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TABLE OF CONTENTS

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Imagery of Nature in Ancient and Modern Poetry.*

By GEORGE SPRAU.

As far as man and human understanding are concerned, all phenomena may be classified as Nature and Art. Nature, as used here, includes all the material world, the whole of reality outside of mind and independent of it. Not that mind and so-called nature may not be limited by the same First Cause, but that there is a distinction between what we call man and not-man. Art, on the other hand, is the projection of personality into the outside world; or, as some one has said, "Art is a bit of nature seen through a personality."

However clear may be the distinction between the subjective and objective, yet there is so close a relation of action and reaction that at times one may seem almost to be conditioned by the other. Through every moment of conscious existence impression after impression, whether of sight, or sound, or touch, or taste, or odor is silently but indelibly tracing its outline on the sensitive-plate of soul. The song of the robin singing in the old elm-tree may indeed grow weaker and weaker, and in infinitude, perhaps, may die away, but through the niches of the soul of him who hears, these notes once heard will echo ever more. The winding river flows not only through the distant plain, but just as surely through the seer's brain. Thus every sense impression is followed by an image, and knowledge and emotion grow out of the soul's interpretation of images. To one the song of the bird, the moaning of the wind, and the ripple of the waters may be only so much pulsation; to another it may be part of one harmonious rhythm flowing through the soul of world, of man,

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of God. To one the mountain is but a dead and barren heap; to another it may be evidence of the power that made and fills it. What we see, what we hear, every sense impression before it becomes an idea and passes into the conscious experience of the soul, must be interpreted and receive coloring from the personality that perceives.

Every idea, whether expressed or latent, consists of a thought or an emotion in an image. The mental image cannot exist apart from thought or emotion. They enter into its very structure and become part of its very nature. No external force acts upon the mind but there is reaction from within; the product or resultant is the mental image or idea. Observation, then, as applied to objective phenomena is not so much a process of sense activity as activity of mind through the media of the senses.

Through the limitations of individual personality, absolute nature cannot be known, or at least known only in so far as individual images harmonize, coincide, and agree. The landscape painting of the artist and the chiseled form of the sculptor are not absolute representations of natural reality, but the product and interpretation of individual minds, the projection of personality into impressions from without. The poet tells us not what absolutely is, but gives us his thought and feeling through his personal imagery. So long as our interpretations coincide, so long as our imagery is the same, we accept a uniform truth and obey a common law. When, however, our interpretation and imagery no longer harmonize and agree there is evidence that we no longer accept the same truth, and that mentally as well as physically we are subject to processes of change.

Natural environment acts on the soul through the media of the senses and in part conditions psychic activity, but the significance of nature to the individual depends upon psychic experience and interpretation. Imagery of nature as revealed in all forms of art is colored by the aggregate of the artist's subjective experience, and becomes in part the index of his inner life. No sense impression comes to the soul from without and retains its individuality as an isolated fact, but, by the law of association, each separate

impression calls up previous psychic experiences in the light of which it is interpreted. The image resulting from any particular psychic experience is composed of the impression itself and of elements of thought and emotion with which it is associated and by means of which it is interpreted.

The element of cause is always present. No impression is made without a cause, and the ultimate nature of the cause becomes part of the image. This final cause, or purpose, may by resemblance suggest other images some elements of which may be reflected from, give coloring to, and become part of the immediate imagery of the mind. This is beautifully illustrated in Sidney Lanier's poem, "The Pine and the Palm."

> In the far north stands a pine-tree lone,
> Upon a wintry height;
> It sleeps; around it snows have thrown
> A covering of white.
>
> It dreams forever of a palm
> That, far in the morning-land,
> Stands silent in a most sad calm
> Midst of the burning sand.

