of both plays are identical. The two plays make use of the same type characters which are similar in major particulars: clever valets, handsome, mysterious masters, innocent heroines, and ugly, rich old men. Both authors employ low comedy and fast-moving dialogue; both revive ancient comedy and introduce irony; both plays are optimistic.

La ciudad alegre y confiada and *Le Mariage de Figaro* are constructed on a larger scale but use the characters of the first plays. Generally the personages of both dramas are cynical and discontented. In each drama there is comparatively little comic effect. Both plays have to do with a political problem, corruption in governmental officials, which can be solved only by overthrowing the persons responsible. Seriousness, dignity, and bitter satire permeate the body of the dramas, and their spirit is pessimistic.

ELMA ESTELLE HARPER. Some Aspects of the Dramatic Art of Guillén de Castro. (Under the direction of S. E. LEAVITT.) (August, 1929.)

The following conclusions were reached in this thesis. It is found that lies—spoken, written, and acted—are the favorite motivating devices for the action in the plays of Guillén de Castro. It is shown that he uses the plots of certain ballads and even inserts in his plays ballad-passages. Guillén de Castro is quite conventional in his use of natural settings and is not given to excessive comment on the beauties of nature. Only once does he permit himself to express his genuine reaction to it. It is found that fate, prophecies, miracles, and visions in most cases are used with dramatic effectiveness, but in three plays in which there are a series of miraculous occurrences used with the pur-

pose of converting characters to the Christian faith the excessive amount of supernaturalism is weakening. A study of the use by the author of realistic touches shows that appropriate costuming of characters, presentation of horrible spectacles, and live animals on the stage are some of his most effective devices.

KATHERINE NEIL HENDRICKS. Alfred de Musset Portrayed in his Work. (Under the direction of W. M. DEY.)

This study is an analysis of Alfred de Musset as he has portrayed himself through his poetry and dramas. His parentage, his home training, his temperament, his education, his early bent towards literary creation, and his subsequent development are first discussed. The factor of love in Alfred de Musset's life is given detailed treatment, showing his pursuit of the ideal in woman. Love for George Sand was his main inspiration in life, producing his greatest poems, *Les Nuits* and *Le Souvenir*. Musset's poetic temperament is clearly revealed in the disclosure of his heart affairs; his passionate, impulsive nature, his generosity, and his anguish.

Alfred de Musset's religion is discussed as revealed in his poems, *La Confession d'un Enfant du Siècle*, *Lettre à M. de Lamartine*, and a letter to Mme la Duchesse de Castries. Though he was innately religious, Musset's reason and heart struggled against each other during his whole life and he never made any real attempt to practice his religion.

Musset's philosophy of life does not seem to have been due to the influence of the philosophies of his own day, nor to foreign influence, but to his own personal experiences with life. He was an Epicurean in spirit.

AUGUSTUS CAMPBELL JENNINGS. Dramatic Treatments of the Conde Alarcos Legend. (Under the direction of S. E. LEAVITT.)

This thesis contains a study and discussion of the legend of Count Alarcos as presented in Spanish, Portuguese, and Catalan ballads. The ballad originated in Castile, but no conclusion can be reached regarding its date and authorship. From an examination of the *Comedia Serafina* of Torres Naharro, it seems evident that, contrary to Northup's belief, Torres' work has no connection with the legend. Guillén de Castro in *El Conde Alarcos* invented a part, but preserved the spirit of the ballad to a considerable extent, and based two episodes entirely upon it. Lope de Vega in *La fuerza lastimosa* used Castro's play as a source and kept but few of the legendary elements. Friedrich von Schlegel based his *Alarcos* almost entirely upon the Castilian ballad, but seems to have taken two episodes from Lope. José Jacinto Milanés depended entirely upon the Castilian ballad, but gave his drama an original romantic flavor. Jacinto Grau utilized almost all the details of the legend of Castile, but decorated them with much of his own elaboration. Grau is indebted to Milanés and Schlegel for many important suggestions, but strikes an entirely new note in his third act.

WILLIAM MILTON McLEOD. Learned Words in French of the Twelfth Century Renaissance. (Under the direction of U. T. HOLMES.)

An attempt has been made in this study to determine the number and kinds of learned words in French of the twelfth century Renaissance. A total of 1,269 words has been listed. These words have been classified to determine what elements contributed learned forms, and the number in each classification is given. The ecclesiastical group is found to be the largest, the scientific next, and the legal third. Since the clergy directly or indirectly controlled education, the greatest single factor in the intrusion of learned forms was naturally the church. As the second and third largest groups are the scientific and the legal, some discussion of the rise and development of scientific and legal studies is given in the preface. Particularly are translations of Greek and Arabic works into Latin cited to show the extent of the revival of learning and the use of Latin as the language of educated people.

ARCHIBALD KENNETH SHIELDS. Adelardo López de Ayala and the Spanish Stage. (Under the direction of S. E. LEAVITT.)

After a brief statement of the known facts concerning the life of López de Ayala a detailed study of his plays has been made. The serious dramas of Ayala fall into two groups: those similar to many dramas of the Siglo de Oro, and those dealing with social themes. Between these two stands a group of *zarzuelas*. In each group the characters portrayed by the dramatist have been analyzed, the defects or merits of the plots outlined, and possible sources suggested. The influence of various contemporaries has been discussed, particularly that of the great actress, Teodora Lamadrid. In conclusion, after an examination of Ayala's works and the fragmentary notes which he left, an attempt has been made to determine his method of composition.

DEPARTMENT OF RURAL SOCIAL-ECONOMICS

E. C. BRANSON directed studies in County Government and County Affairs.

Economic-social-civic studies of four counties in Mississippi since November 1, 1929, directed by E. C. BRANSON and S. H. HOBBS, JR., for the Institute of Research in Social Science at the University of North Carolina and for the Mississippi Development Association, in behalf of improved county government in Mississippi and the country at large.

County Government in Mississippi, by COLUMBUS ANDREWS. A study of county government in Mississippi in contrast with county government in North Carolina, a four-hundred page MS now ready for the printers.

A field study of four typical regional counties of South Carolina, along with a study of county government in the State of South Carolina as a whole in contrast with county government in North Carolina. For the Institute of Research in Social Science at the University of North Carolina in collaboration with the University of South Carolina.

A field study by INEZ C. BONEY, of country church conditions in Rose Hill Township, Duplin County, North Carolina.

S. H. HOBBS, JR. published during the year :

North Carolina: Economic and Social, 400 pp. University of North Carolina Press, 1930.

The chief headings are as follows :

Physical resources: land, etc., water power, and minerals, resorts, fishing, and hunting; population composition and characteristics; physical and social-economic areas; North Carolina as an agricultural state; farm tenancy; industry; financial institutions; transportation and communication; wealth, debt, and taxation; ruralism and urbanization; state government; county government; public education; illiteracy, reading habits; public health, health work, public welfare.

He has completed the following research: Economic and Social Survey of Mississippi for the Central Committee for an Economic and Social Survey of Mississippi.

The report submitted contains more than two thousand pages, covering natural resources, agriculture, industry, forestry, reforestation, public education, state government, county government, public health, institutions, and related economic and social data on Mississippi.

During the year the Department issued The North Carolina Club Yearbook.

It contains the following chapters: Ruralism, Urbanization and Rural-Urban Economic Interdependence in North Carolina, S. H. HOBBS, JR.; The Southern Labor Supply, RUPERT B. VANCE; The Contemporary Social Process, FRANK P. GRAHAM; The Place of Collective Bargaining in our Modern Industrial Life, WIRTH F. FERGER; The Use of the Injunction in Strikes, R. J. M. HOBBS; The Functions of a State Department of Labor, H. D. WOLF; The North Carolina Child in Industry, B. B. SWIFT; A Pragmatic View of Employee Welfare, G. T. SCHWENNING; The Southern Industrial Problem as the Social Worker Sees It, HARRIET HERRING; The Crisis in The Cotton Textile Industry, C. T. MURCHISON; and The Place of the State in Economic Life, J. GILBERT EVANS.

Other research projects were :

Industrial Development and Possibilities in Mississippi, VIRGINIA DENTON; Forestry and Reforestation in Mississippi, V. L. WHARTON; Public Education in Mississippi, MISS E. W. STEVENS; State Government in Mississippi, S. W. PRESTON; Studies of State Revenues and Taxation in Mississippi, J. C. HERBERT; County Government in Neshoba, Covington and Washington counties, Mississippi, E. A. TERRY.