In the first stanza the image is a lone pine standing upon a height of land; everything is frozen; all life seems temporarily suppressed: figuratively, it sleeps. The image changes, or rather is modified: snow falls, covering the branches of the tree and the surrounding land. There in the depth of slumber the pine-tree dreams. There is another image as an adjunct to the first which does not leave the mind; a single withering palm: the rising sun: the glare of the burning sand. But still there is something more. This is not the whole of the mental state of which Sidney Lanier was conscious; not all that we who read his poem see or feel. There is running through it all a power, a something back of it that gives it color and significance; an atmosphere, as it were, that serves as a background or setting for the whole, and links it all together in harmonious unity. The lone and forlorn state of the pine, by analogy, called up in the poet's mind those states of sadness and longing that enter into the experience of every human soul. He saw in the tree, in the outside

world, the same power at work, the same life that he felt in himself. As in his own life there was that eternal longing and aspiration for that which is ever beyond, so in the tree and all nature the same power reaches outward and upward toward that which is distant. But yet, the far-off palm, the Eden of the pine-tree's dream, as the morning sun rose higher and higher, stood sadly calm amid the burning sand. Still there is longing, still aspiration, still hope.

Religion, science, and philosophy also are potent factors in natural imagery, determining not only how but frequently, also, what one perceives. Much of the material or objective world becomes solicitous and gathers meaning and significance from the religious feelings and philosophic theories of the individual or race. It seems to be characteristic of the human mind, unless strictly on guard, to have all phenomena harmonize and agree with laws and theories the direct product and outgrowth of immediate psychic activities. For one age and race the earth is the center of the universe, and all celestial phenomena become secondary and subservient to it. To another the earth is but a lesser satellite, a single factor in an incomprehensible scheme. When Mars is the chief god of worship and sacrifice, deeds of heroism and imagery of battle are rife in the minds of men. Then Diana, Apollo, Venus, and Pan are forgotten or sustain only a vague and shadowy existence in the outer fringe of consciousness. When gods and man live on a plain of social equality, all things receive a grace and charm from the god or goddess who has his habitation there. When the world is conceived as polluted by Satan who stole it from the great God, its creator, whose habitation is far away in realms unknown, then all is woe and imagery of nature is filled with sadness and gloom.

Science, however, more than aught else has influenced man's attitude toward the outside world and his interpretation of natural phenomena. The close attention and detailed investigation so characteristic of the natural sciences and so necessary to their progress have revealed much of the mystery of things, and have provoked an in-

terest in things not self. Whether the accepted truths of science in any age be absolute truth or only illusions of misconceived and misinterpreted phenomena, it is, nevertheless, inseparably interwoven with individual and race consciousness, and becomes the light by which all imagery of nature is formed and interpreted.

As man's mind grows, as his psychic content with reference to religion, science, and philosophy changes, as his apperception mass becomes larger and more complex, his mental imagery will manifest a parallel variation. When the child first becomes psychically responive to impressions of sense, and mental interpretation is in its very incipiency, his attitude is a stare of mystery, and perception is limited to separate individuals stripped of all relations and void of all inner life or significance. Little by little he gathers acquaintance and experience and things begin to be understood in the light of this experience. As the horizon of knowledge widens the dome of understanding becomes vaster and vaster. Mystery and superstition gradually fade away and give place to rationalism and investigation. The moon no longer appears as the shining background for the silhouette of a wicked and foolish Sabbath-breaker, but becomes the reflecting surface of another world with shadows of mountains; yes, sometimes even the forces that hold it in place may figure in its conception and image. The music of the birds and the little flower by the wayside no longer form the whole content or are solicitous of the all absorbing attention of mind, but are perceived in relations and become parts of one greater and more unified whole. Personality has grown with experience, is projected into the outside world and gives coloring to it.

Since the life and development of the individual is to a certain extent a recapitulation of the history of race civilization and growth, the manifestation of change and conditions in one might be taken as an indication of evident similarity in the other. What, then, is the testimony of art as to the progress and growth of the human race? More narrowly speaking, what changes are manifest in the imagery of nature as revealed in ancient and modern poetry? Ancient poetry, as used here, will be limited espe-

cially to the early poetry of the Romans, Greeks, and Hebrews, and, to some of the earliest poetry of the races from which the English-speaking race has been developed. Modern poetry will be confined to the most recent, perhaps limited to the Nineteenth century. This close limitation is made that a longer period of time might intervene and all evidences and indications of change or difference might be more marked and suggestive.

It has been stated above that religion, philosophy, and science enter very largely into sense interpretation, not only supplying the background or setting in which things are perceived, but also determining what is perceived. To the ancients science, or natural science as we know it, was unknown. Their understanding of nature was, so to speak, the child of religion and philosophy, conditioned by and dependent upon them. So nature is interwoven in their thoughts and is revealed in their literature principally through their mythology and by a symbolism peculiar to race and people. All external reality was presided over by, and became the embodiment of, one god or many gods, as the case may be, who ruled according to caprice, without law or established uniformity. God spoke from the burning bush; his voice was heard in the thunder; his form concealed by the clouds. Flowers and trees became the embodiment of gods and goddesses, and the sound of the wind the music of their voices. Aside from mythology, references to nature are few except as mere reference to single objects or in symbolisms sometimes difficult to understand. All nature was not conceived as a harmoniously related whole, nor was there one cause back of it all, according to which things were perceived and interpreted. Each individual object, each seperate phenomenon was the immediate product and purpose of some concealed divinity. The thunder-storm, and the calm brightness of a cloudless day were alike expressions of God's anger or good will. Aurora was the central factor in the rosy morn, the only dawn noticed or mentioned. The moaning of the winds among the reeds, and the rushing of the waves upon the shore were Syrinx' oaten flute or Triton's wreathed horn. Narcissus smiled from the flower by the river's side, and

Daphne lived in the laurel that crowned the victor's head. 'Twas Clytie's love that made the flower turn toward Apollo's shining face; the voice that came back from the hills was only Echo speaking in her mournful state. Thus in all ancient imagery of nature is present some divinity of anthropomorphic form, the natural reality serving only as a background or setting for the god or goddess, the apparel by which he was known. This was the cause of things.

Just in what proportion the divinity figured in ancient imagery is, perhaps, somewhat difficult to determine. However, the evidence of ancient art, painting and sculpture aside from literature, seems to indicate that the divinity of anthropomorphic form was the element of prime significance, the thing really to be sought and perceived in nature. Landscape painting as we know it was unknown to them. Only enough of natural phenomena was given in art to suggest what was necessary to the understanding of its immediate purpose, perhaps only the branch of a tree or leaf of a vine. As a rule, however, these, as well as many references to natural objects in literature were significant not in themselves, but as symbols of that which should take precedence in the mind; as, the oak for strength, the vine for grace, the sky and mountains for sublimity, the winds for swiftness. Plants and animals useful for food or sacrifice figure in ancient art and imagery in connection with the purpose for which they were destined.

Imagery of nature among the ancients, as well as all ancient art, is characterized especially by two principles, idealism and repose. For them the process of creation was overcome; the universe and man were finished and complete. Of all this greatness and vastness man was the crown and culmination. Created in the image of God or gods, he differed from them only in degree, communed with them, and together with them enjoyed the pleasures of existence. For them man and man-gods were the whole subject of absorbing thought, figuring as primal elements in all their ideas, and entering into all interpretations of sense impressions. Activity and motion entered into their theory of the universe and life not as necessity but as a

means of pleasure and result of choice. Ease and repose became the general manner and ideal of life and were interwoven and gave coloring to their thought and imagery. They did not grasp the phenomena of nature in their casual relations except as the immediate consequence of some divine volition. They did not conceive as did Lowell that,

> "Every cloud feels a stir of might,
> An instinct within it that reaches and towers
> And groping blindly above it for light,
> Climbs to a soul in the grass and flowers."

The flower, the grass, and the clod were significant and contained a soul not of themselves, but their life was conceived as a partial manifestation of some mysterious manlike god or goddess dwelling in them. Their imagery of nature is, for the most part, still, as it were, a fixed stare where some ideal figure seemed to absorb attention while nature figured vaguely only in the fringe of consciousness. Composite images are rare; neither is their imagery rich in color and detail. Only the striking, bright, and terrible seemed to provoke attention, and with its weird and mysterious interpretation figures in constant and extravagant repetition.

When we turn to modern poetry we immediately recognize a decided change. There is no longer the presence or suggestion of superstitious interpretation of the outside world. No longer is there the cold and lifeless representation of nature as if cut in marble. No longer the vague and hazy conception and relation of things. Idealism and repose have given way to realism and aspiration. Things are perceived as realities rich in self-contained beauty and significance. Nothing is discarded or conceived as void of life and purpose; one life-stream, one power, one cause flows through the outer world in concording harmony with the human soul. Nothing is isolated, or perceived as separate from the single unit, the one world-soul. Tennyson indeed voices the sentiment of modern thought when he says:

> "Yet I doubt not through the ages one increasing purpose runs;
> And the thoughts of men are widening with the process of the suns.'