PAUL W. WAGER, as secretary of a committee of the National Municipal League, made a nation-wide inquiry as to the presence or absence of an executive or chief administrative officer in the counties of the several states.

The investigation also sought to measure the sentiment for the adoption of the manager plan in county government. The committee has also been engaged in drafting a model county manager bill for the use of state legislatures.

Since February, 1930, PROFESSOR WAGER has been on leave in order to direct a study of forest taxation in North Carolina for the Forest Taxation Inquiry of the U. S. Forest Service.

Intensive studies are being made in Beaufort, Chatham, and Macon counties, these counties being considered representative of the three major types of forest conditions in the state. The main objective of the study is to determine to what extent timber lands and cut-over lands figure in the tax base and how other methods of taxing such lands than the use of the property tax would disturb the revenues of local government.

DEPARTMENT OF SOCIOLOGY

HOWARD W. ODUM has edited for the American Social Science Series during the year the following :

An Introduction to Social Anthropology. By Clark Wissler.

Introduction to Mental Hygiene. By Ernest R. Groves and Phyllis Blanchard.

The Negro in American Civilization. By Charles S. Johnson.

PROFESSOR ODUM is completing *An American Epoch: Southern Portraiture* in the National Picture, to be published in September by Henry Holt and Company, which is a part of several years' research into Southern social conditions; also the third volume of the trilogy of case portraiture of an American Negro migrant.

PROFESSOR ODUM is directing the research project, *Trends in Public Welfare*, a unit in the research of the President's Committee on Social Trends, of which he is assistant director of research.

With KATHARINE JOCHER he is continuing the studies of regional and folk sociology.

H. D. MEYER has been engaged in the following piece of research: *Laws Relating to Play and Recreation in North Carolina.*

A study of the existing laws in the state, counties, and municipalities of North Carolina relative to play, playgrounds, recreation, commercialized amusements, and parks.

L. L. BERNARD has completed the following research work during the year:

Schools of Sociology. (Prepared by invitation for the Sociological Section of the Southwestern Political and Social Science Association to be published in the *Southwestern Political and Social Science Quarterly.*)

Reviews the changing emphasis of social philosophy and sociology from the time of the Sophists to the present, together with citations of the authors who have emphasized these viewpoints.

The Limits of the Social Sciences and their Determinants, *The Journal of Philosophy*, XXVI: 430-438. (August 1, 1929.)

A Report on Sociology and the Study of International Relations. (With JESSIE BERNARD.) Published in mimeograph form, 1930. (An investigation made at the request of the Special Committee on International Relations of the Social Science Research Council.)

The report covers relations of sociology to the subject of international relations, research in the field by sociologists, concepts, viewpoints, and interpretations of value for the study worked out by sociologists, sociology courses in the colleges and universities dealing with subject matter of significance for the study, possible contributions of sociology to coöperative investigation in the field, practical contributions to international relations made by the sociologists, digest of subjects discussed by sociologists bearing directly on the field, digest of the views of American sociologists on subjects related to international relations, summary of the relations of sociology to the other social sciences in the study, and charts showing men in other fields who have influenced sociologists and those they have influenced, as evidenced by their citations, and showing men in other fields who have influenced sociologists as evidenced by citations by the latter.

PROFESSOR BERNARD has the following research in progress:

History of the Social Sciences in the Colleges and Universities of the United States. (With JESSIE BERNARD.)

The Founders of Sociology in the United States.
The Development of the Social Sciences in Latin America.

LEE M. BROOKS has completed during the year :

Sociology in the Works of Francis Lieber. *Social Forces*, December, 1929.

A Study of Primary Group Isolation. For abstract see p. 74.

The New Mobility and the Coastal Island. A paper read at the annual meeting of the American Sociological Society, December 1929, and abstracted in the *Proceedings*, Vol. XXIV.

He has in progress :

A continuation of the Study of Primary Group Isolation with emphasis on factors of social change.

The Family and Character. (With E. R. GROVES.)

Measuring Racial-Social Distance among Southern Students of Sociology. (With H. D. MEYER.)*

The following doctoral dissertations were accepted by the Department during the year :

HUGH PENN BRINTON, JR. *The Negro in Durham.* (Under the direction of H. W. ODUM.)

Durham as a center of Negro life owes its importance to the presence of large tobacco manufactories, a hosiery mill operated by Negroes, and a well-developed business and professional group serving the race.

The report of occupational opportunities in Durham has brought in Negroes from the country. In Durham these migrants have their first contact with an urban environment. In Durham influences are at work leading the migrant both toward crime and toward stable citizenship, both shaping his destiny.

The population was divided into two broad groups, using as criteria of the degree of adjustment the rate of crime per 100 families as calculated from the records of the recorder's court. An area having a high crime rate was considered unadjusted and one having a low rate well adjusted. The laboring class constituted the majority of the population. Maladjusted areas were found to be confined entirely to this class, and well-adjusted areas were found to contain the skilled class and the more steady members of the laboring class. The attempt was made to find points of adjustment to urban life in these two groups; how the process went on in each; and how individuals have risen from the lower to the higher groups. Members of the skilled class, comparatively well-adjusted Negroes, were used as standards.

* See also *Institute for Research in Social Science*, pp. 80 ff.

To study the processes of urbanization the following problems were considered, adjustment to the law—including crime and the courts—to vocational needs, to physical needs, to religious needs, to mental needs, and to recreational needs.

These problems were discussed concretely to show conditions as they exist among the Negroes of Durham. Such a method is purely descriptive and does not lend itself to broad and general conclusions. The result is really a picture of contemporary Negro life in a small Southern city, but it is directly valid only for Durham.

LEE M. BROOKS. *A Study of Primary Group Isolation.* (Under the direction of E. R. GROVES.) (August, 1929.)

This study describes certain spatially isolated communities and families as they are to be found today in three dissimilar regions, i.e., New England, the Southern Appalachians, and Eastern North Carolina. The first part deals with isolation as a psycho-sociological concept. With a general consideration of scattered examples, it also includes a discussion of isolation in its several forms and effects. The rest treats of specific regions, communities, families, and conditions as observed in 1928. In addition to case sketches in the chapters, the appendices contain material of an intimate nature, revealing social attitudes and culture traits. A descriptive sampling, the work was made possible through the coöperation of physicians, clergymen, teachers, nurses, librarians, social workers, county and state officials, radio broadcasters, and others.

Among the facts revealed or verified by the study are the following: from the standpoint of mental hygiene and social adjustment in the super-isolated primary group, the present opinion of psychiatry is that isolation *per se* is merely a precipitating factor rather than one having any causal relation to a psychosis. In all three regions food customs lag markedly behind the recent theories of dietetics. Midwifery among white people does not appear to be synonymous with a high rate in infant mortality and morbidity, according to the statistics gathered. Age at marriage ranges below twenty rather than above. Many of the younger people who have been "outside" are planning to have fewer and better-trained children. Denominationalism in religion is crumbling perceptibly, in New England especially. State, community, and family interest are increasingly being directed toward more adequate educational facilities, but in this the remote Southern highlands rank low. The lack of libraries and reading matter in the Southern regions is as striking as the abundance of such cultural advantages in New England.

FRANK WILLIAM HOFFER. *Counties in Transition, A Study of County, Public and Private Welfare Administration in Virginia.* (Under the direction of E. R. GROVES.) (August, 1929.)

The existing welfare agencies are described under the following general headings: dependency—boards of public welfare, Red Cross, Salvation Army, Associated Charities: delinquency—jails, juvenile and domestic relations

courts, probation service; character-building and recreational agencies—Young Men's Christian Association, Young Women's Christian Association, Boy Scouts, Girl Scouts, 4-H Clubs; religious, civic, and fraternal organizations—Rotary, Kiwanis, Lions', women's clubs, and fraternal societies; health and hospital services—county departments of health and nursing.

Six counties are considered, representing the varying conditions in the state, reflecting in the basic composition of population, vital statistics, distribution of population, and agricultural and industrial life, conditions ordinarily considered favorable to a fairly high degree of general well-being. Those selected are in their fundamental, social, and economic activities similar to other Virginia counties.

The study shows that in some counties welfare services are well developed; in others, almost non-existent. One places its emphasis on child welfare; another, mothers' aid; a general program emphasizing outdoor relief is found in another; still another has coördinated the private agencies with the county board of public welfare. In some instances, counties are in the process of urbanization and industrialization, tending to create new problems and agencies to care for them. In one, population growth is influenced by a large urban center; the population increase of another is affected by an unusual industrial expansion; in a third, the population growth for the last decade was less than one hundred per year, and not much more than that for several decades previous.

Two kinds of information about welfare agencies were sought: facts which could be statistically expressed, and intangible information, such as opinions, personnel morale, and administrative practices.

The material on the social and economic life of the counties was selected with a view to illuminating the problems of public and private welfare. The data on the welfare agencies reveal the different and contrasting methods by which the counties have sought to attack their problems.

The following master's theses were accepted by the Department during the year:

LILLIAN PEARSON BRINTON. Keeping Time. (Under the direction of E. R. GROVES.)

The analysis of time schedules of 184 homemakers is made under the headings of: equipment; help of husband; paid help; help of children; use of outside agencies; effect of housing; and work plans, or short cuts. A comparison of the findings of this study is made with the material from 2,000 similar schedules. The object of the study is to standardize and mechanize housekeeping to the extent that the housekeeper is left free, while performing the operation, to plan remaining activities to be performed.

VIRGINIA LYN DENTON. *Social-Economic Characteristics of the Mississippi Delta.* (Under the direction of T. J. WOOFER, JR.)

The purpose of this thesis was to indicate statistically the social and economic characteristics of the Mississippi Delta region, embracing nine counties in Arkansas, twelve in Mississippi, and twelve parishes in Louisiana. Greater homogeneity socially and economically was found within these counties than in the states as wholes. The study dealt with the following main topics: population, farm lands, farm tenancy, farm values, farm incomes, illiteracy and education, birth rates, and infant mortality statistics. The data secured were compared with conditions in the states as wholes; results showed that on the whole the delta region is more backward than the states considered as a unit.

MARY KATHARINE FLEMING. *A Follow-up Study of Juvenile Court Cases in Orange County, North Carolina, 1919-1929.* (Under the direction of W. B. SANDERS.)

This survey comprises a study of the children appearing before the juvenile court in Orange County, North Carolina, from the date of the first case, July 26, 1919, until the same date in 1929. A total of 116 children—99 delinquents and 17 dependents—appeared in the court during the period. The study is concerned only with 60 delinquents and the 12 dependents about whose social condition it was possible to secure reliable information.

The study compares the social status of the juvenile court cases with that of the children in the general population, evaluates the effectiveness of the juvenile court treatment of delinquency and dependency in a rural area. It was found that large families, broken homes, and homes where adult offenders are found occur frequently in these cases. Outside interests and activities were almost entirely lacking among them.

Forty-two, or 70 per cent, of the entire delinquent group were found to be at present satisfactorily adjusted in the community. Institutional commitment for the delinquents was found to be a less successful means of treatment than other court dispositions. Of the twelve dependent children all but two, who are self-supporting, are in permanent homes.

BERTHA CARL HIPPI. *A Gaston County Cotton Mill and Its Community.* (Under the direction of T. J. WOOFER, JR.)

The mill community involved in this study is the A. M. Smyre Manufacturing Company, located in Gaston County, North Carolina, established in 1917. It is representative of Southern cotton mills in organization, size and type of work, and in location. The study is based on personal observation supplemented by details from the mill records, the mill superintendent, the welfare worker, and others. It gives a complete account of the work and policies of the mill, standards of living, education, and social organizations with frequent comparisons with other manufacturing establishments and social institutions.

The mill was successful as a business enterprise, because of a firm economic foundation and good managerial policies. The general situation for the employees was also favorable, because of good managerial personnel. Wages are

somewhat higher than the average for the state, mill operation steady, and working and living conditions above average. Participation of the workers in the social organizations in the village and friendly relations between employers and employees were factors making for favorable conditions.

GERTRUDE VAILE. Some Aspects of Family Social Work in Rural Communities in Iowa. (Under the direction of HOWARD W. ODUM.)

This study was undertaken primarily for the purpose of securing social case records which might be useful for analysis and study of social case work problems and processes in rural communities. The 57 case records analyzed were selected from eight rural counties in Iowa in which high standards of living and education prevail and which have, on the whole, a constructive case work program, carried on largely by public agencies, for the care of the socially and economically deficient members of the community.

The analysis of these cases showed that the sources of information and aid used by these workers were largely personal. Of 93 neighborhood sources of information, 27 serve as resources of aid. Local public officials provided 77 sources of information and 52 resources of aid in other than routine capacity of consultation or authorization. The church or minister appears as a source of information in 9 instances; of aid, in 8. There were 106 medical sources of information, of which 28 were state or other out-of-county sources. Local organizations gave information in 5 instances, and aid to 8 families. The material basis of living, the use of public relief, and the coöperation of the church were studied especially.

DEPARTMENT OF ZOOLOGY

During the past academic year H. V. WILSON has been absent on leave and engaged in research at the Biological Station in Naples and elsewhere. A report of his work is deferred. There has appeared during the year the following paper by PROFESSOR WILSON and J. T. PENNEY:

The Regeneration of Sponges (*Microciona*) from Dissociated Cells. *Journal of Experimental Zoology*, LVI: 73-134. 1930.

R. E. COKER has continued studies of fresh water crustacea. There has recently been published by a former student, L. L. HILL, and R. E. COKER, jointly, an article entitled Observations on Mating Habits of Cyclops. *Journal of the Elisha Mitchell Scientific Society*, XLV: 206-220. 1930.

Other scientific publications of PROFESSOR COKER appearing during the year and embodying the results of work previously done are the following:

Keokuk Dam and the Fisheries of the Upper Mississippi River. *Bulletin of the U. S. Bureau of Fisheries*, 45: 85-139. (*U. S. Bureau of Fisheries Document No. 1063.*) 1929.

Studies of Common Fishes of the Mississippi River at Keokuk. *Bulletin of the U. S. Bureau of Fisheries*, 45: 140-225. 1930. (*U. S. Bureau of Fisheries Document No. 1072.*)

C. D. BEERS has published the following:

Some Effects of Encystment in the Ciliate *Didinium nasutum*. *Journal of Experimental Zoology*, LVI: 193-208. 1930.

The decline of a group of lines of *Didinium* was induced by culture on an inadequate diet which consisted of only nine paramecia per line daily. The lines suffered a decrease in fission rate and an increase in encystment rate as generations passed. They underwent complete encystment in the 112th generation. The cysts were revived by altering the environment. Active didinia from these cysts when subjected a second time to the original inadequate diet showed a marked increase in vitality as measured by the fission and encystment rates. They passed through a second cycle equal in length to the first. The conclusion is reached that encystment in *Didinium* may function to increase the vitality of the race when the animals are depressed by inadequate cultural conditions. Suitable controls were maintained throughout the experiment to substantiate this conclusion.

J. M. VALENTINE has the following research work in progress:

I. Studies in experimental evolution: (a) The effect of exercised bipedalism in the albino rat. (b) The effect of conditions such as to discourage flight in the fruit fly, *Drosophila melanogaster*.

II. Studies in the senses olfaction and gustation in the mealworm beetle, *Tenebrio molitor*.

III. A study in cave adaption: description of new species of cavernicole ground beetles of the genus *Pseudanophthalmus*, and a study of the distribution and adaptation of the group.

Illustrations for an article on standard measurements of the external anatomy of birds.

ALAN MOZLEY has completed:

Notes on Western Canadian Mollusca. I *Planorbula campestris* Dawson. Nautilus.

Notes on the Molluscan Fauna of the Province of Alberta.

Descriptive introduction and faunal list complete, awaiting assemblage of further chemical data before publishing.

The Role of Hereditary and Environmental Influences in the Variation of Some Fresh Water Molluscs.

Measurements and calculations have been completed for somewhat over one thousand individuals of *Lymnaea vahlü* and *Lymnaea emarginata*. These have been arranged in tables to show the range of variation, and standard deviations and probable errors have also been included. The first draft of the text of the paper has been completed. It is planned to examine a total of at least two thousand individuals before publication.

The following master's theses were accepted by the Department during the year:

J. PAUL REYNOLDS. Origin of the Germ Cells in Some Beaufort Sponges. (Under the direction of H. V. WILSON.) (August, 1929.)

Three divergent views are held regarding the origin of the sex cells in sponges, all of which are supported by competent investigators. They are: that gonocytes are derived from collar cells; from any mesenchyme cell; or from archaeocytes, undifferentiated blastomeres left over in ontogeny.