There is in modern imagery of nature not that element of completeness, satisfaction, and repose, but rather motion,

aspiration, hope. Things are not finished and complete, but subject to progress, growth, and development in accordance with order and law. Idealism has given place to realism. Things no longer gather life and meaning from an imaginary idealistic anthropomorphism associated with them and conceived as dwelling in them, but are perceived and interpreted as they are, the life and spirit of the outside world, as well as that of man, flowing from one eternal stream.

> "Are not the mountains, skies, and seas
> Part of myself, as I of these?"

Landscape imagery in ancient poetry is rare and very incomplete. As mentioned above, only the unusual, the striking, the terrible in nature has prominence in the imagery. Things are suggested not in relations but as individuals. As a rule images are not complex, composed of many factors harmoniously related, but seem to be limited to one or, at most, a few elements. This is due, perhaps, to their lack of power to grasp things through the senses in groups. Only those phenomena which were able violently to disturb their accustomed equilibrium of repose and introspection were imaged in consciousness, and then not in relations but only in isolated and mysterious symbolisms. Delicate coloration, fine co-ordination of sight and sound together with intricate relations of odor, taste, and feeling are very rare if not altogether wanting. Even so important an element as the sky, in landscape imagery, plays an insignificant part in ancient imagery and, when suggested at all, it is with the dull monotony of a very meager and limited coloration.

Modern poetry, on the other hand, is rich in landscape imagery, not only in quantity but also in quality. Things are so suggested that the picture flashes upon the mind as a reality with all related parts distinctively real and characteristic. Nor is there that feeling of limitation and boundary, but frequently there is a suggestion of endlessness that creates a mental state of aspiration reaching outward and upward. Sometimes the image changes while in consciousness; not a succession of distinct images, but one image modified, as it were transformed by natural law.

It might be well now to notice a few examples from ancient and modern poetry illustrating some of the principles referred to above. Perhaps no single natural phenomenon has been of more universal interest than sunrise and sunset, dawn and evening, morning and night. Homer pictures morning and sunrise in a general way by the aid of Aurora.

"Soon as Aurora climb'd Olympus top
With notice to the gods of rising day,"

In the Songs of Solomon, morning is referred to,

"Until the day break, and the shadows flee away."

In Beowulf morning and evening are referred to by a single suggestion in a simple image.

"When the sun was sunken."
"In the dusk of the dawning, as the day was just breaking."
"Came a light from the east, God's beautiful beacon."

Similar are these illustrations from Virgil.

"Meanwhile heaven shifts from light to gloom
And night ascends from ocean's womb."
"The morn meantime from ocean rose."

While these few illustrations may not furnish conclusive evidence, yet they are characteristic of the ancient mind and typical representations of their natural imagery. The imagery is not complex, nor as a rule does it appeal to more than one sense. In comparison with these, how different is Gray's picture of morning,

"The breezy call of incense-breathing morn,
The swallow twittering from the straw-built shed,
The cock's shrill clarion, or the echoing horn,
No more shall rouse them from their lowly bed."

Here not only one sense is appealed to, but several. The general aspect, that of the sun and light, without which one cannot think of dawn is left unmentioned, while detailed factors are vividly brought before the mind making the image more real and complex.

Longfellow in describing the twilight makes us feel the growing darkness, when he says,

"Meanwhile apart, in the twilight gloom of a window's embrasure,
Sat the lovers, and whispered together, beholding the moon rise
Over the pallid sea and the silvery mist of the meadows,
Silently one by one, in the infinite meadows of heaven,
Blossomed the lovely stars, the forget-me-nots of the angels."

Here the image is not fixed but changes. We feel the

lapse of time and the growing depth of shadows by the stars increasing in number one by one.

Notice also a few illustrations from Shelley.

"If solitude hath ever led thy steps
To the wild ocean's echoing shore,
And thou hast lingered there,
Until the sun's bright orb
Seemed resting on the burnished wave,
Thou must have marked the lines
Of purple gold, that motionless
Hung o'er the sinking sphere;
Thou must have marked the billowy clouds,
Edged with intolerable radiancy
Towering like rocks of jet,
Crowned with a diamond wreath.
And yet there is a moment,
When the sun's highest point
Peeps like a star o'er ocean's western edge,
When those far clouds of feathery gold
Shaded with deepest purple, gleam
Like islands on a dark blue sea."