According to Wilson and Penney (1928), at least two cell categories of granular, amoeboid cells are to be found in the mesenchyme of the sponge body. In *Stylotella*, the type used in the present investigation, it was found that one type possessed a large, nucleolated nucleus about 2.5μ in diameter and the cytoplasm usually contained large, conspicuous granules. The other type had a small, granular nucleus about 1.5μ in diameter and the cytoplasm was finely granular. If both of these types of cells are actively amoeboid, indifferent cells—and from their appearance in the fixed material they are such—they should be grouped under the general class of archaeocytes.

The question now arises whether the gonocytes are derived from a particular cell category of the mesenchyme. From this investigation it appears that only the nucleolated cells give rise to the gonocytes.

THOMAS C. WATKINS. Some Points in the Life Cycle of the Gregarine Monocystis. (Under the direction of C. D. BEERS.)

The life cycle of the species of Monocystis in the seminal vesicles of the common Chapel Hill earthworm, *Pheretima*, was followed to completion. It was found that two adult animals known as trophozoites shut themselves up in a common cyst membrane. The nucleus of each is largely dissolved and only a small portion of the chromatin content is used in the formation of the first division spindle. The first division forms two daughter nuclei in each individual and eight similar divisions follow in rapid succession, forming approximately five hundred daughter nuclei in each individual. These nuclei become collected around the periphery of each gregarine. Each small nucleus with a small clump of hyaline cytoplasm forms a gamete. Then the two encysted gregarines lose their individuality and the gametes of one animal fuse with those of the other in pairs. From each zygote thus formed there develops a

spore with eight sporozoites, which, when liberated, will develop into trophozoites. Meanwhile, the residual cytoplasm has been lost so that the mature oöcyst contains only spores which are protected from unfavorable environmental conditions by a tough covering known as the sporocyst.

The seminal vesicles of two hundred and eleven worms were examined and 71 per cent of these were infected. Though the percentage of infection is high, yet the infections are not very heavy due to the fact that the vast majority of spores produced die.

INSTITUTE FOR RESEARCH IN SOCIAL SCIENCE

Substantial grants from the Laura Spelman Rockefeller Memorial and the Rockefeller Foundation made to the University of North Carolina, for the study of problems in the social sciences arising out of state and regional conditions, led to the establishment in 1924 of an Institute for Research in Social Science, the main purpose of which is to assist faculty members in the prosecution of their research by means of research assistants, field expenses, and clerical help. The work of the Institute represents, therefore, a specific program of regional social research, study, and interpretation.* A summary of the work of the Institute for the current year follows:

The Institute, in coöperation with the University of North Carolina Press, published during the year:**

Income and Wages in the South. By Clarence Heer.

Some Southern Cotton Mill Workers and Their Villages. By Jennings J. Rhyne.

The following MSS are in press or ready for publication:

Constitutional Development in the South Atlantic States, 1776-1860. By Fletcher M. Green.

The Negro Sings a New Heaven. By Mary A. Grissom.

A Social History of the Sea Islands (with special reference to St. Helena Island, South Carolina). By Guion Griffis Johnson.

Folk Culture on St. Helena Island. By Guy B. Johnson.

The State Highway System of North Carolina. By Cecil K. Brown.

ERNEST R. GROVES has published during the year:

Introduction to Mental Hygiene. (With Phyllis Blanchard.) Henry Holt.

History of the Family for 1929. *American Journal of Sociology*, May, 1930.

* For a further statement regarding the establishment and the purposes of the Institute, see *Research in Progress*, 1928-1929, pp. 95-96.

** The book-list from 1924 to 1929 is found on pp. 96-97 of *Research in Progress*, 1928-1929.

Mental Hygiene in the College and University. *Social Forces*, September, 1929.

Mental Hygiene and Religion. *Social Forces*, December, 1929.

Recent Changes in Family Mores. *Religious Education*, January, 1930.

Discussion of Mental Hygiene and Adolescence. Presented at the International Congress of Mental Hygiene, May, 1930.

PROFESSOR GROVES has edited for the Longmans Social Science Series:

Social Psychology. By E. T. Krueger and Walter Reckless.

PROFESSOR GROVES has under way special researches in the Negro family, and is directing the compilation of an exhaustive bibliography on the family and family life in America for the White House Conference.

THOMAS J. WOOFER, JR. has published during the year:

Black Yeomanry: A Study of Negro Culture on St. Helena Island, South Carolina. Henry Holt.

DR. WOOFER has the following research under way:

A social and economic analysis of the Tri-State Tobacco Growers' Coöperative Marketing Association. A definite section of the study, Cigarette Tobacco: The Economic Obstacles of Coöperative Marketing, has been completed.

DR. WOOFER has directed the following research:

In association with ARTHUR F. RAPER, an analysis of the social and economic factors in population movements in two black belt counties in Georgia—a comparative study of man-land relations, planes of living, institutions, and attitudes, etc.

He is also undertaking and directing the research on ethnic groups in the United States, a unit in the research of the President's Committee on Social Trends.

ROY M. BROWN has the following research under way:

A Statistical Study of Crime in North Carolina.

This study is based upon data from the reports of superior court clerks to the attorney-general. It covers all indictments in the superior courts, involving 65,000 cases, for a period of four years, July 1, 1922, to June 30, 1926. The study will show types of crimes and disposition of cases by county, judicial district, judge, age, race, sex, and occupation. The chief value of this study is that it will form the basis for further analyses and interpretations.

The collection of material for a documentary history of public welfare in North Carolina, which will be valuable as a reference book and also for teaching purposes.

DR. BROWN has directed the following research :

In association with HUGH P. BRINTON, a study of the Negro in Durham—a study of Negro segregation, including education, housing, health, group participation, juvenile delinquency, adult crime, etc.

With J. PAUL MCCONNELL, a study of men released from the state prison of North Carolina, during the years 1917 to 1922, inclusive. All data available from prison records have been secured and detailed case studies made of a number of the men.

CLARENCE HEER has published during the year :

Income and Wages in the South. University of North Carolina Press.

The Rural Tax Problem. *Social Forces*, September, 1929.

Taxation in North Carolina. *The Bulletin of the National Tax Association*, October, 1929.

DR. HEER has under way a study of state and local finance: a problem in fiscal coördination.

This is an approach to the problem of securing inter-regional equality in the matter of tax burdens and uniformity in standards of local governmental services through a rational allocation of functions, financial burdens, and revenue resources as between the state and its subordinate political units. The statistical illustrations will be based mainly on the experience of North Carolina.

HARRIET L. HERRING has published during the year :

The Southern Mill System Faces a New Issue. *Social Forces*, March, 1930.

The Metamorphosis of the Docile Worker. *Greensboro Daily News*, et al. October 27, 1929.

Peace or War in Southern Textiles. *Greensboro Daily News*, et al. November 3, 1929.

MISS HERRING has continued her history of the textile industry in the South and expects to have the MS ready for publication at an early date.

This study will cover the development of textile manufacturing from the domestic stage in the colonial and early national periods; the rise of the mills, expansion and diversification, concentration and localization, and the transplanting of the industry; some attention to technical development and to financial, manufacturing, and marketing organization; and with at least passing reference to group interests of owners and workers, to the social implications of the mills, and to the textile industry in Southern public opinion and policy.

KATHARINE JOCHER (with HOWARD W. ODUM) is continuing the studies of regional and folk sociology.

GUY B. JOHNSON has published the following during the year :

John Henry, Man or Myth? *National Everyweek Syndicate*, January and February, 1930.

Folk Tales from St. Helena Island. *The Inlander*, April, 1930.

A Note on Negro Speech. *Folk-Say*, II, 1930.

Folk Values in Recent Literature on the Negro. *Folk-Say*, II, 1930.

DR. JOHNSON has completed his researches in the folklore, folkways and customs, and folk songs of the Negroes on St. Helena Island, South Carolina.

These with his studies of Gullah will comprise his forthcoming volume, Folk Culture on St. Helena Island, now in press and to be published by the University of North Carolina Press.

GUION GRIFFIS JOHNSON has completed her special researches in the social history of the Sea Islands with special reference to St. Helena Island.

The manuscript is now in press and is to be released as an early fall publication by the University of North Carolina Press.

DR. JOHNSON has in preparation :

A Social History of North Carolina, 1800-1860. This volume is to be completed during the coming year.

Social History of the American Family. Collection of data for this project has been started.

RUPERT B. VANCE has published during the year :

The Concept of the Region. *Social Forces*, December, 1929.

DR. VANCE has continued his researches in human geography of the South in which the South is studied as a natural region and a culture area.

Detailed studies of population, topography, plants and animals, forestry, soil, and social geography of Southern agriculture, livestock and dairying, transportation and communication, demography, diet and nutrition, climate in its relation to energy, health, work, and Southern culture are some of the factors to be included. Two of the three years' work required for the completion of the first volume have been done.

CECIL K. BROWN has completed his study of the history and development of the state highway system of North Carolina.

The MS is in preparation for the press and will be published shortly by the University of North Carolina Press.

E. C. BRANSON and his field assistant, COLUMBUS ANDREWS, have continued their detailed examination of county government and county affairs.

For the purpose of comparative study, counties in Mississippi and South Carolina have been investigated.

Mr. Andrews has also completed a comprehensive study of the administration of county government in Mississippi.

MARY PHLEGAR SMITH has published during the year :

Borough Representation in North Carolina. *The North Carolina Historical Review*, April, 1930.

Under the direction of EDWARD J. WOODHOUSE, MISS SMITH has continued her project on the development of municipal life in North Carolina.

This is a study of the growth of municipalities and their changing functions, from the colonial period to the present date. This study is to be completed shortly.

JULIA C. SPRUILL, under the direction of R. D. W. CONNOR, has continued her comprehensive study of the changing attitude toward women in the South.

The collection of data for the first volume on the woman of the ante-bellum South has practically been completed, and this volume is now being written.

OFFICE OF THE DEAN OF STUDENTS

This office, under the direction of FRANCIS BRADSHAW, as part of its coöperation with the American Council on Education, completed this last year a three-year project on the reliability of the American Council on Education rating scale—a device for accumulating, recording, and combining the judgment of teachers and acquaintances concerning five student traits: appearance and manner, initiative, power over others, emotional control, and definite purposes in terms of which he distributes his time and energy.

Ratings on students at the University were obtained from former school teachers, members of the University faculty, and fraternity mates. These were checked by psychological test scores, scholarship records, and the history of the

individual in student activities. In general, reliabilities higher than those previously obtained with less carefully constructed scales were discovered. The combined average of 3 ratings on the second trait proved as satisfactory a prediction of freshman scholarship as did the psychological test score. This study is soon to be published in the *Archives of Psychology*, Columbia University.

At present this office is engaged in a careful follow-up of the classes entering the University in the fall of 1922 and 1923.

The class of 1922 was the first one to be given the psychological test; a cumulative personnel record was begun at the same time. The aim is to find out what has happened during the succeeding seven and eight years to the different types of students admitted to the University at those respective times.

RESEARCH ORGANIZATIONS

THE ELISHA MITCHELL SCIENTIFIC SOCIETY

314TH MEETING, OCTOBER 8, 1929

W. DEB. MACNIDER. Regeneration of the Kidney and its Bearing on Kidney Function. (Illustrated.)

A. S. WHEELER. Further Para-Cymene Studies.

Recent researches which were completed in the organic laboratory of the University of North Carolina were concerned with (1) para-cymyl-4-semicarbazide (with J. G. Park); (2) para-bromophenyl-4-semicarbazide; and (3) para-cymylhydrazine-2 (with C. L. Thomas).

(1) Para-cymyl-4-semicarbazide was prepared as follows: Aminocymene in glacial acetic acid was treated with potassium cyanate. The cymylurea thus obtained was heated with hydrazine hydrate for 30 hours. Eleven semicarbazones were prepared by treating the semicarbazide with the following ketones: acetone, methylethyl ketone, alpha-gamma-dichloroacetone, mesityl oxide, acetoacetic ester, cyclohexanone, camphor, carvone, benzophenone, acetophenone, and benzoin.

(2) Cymylhydrazine was prepared by diazotizing aminocymene and reducing the product with sodium sulphite. Three salts, the hydrobromide, sulphate, and picrate, were made. Also the cymylhydrazones of cinnamylaldehyde, salicylaldehyde, and benzophenone. Also cymyl-1-semicarbazide, cymyl-1-thio-semicarbazide, and p-nitrobenzoyl-p-cymylhydrazine.

(3) Para-bromophenyl-4-semicarbazide was prepared by treating p-bromophenylurea with hydrazine hydrate. The semicarbazones of acetone, acetophenone, benzophenone, alpha-gamma-dichloroacetone, and methylethyl ketone were prepared.

315TH MEETING, NOVEMBER 12, 1929

E. K. PLYLER. Study of Molecular Structure from Band Spectra.

An experimental study has been made of the infra-red absorption spectra of some organic nitrates and alcohols. Many similarities were found between the two spectra. The organic nitrates did not have any of the bands which were found in the inorganic nitrates. This difference was probably due to the nitrate ion in the organic compounds being broken up into other groups and the formation of OH groups, causing the alcohols and the organic nitrates to have many like absorption bands.

J. F. DASHIELL. Some Psychological Effects of Insulin.

A diabetic patient completely dependent upon insulin was tested at intervals through a normal day, and with these results were compared tests made

during the condition (hyperglycemia) of underdosage of insulin, and during the condition (hypoglycemia) of overdosage of insulin (i.e., not balanced with food). Four tests were used: strength (on Smedley dynamometer); color naming; cumulative adding (orally adding 2, then 3, then 4, then 5, then 2, etc.); and serial discrimination (telegraph keys pressed according to number appearing in Ranschburg exposure apparatus, keys wired through Ranschburg and electric recording markers). (1) Deterioration was observed in all four functions during both abnormal physiological conditions. (2) In hypoglycemia the deterioration was both very rapid and very profound. (3) It probably did not parallel changes in B-S level at the same rate of progress. (4) The character of the impairments suggests explanation in terms of changes in the higher nervous centers. (5) Need of further work is indicated.

316TH MEETING, DECEMBER 10, 1929

T. F. HICKERSON. A Design of Rigid Frame.

COLLIER COBB. Human Habitations as a Response to Environment. (Lantern.)

317TH MEETING, JANUARY 14, 1930

W. F. PROUTY. Relation of Geological Structures to Marble Quarrying.

Several distinct structural types of calcite marble deposits exist in eastern United States, each with its favorable method of working and its peculiar structural problems. These types can be roughly classified under three heads, according to the amount and character of metamorphism which they have undergone.

The Georgia type represents conditions where metamorphism has been intense. The crystals are large and generally twinned, the folding has been excessive, and drag-folding at a maximum. Here the old lines of unsoundness have been largely healed by flow and crystallization of the limestone. Bedding planes are inconspicuous and color banding, due to crumpling and drag-folding, largely controls quarry methods. Under such conditions, the quarries are operated with level floors and vertical channelling. Color conditions in all marble correspond largely to bedding conditions. Some beds are colored very differently from others, so that the quarry problem in this type largely resolves itself into the determination of the position of certain objectionable or favorable color areas in the stone. A knowledge of the structure may enable one to take out blocks with the minimum of objectionable color mingling.

In areas of intermediate metamorphism, where folding is less intense and faulting and shearing more prevalent, as in Alabama, a number of vexing problems must be solved in the profitable extraction of the marble. The bedding and shearing planes occur at a considerable angle to the horizontal. These conditions exclude the level-floor method of quarrying and necessitate the saw tooth method of marble extraction. In this type of deposit, to get the best

results out of quarrying, attention must be paid to the bedding, the various joint and fracture systems, and to the color differences. In some localities, to get the highest percentage of sound blocks, the direction of channelling is necessarily taken obliquely to the strike and dip. In one well-known quarry this shift from channelling parallel with dip and strike to an oblique direction increased the production of sound marble by about 75 per cent. In marble areas of this type success or failure in marble quarrying is largely dependent upon conformity or non-conformity with geological structures.

A third type of marble deposit is represented by the East Tennessee marble belt where folding, faulting, and shear are not important and where compressional and tensional jointing are the ruling factors in unsoundness. In this region compressional and higher temperature metamorphosis are at a minimum, and lower temperature crystallization through solution has played the larger rôle. Bedding in such a region is usually distinct, though usually modified by differential solution along the stylolite or original bedding planes. In this region there is the closest possible relation between quarrying and fold structure. There is probably not a single quarry in this section of the country that has found suitable quarry conditions prevailing over fairly sharp anticlinal folds. The most successful quarry operations have taken place in relatively broad synclinal areas.

J. M. VALENTINE. The Olfactory Sense in Beetles.

Considerable disagreement arises among entomological physiologists regarding the location and morphology of olfactory organs in insects, differences in experimental technique being largely responsible for the conflicting results.

This investigation attempts to produce evidence to settle the question in so far as a single insect species is concerned. The common meal-worm beetle, *Tenebrio molitor* (Linn.), was selected because of its hardiness and the ease with which it can be bred.

Experiments in which the odor of food and the sexual odor of the female were used to stimulate beetles deprived of one or both antennae, or the distal segments of this appendage, indicate that the olfactory organs are borne by the antennae and principally by their four terminal segments.

A distinct peg-organ with a probably permeable cuticle was discovered in large numbers occupying areas on the antennae where the olfactory organs were experimentally located.

In experiments in which an essential oil was employed as the stimulant, the reactions of insects operated as above clearly show the irritating effect of the oil on nerve-endings not normally operative in the perception of odors natural to the organism.

Doubt is therefore thrown on the validity of the conclusions drawn by those workers who have used essential oils to determine the location of olfactory organs in insects, and who are thus led to the opinion that these organs are distributed at various points on the legs, wings, and body.

318TH MEETING, FEBRUARY 11, 1930

F. P. BROOKS. The Vitamin D Content of Shrimp Oil.

The product resulting from the extraction with ether of the dried waste of "shrimp" was used in rat feeding experiments on animals rendered rachitic by Steenback's diet No. 2965. Various amounts of the extract were fed for varying lengths of time and the animals examined for effect. The bones and blood were analyzed for Ca and P, and sections of the tibias were prepared and examined for evidence of McCallum's line test.

The results of several typical experiments presented in charts and graphs and photographs of the bone sections shown on the screen demonstrated that the shrimp preparation had a definite curative effect on rachitic animals but to a less extent than a good grade of cod liver oil. The later experiments appeared to show a deterioration in the vitamin content of the material.

Conclusions: shrimp oil, when prepared with precautions designed to protect vitamin content will probably show a vitamin D content not much less than that of cod liver oil. This is to be checked by further experiments on a fresh and more carefully prepared preparation.

W. C. GEORGE. The Unit of Life.

The sharp distinctions that once existed between the physical sciences and the biological sciences have disappeared. The boundaries of the various natural sciences have enlarged until they overlap and we find these sciences occupying a common domain. Furthermore, the distinctions between animate and inanimate substances have become vague. Those phenomena that we have heretofore called fundamental vital phenomena (motility, sensitivity, metabolism, growth, and reproduction) have proved upon critical analysis to be unreliable criteria for distinguishing living substance from non-living substance. Our traditional concepts that limit the boundaries of life by the surfaces of what we call organisms are inadequate. Forces and substances external to cell membranes seem quite as much a part of the life process as the forces and substances within the cell. The universe itself may be looked upon as the ultimate organism and life as being co-extensive with time and space.

319TH MEETING, MARCH 11, 1930

W. R. BERRYHILL. The Effect of the Eating of Liver on Pernicious Anemia.

H. D. CROCKFORD. Some Thermodynamic Studies of the Nitrotoluenes.

The work on the temperature-composition diagrams of the binary systems of the nitrotoluenes with another component has been extended to benzoic acid. An apparatus has been developed which gives results of a much higher order of accuracy than those obtained heretofore. This apparatus can also be used for the photographing of cooling curves.

The systems with benzoic acid all prove to be simple ones, showing no indication of compound formation.

320TH MEETING, APRIL 8, 1930

J. W. LASLEY, JR. Some Conics Associated with a Plane Curve.

This study concerned itself with a construction for the members of the family of penosculating parabolas and of the family of penosculating equilateral hyperbolas associated with a curve at a point of it. Through the lines of the pencil on the point of the given curve a one to one correspondence was set up between the members of these two families.

C. M. CHILD. (Duke University.) Some Recent Experiments in Transplantation.

321ST MEETING, MAY 13, 1930

OTTO STUHLMAN, JR. The Motion and Bursting of Bubbles Rising through Liquids.

(For abstract, see p. 55).

F. K. CAMERON. Absorption of Sulphur Dioxide by Calcium Phosphates.

This work is a continuation of the investigation upon which W. M. Mebane reported last year to this Society, and described in detail in the *Journal of Physical Chemistry*, XXIII: 961-969 (July, 1929). The work has been made possible by the Robert Ober Fellowship, inaugurated by Ober Sons and Company through its president, Mr. Gustavus Ober.

The work may be conveniently described under three headings:

(1) Working with pulverized phosphate rock containing small amounts of absorbed water, at pressures from one to two atmospheres, it was found that the absorption of sulphur dioxide took place best at a temperature of about 450° C. The absorption follows, approximately, the equation for a monomolecular reaction. About two-thirds of the phosphorus is transformed to "citrate soluble" form.

(2) Working with precipitated tricalcium phosphate at lower temperatures, it is found that the absorption of SO₂ is most satisfactory at about 60° C. Again the conversion to "citrate soluble" is approximately two-thirds of the phosphorus.

(3) The results, although better than those recorded by any previous investigator, are not suggestive of any possible economic utilization. Preliminary experiments showed that if the tribasic phosphate be shaken with a mixture of liquid sulphur dioxide and water, a good separation of the lime and phosphoric acid can be secured, the aqueous solution containing the lime and most of the

phosphorus in the ratio corresponding to a mixture of primary and secondary calcium phosphate; a solid formed of a very basic phosphate, and the liquid sulphur dioxide, contains very little of either lime or phosphoric acid. Investigation of this reaction and the necessary study of the vapor pressures involved is under way, and the data now reported will be much extended before the formulation of a plant process is undertaken.

THE PHILOLOGICAL CLUB

OCTOBER 15, 1929

N. B. ADAMS. Some Literary Treatments of the "Pastelero de Madrigal."

An investigation based on the records of the trial, preserved in the *Archivo de Simancas*, and of the MSS and printed versions of the *Historia de Gabriel de Espinosa*, and their influence upon the plays of Cuéllar(?) and Zorilla and the novels of P. de la Escosura and Fernández y González.

NOVEMBER 5, 1929

W. R. CUMMINGS. (Davidson College.) The Influence of Ovid's *Metamorphoses* on Spenser's "Mutabilitie" Cantos.

R. S. BOGGS. A Method of Classifying Folk Tales.

In 1910 A. Aarne devised a classification of folktales arranged according to subject matter. Since then the tales of about a dozen peoples have been organized on the basis of Aarne's index. In 1928 S. Thompson revised and expanded Aarne's list, incorporating the wealth of new material brought to light by the numerous indexes. The first index to be based on Thompson's revision is that of the Spanish folktales made by the writer. This paper discussed some of the problems involved in making such an index and in defining the material, and also showed how to use Aarne's index as well as other guides into the great mass of folktale material.

DECEMBER 10, 1929

H. M. JONES. Methods of Contemporary Biography.

After calling attention to the extraordinary vogue of biography in the last three or four years, this paper noted that in the judgment of critics the value of biography has not increased proportionately with its quantity, and sought to find the reasons for this discrepancy. These reasons are found in (a) conditions external to the writing of biography, and (b) conditions internal to that writing. Among the first the factors of high-pressure advertising, commercial competition, and haste were analyzed, particularly with reference to their effect upon style and attitude. In treating the second, this paper sought to establish various types of contemporary biographical method, and to analyze the virtues and defects of each type from illustrative examples. The conclusion reached

was that there is little in the modern biographical methodology which comes closer to the "truth" than is contained in the methods of Boswell or even the ancients.

JANUARY 16, 1930

GEORGE STEVENS. The Author and His Relations to His Publisher.

FEBRUARY 11, 1930

(Joint meeting with the Erasmus Club of Duke University.)

N. I. WHITE. Shelley and Practical Radicalism.

NORMAN FOERSTER. Erasmus and Humanism Today.

Beginning with a demonstration of the vagueness of the term *humanist*, whether applied to present movements of thought or to the Renaissance, the writer attempted to work out a clear definition of humanism based upon the achievement and aims of the Italian humanists and Erasmus. In the last section of the paper he traced rapidly the subsequent fortunes of humanism, affirming that our contemporary scholarship has developed out of an age of naturism (romanticism and science) and that it will presently be forced to adjust itself to an age more humanistic. This paper will be published in the autumn of 1930 in a book entitled *Toward Standards*.

MARCH 4, 1930

E. C. METZENTHIN. Goethe and America: an Unorthodox View.

APRIL 2, 1930

J. C. LYONS. Ideas of Democracy in French Literature of the Sixteenth Century.

An examination of French political theory in the latter half of the sixteenth century reveals that only after 1580 can the principle of absolute monarchy be regarded as predominant. Before this date republican ideas and the limited monarchy were much more in favor than absolutism. The Huguenots, whose interests were opposed to those of the Valois family, may be considered the chief proponents of revolutionary doctrine.

Two of the most striking anti-monarchical treatises are the *Servitude Volontaire* of Étienne de la Boétie, and the *Franco-Gallia* of François Hotman. The tone of the former work is speculative, and the author seems to be almost free from prejudice in his views. He is thoroughly impractical, and offers no concrete suggestions as to the machinery of his ideal state. The attitude and ideas of Hotman are quite evidently dictated by his political hatreds. He was much more practical than his predecessor, and planned to build his proposed state around the only representative body that then existed, the Estates-General. His work is, however, so strongly partisan that it scarcely deserves the title of a piece of political literature.

The shifting political theories of the Huguenot poet, Salluste du Bartas, give eloquent evidence of the speed with which political situations were changing in his lifetime. Anti-monarchical in his earlier works, Du Bartas becomes a staunch advocate of the absolute monarchy when it becomes probable that Henri de Navarre may ascend to the throne.

L. B. WRIGHT. Middle-class Concern over Learning in the Renaissance.

This paper traces the development of an interest in learning among the tradesman class of the sixteenth and early seventeenth centuries. It shows that scores of grammar schools were founded by merchants individually or through the trade guilds, that the guilds maintained many scholars in the universities, that gradually through middle-class influence the utilitarian idea of education became dominant, resulting in the introduction of "useful" subjects in the schools, that this utilitarian ideal was responsible for the beginning of an interest in Oriental and eastern European languages, etc. The activities of merchants in collecting books and founding libraries is also mentioned.

MAY 6, 1930

G. C. TAYLOR. Shakespeare's "King John," An Experiment in Interpretative Editing.

THE SOCIETY OF SIGMA XI

The University of North Carolina Chapter of the Society of the Sigma Xi held eight general meetings during the year. Six were monthly meetings at which the departments of Zoölogy, Psychology, Physics and Mathematics, Medicine, Engineering, and Geology, respectively, were in charge of the program, the members of each department giving an account of the research in progress in their department. The annual lectures were given February 12 and 13 by Dr. Harlow Shapley, director of the Harvard Observatory. The final address of the year was given by Dr. W. L. Poteat, president-emeritus of Wake Forest College. During the year one alumnus, four active members, and twenty-eight associates were elected to membership.

RESEARCH PUBLICATIONS

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- Coleridge and "Asra." *Thomas M. Raysor.*
 Richard Steele and the Status of Women. *Rae Blanchard.*
 The Early Stages of Cartesianism in England. *Marjorie Nicolson.*
 What was Chaucer's Aim in the *Knight's Tale*? *J. R. Hulbert.*
 Towneley, York, and True Coventry. *Frank W. Cady.*
 The First Editions of Home's *Douglas*. *Dougald MacMillan.*

VOLUME XXVI, 4—OCTOBER, 1929

- A Plea for the Study of the Corpus Christi Plays as Drama. *George R. Coffman.*
 The Original Music for Beaumont's Play *The Knight of the Burning Pestle*.
Edwin S. Lindsey.
 Wordsworth and William Fleetwood's *Sermons*. *Abbie F. Potts.*
 Burns's Last Years. *Franklin B. Snyder.*
 Mr. Graydon's "Defense of Criseyde." *Joseph M. Beatty, Jr.*
 On the Dating of Spenser's "Mutability" Cantos. *Evelyn May Albright.*
 The Topography of Dekker's *The Shoemaker's Holiday*. *W. K. Chandler.*

VOLUME XXVII, 1—JANUARY, 1930

- "Sordello's" Story Retold. *William Clyde De Vane.*
 George Eliot and Humanism. *Mathilde Parlett.*
 Carlyle and Novalis. *Charles Frederick Harrold.*
 Charles Read's Notebooks. *Emerson Grant Sutcliffe.*

VOLUME XXVII, 2—APRIL, 1930

- The Muse of the *Faerie Queene*. *Frederick M. Padelford.*
 Sir Calidore: Essex or Sidney? *Kenneth Thorpe Rowe.*
 Spenser's Allegory in Book I of the *Faerie Queen*. *Ray Heffner.*
 Spenser's "Clothes of Arras and of Toure." *Frederick Hard.*
 Further Borrowings from Poems in *Philotimus* (1583). *M. O. Tilley.*
 Aristotle's "Sweet Analutikes" in Marlowe's *Doctor Faustus*. *Bonno Tapper.*
 The Printer and Elizabethan Punctuation. *Edwin J. Howard.*
 The Original of Sir John Falstaff: Believe it or Not. *Baldwin Maxwell.*
 An Additional Source for *A Midsummer-Night's Dream*. *Margaret L. Farrand.*
 Bacon's True Opinion of Poetry. *Murray W. Bundy.*
 Notes on English Educational Opinion during the Seventeenth Century.
Ricardo Quintana.
 Recent Literature of the English Renaissance. *Hardin Craig.*

THE NORTH CAROLINA LAW REVIEW

VOLUME VIII, 1—DECEMBER, 1929

1. The O'Fallon Case: Latest Battle in the Public Utility Valuation War.
Gustavus H. Robinson.
2. Profits, Surplus, and the Payment of Dividends. *C. B. Sparger.*
3. Religious Belief as Qualification of a Witness. *J. Crawford Biggs.*

VOLUME VIII, 2—FEBRUARY, 1930

1. Some Phases of the Doctrine of Exemplary Damages. *Charles T. McCormick.*
2. Parol Trusts in North Carolina. *B. Thorn Lord and M. T. Van Hecke.*
3. Some Legal Aspects of Employee Stock-Purchase Plans. *Jefferson B. Fordham.*
4. Tax Advantages of Incorporating North Carolina Enterprises Outside the State. *J. H. Anderson, Jr.*

VOLUME VIII, 3—APRIL, 1930

1. Federal Practice and Procedure. *J. Crawford Biggs.*
2. The Family Automobile. *Frederick B. McCall.*

VOLUME VIII, 4—JUNE, 1930

1. Making Lawyers. *John Dickinson.*
2. Equitable Liens—A Tentative Analysis of the Problem. *William E. Britton.*
3. The Chief Justice of the United States. *W. M. Hendren.*
4. Nine Months of Workmen's Compensation in North Carolina. *Allen K. Smith.*

SOCIAL FORCES

VOLUME VIII, 1—SEPTEMBER, 1929

- Birth Rates and Social Classes. *W. F. Ogburn and Clark Tibbits.*
- Roots of Religion. *Radhakamal Mukerjee.*
- The Verification of Social Measurements Involving Subjective Classifications. *Stuart A. Rice and W. Wallace Weaver.*
- Why Systematic Economic Theory? *Paul T. Homan.*
- Mental Hygiene in the College and the University. *Ernest R. Groves.*
- Opportunity in the Modern World. *Walter G. Beach.*
- Fourteen other articles in the departments of Teaching and Research in the Social Sciences; Public Welfare and Social Work; Community and Neighborhood; Race, Cultural Groups, Social Differentiation; Government, Politics, Citizenship; Social Industrial Relationships.

VOLUME VIII, 2—DECEMBER, 1929

- A Measurement of the Factors in the Presidential Election of 1928. *William F. Ogburn and Nell Snow Talbot.*
- Charles Horton Cooley. *Walton H. Hamilton.*
- Some Aspects of Mental Hygiene and Religion. *Ernest R. Groves.*
- Factors in Law Enforcement. *Ray Erwin Baber.*
- The Concept of the Region. *Rupert B. Vance.*
- Homicide in South Carolina. *H. C. Brearley.*
- Thirteen other articles in the departments of Teaching and Research in the Social Sciences; Public Welfare and Social Work; Community and Neighborhood; Race, Culture Groups, Social Differentiation; Government, Politics, Citizenship; Social Industrial Relationships.

VOLUME VIII, 3—MARCH, 1930

Culture and Environment. *L. L. Bernard.*

Community Organization: Myth or Reality. *Jesse F. Steiner.*

Cooley's Heritage to Social Research. *Robert C. Angell.*

Three Obstacles to the Development of a Scientific Sociology. *William F. Ogburn.*

The Southern Mill System Faces a New Issue. *Harriet L. Herring.*

Economic Aspects of the Gastonia Situation. *Benjamin U. Ratchford.*

Fourteen other articles in the departments of Teaching and Research in the Social Sciences; Public Welfare and Social Work; Community and Neighborhood; Race, Cultural Groups, Social Differentiation; Government, Politics, Citizenship; Social Industrial Relationships.

VOLUME VIII, 4—JUNE, 1930

The Value of Sociological Community Studies for the Work of Social Agencies. *Ernest W. Burgess.*

And discussions by *Jesse F. Steiner, LeRoy E. Bowman, Elwood Street.*

Social Work Material in Introductory Sociology Texts. *Read Bain.*

And discussions by *E. H. Sutherland, Frank J. Bruno, Mildred D. Mudgett.*

A Study of 250 Successful Families. *Chase Going Woodhouse.*

And discussions by *Ada E. Sheffield, Ernest R. Groves, and Lawrence K. Frank.*

Seven other articles in the departments of Teaching and Research in the Social Sciences; Public Welfare and Social Work; Community and Neighborhood; Race, Cultural Groups, Social Differentiations; Government, Politics, Citizenship; Social Industrial Relationships.

PART II

FACULTY PUBLICATIONS

The second section of this bulletin contains a list of faculty publications of a less scholarly nature than those mentioned in the first section but nevertheless worthy of record. No attempt has been made to admit pieces of work not yet published. The list is arranged alphabetically by authors. Abstracts have been wholly omitted, to conserve space.

N. B. ADAMS. *La Cabeza del Dragon*. A school edition.

Contemporary Spanish Literature in English Translation.
(With AGATHA BOYD ADAMS.) *Univ. of N. C. Extension Bulletin*,
Vol. VIII, No. 9. 1929.

L. L. BERNARD. "The Unity of the Environment," *Social Forces*, VIII: 327-334 (March, 1930). "The New Nationalism in Spanish America," *Social Forces*, VIII: 136-141 (September, 1929). "Phases of Spanish American Social Thought," *Social Forces*, VIII: 300-305 (December, 1929). "Life and Literature in Latin America," *Social Forces*, VIII: 452-457 (March, 1930). "The Struggle for Social Well-Being in Latin America," *Social Forces*, VIII: 595-603 (June, 1930).

The following articles for the *Encyclopedia of the Social Sciences*: "The Social Sciences as Disciplines in Latin America," I: 301-320. "The Social Sciences as Disciplines in the United States," I: 324-349. "Alberdi, Juan Baptiste (1810-1884)," I: 613.

J. M. BELL. "Dr. F. P. Venable's Contributions to Chemistry," *Journal of Chemical Education*, VII: 6, 1300-1304.

R. S. BOGGS. "Folklore," *University of North Carolina Extension Bulletin*, IX, 6.

M. L. BRAUN. "The Native Storage of Ice, Shanghai, China," (read before the North Carolina Academy of Science, May, 1930).

R. E. COKER. Allegany School of Natural History—First Annual Report, 67th Annual Report Buffalo Society of Natural Sciences, 1929, 44-59. Allegany School of Natural History—Second Annual Report, 68th Annual Report Buffalo Society of Natural Sciences, 1929, 66-74. "A Summer School of Natural History in

New York," *Nature and Science Education Review*, II: 2, 130-1 (1930). "The Future of the Oyster in North Carolina," *Journal of the Elisha Mitchell Scientific Society*, LXV: 2, 338-349.

W. M. DEY. *Madame de LaFayette: La Princesse de Cleves*. A school edition. *Fromentin: Dominique*. A school edition.

HUGO GIDUZ (with U. T. HOLMES). *Contes De La Vieille France*. A school edition.

J. M. GWYNN. "Some Possibilities for the Use of Vergil in the High School," *The High School Journal*, XIII: 5 (May, 1930). "Types of Playground Supervision—Three General Plans," *North Carolina Teacher*, VI: 4 (December, 1929).

J. P. HARLAND. Reviews of the following books: Poulsen and Rhomaïos, "De Ausgrabungen von Kalydon," in *American Journal of Archaeology*, 452-54 (1929). Tafrali, "La Cité Pontique de Dionysopolis," in *American Journal of Archaeology*, 456 (1929). Mylonas, "The Neolithic Settlement at Olynthos," in *Classical Philology* (in press).

G. A. HARRER (with GEORGE HOWE). *A Handbook of Classical Mythology*, pp. VII + 301, New York, F. S. Crofts and Co., 1929.

U. T. HOLMES. "The French Novel in English Translation," *University of North Carolina Extension Bulletin*, IX, 7. (With HUGO GIDUZ) *Sept Contes de la Vieille France*, New York, Heath and Co. (in press).

GEORGE HOWE (with G. A. HARRER). *A Handbook of Classical Mythology*, pp. VII + 301, New York, F. S. Crofts and Co., 1929.

A. C. HOWELL. *A Handbook of English in Engineering Usage*, pp. VI + 308, New York, John Wiley and Sons, Inc., 1930. "A Report on the Freshman English Course for Engineers at Southern Institutional Members of the Society for the Promotion of Engineering Education." (Presented to the English Committee of the S. P. E. E., June, 1929). "The Practical Impossibilities of 'An Unpractical Education,' a Reply," *Journal of Engineering Education*, N. S. XIX: 10: 972-79 (June, 1929).

A. K. KING. "The Place of History in Improving International Relations," *The High School Journal* (January, 1930). "A Syllabus in North Carolina History for Elementary Teachers" (published in mimeographed form).

E. W. KNIGHT. "It's the People We Meet," *The Outlook and Independent* (July 3, 1930). "The Lesson of Gastonia," *The Outlook and Independent* (September 11, 1929). "Foraging on Parnassus," *Scribner's Magazine* (September, 1929). "The Southern States and National Standards in Education," *Texas Outlook* (December, 1929). "A Negro Teacher of Southern Whites," *Baltimore Sun* (December 8, 1929). "The Return of Hippodamus," *Journal of Adult Education* (January, 1930). "Ninety Years of Rural Education in the South," *Southern Planter* (January 1, 1930). "Education in the South," *The Outlook and Independent* (January 8, 1930). "An Acre in Middlesex," *Journal of Adult Education* (April, 1930). "Our Teachers, Managers of Our Biggest Business," *Outlook and Independent* (February 19, 1930). "Go to the Ant, Thou Sluggard," *Scribner's Magazine* (March, 1930). "Mass Production of Ph. D.'s," *The Outlook and Independent* (June 11, 1930).

S. E. LEAVITT. "The Theater in Madrid, October, 1929," *Hispania*, XII: 629-632.

H. D. MEYER. Editor, The Extra-Curricular Library (ten volumes in distribution), A. S. Barnes and Company, 1929-30. *School Club Practices*, A. S. Barnes and Company, 1930 (in press). One Hundred Club Programs (for parent-teacher groups), University Book Exchange, 1929. "Play and Recreation Leadership Notes," *State Parent-Teacher Bulletin*, (November, December, 1929. January, February, March, and April, 1930).

H. F. MUNCH. "Some Methods of Teaching High School Geometry," *The High School Journal* (January, 1929). "The Content and Function of Junior High School Mathematics," *The High School Journal* (May, 1929). "Mathematics Books for our Libraries," A Bibliography of Books and Material for Libraries, *The North Carolina Teacher* (December, 1929). "Suggestions for a First Lesson in Algebra," *Mathematics Teacher* (December, 1929).

H. W. ODUM. *Wings on My Feet: Black Ulysses at the Wars*, Henry Holt and Company, 1929. "Regional Portraiture," *The Saturday Review*, July 27, 1929. "Black Ulysses Goes to War," *The American Mercury*, August, 1929. "Black Ulysses in Camp," *The American Mercury*, September, 1929.

C. E. PRESTON. Editor of "The Science Column," *The High School Journal* (1929-1930). "The Influence of the Teaching Viewpoint in Laboratory Practices," *The High School Journal*, 207-219 (October, 1929).

SAMUEL SELDEN (with H. D. SELLMAN). *Stage Scenery and Lighting*, F. S. Crofts and Company, New York, 1930.

FRANK C. VILBRANDT. "Chemical Engineering Education in North Carolina," *Journal of Chemical and Metallurgical Engineering*, XXXVI: 682 (1929). "Recent Developments in Industrial Chemistry" (presented before the students of Lenoir-Rhyne College, March 13, 1930). "Opportunities for Chemists in North Carolina" (presented before the Chemical Society of Lenoir-Rhyne College, March 13, 1930).

L. R. WILSON. "Library Development in the South," *School and Society*, XXXI: 804, 714 (May 24, 1930). "Training and Librarianship in the South," *School and Society*, XXXI: 805, 719 (May 31, 1930).

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