And again:

"The orb of day,
In southern climes, o'er ocean's waveless field
Sinks sweetly smiling; not the faintest breath
Steals o'er the unruffled deep; the clouds of eve
Reflect unmoved the lingering beam of day,
And vesper's image on the western main
Is beautifully still."

How diffierent from the ancients does he picture dawn! How delicate are the phenomena suggested! How full of life and motion!

"The point of one white star is quivering still
Deep in the orange light of widening morn
Beyond the purple mountains; thro' a chasm
Of wind divided mist the darker lake
Reflects it: now it wanes; it gleams again
As the waves fade, and as the burning threads
Of woven cloud unravel in pale air:
'Tis lost! and thro' yon peaks of cloud-like snow
The roseate sunlight quivers."

It has been suggested above that the sky does not play a prominent part in ancient imagery of nature, and when suggested at all, it is with the most striking and brightest color. How different is the morning sky suggested by

Sidney Lanier! How delicate is the coloring! How vivid and real the image!

"O Raven days, dark Raven days of sorrow
Bring to us in your whetted ivory beaks
Some sign out of the far land of to-morrow,
Some strip of sea-green dawn, some orange streaks."

Notice but one more illustration from Shelley:

"As the dissolving warmth of dawn may fold
A half unfrozen dew-globe, green and gold,
And crystalline, till it becomes a winged mist,
And wanders up the vault of the blue day,
Outlives the noon, and on the sun's last ray
Hangs o'er the sea, a fleece of fire and amethyst."

Here not only is the imagery rare and rich in color, but also full of motion, suggesting the very laws and processes in nature by which the change is brought about.

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Structure of the Oesophagus, Stomach, and Intestine of the Bird.*

By JOHN EDMON McDANIEL.

In this work most attention was given to the histology of the subject, only enough of the gross anatomy being given to make the finer structure more easily understood.

The chicken was the type form used because it could easily be procured when wanted, and, by special arrangement, of a known age. In tracing certain points embryo chicks, from six days incubation onward, were used.

In fixing tissue, picric alcohol for general use, and Herman's, Flemming's, and Zenker's fluids were used. For staining picrofuchsin with hematoxylin was generally used, with iron hematoxylin for cell structure. Some use was made of the collodion method of imbedding but the paraffin method was used for most of the work.

Considerable literature was found on the gross anatomy of the bird, while but little was obtainable on the minute structure.

The work was undertaken at the suggestion of Dr. W. F. Mercer, head of the Department of Biology at Ohio University, and continued under his personal supervision. Every facility was freely placed at my disposal for the prosecution of the work in hand, for all of which grateful acknowledgement is here made.

The oesophagus (oe, Fig. A) leads to the proventriculus, fore—or glandular—stomach. Its length varies with the length of the neck, being, on an average, about 20 cm long in the chicken. The portion in the neck lies back of the trachea and a little to its right. Its caliber varies, probably, with the kind of food eaten and its abundance. For, instance, in the kingfisher, sparrow-hawk, chicken, and other birds that swallow whole fish and other large pieces

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of food the oesophagus is characterized by its great expansibility. In such birds as take their food in large quantities and at comparatively long intervals, or when the food is of such a character as to require grinding, the oesophagus is modified with one or more expansions which serve as temporary reservoirs for the food. The expansion is of a long fusiform shape in the kingfisher, blue heron, etc., and of a pouch shape in the chicken, turkey, pigeon, quail, and so on. In this latter case the expansion is known as the crop (cr, Fig. A) or ingluvies. No crop was found in song birds, such as the red-bird, different kinds of sparrows, titmouse, blue-bird, woodpecker, etc. It is probable the crop is more than a mere reservoir, for the food is at least softened there and often a little disintegrated mucus secreted by the glands of the oesophagus, and the crop.

The walls of the oesophagus may be considered as composed of three coats—the *fibrous*, *muscular*, and *mucous*.

The fibrous coat (fc, Figs. 1, 2) is outermost and consists of a comparatively thin layer of connective tissue, interspersed with much elastic fiber.

The muscular coat is separated from the fibrous by a layer of loose connective tissue which serves, as do the other connective tissue layers, to convey and support the larger blood vessels and lymphatics. *This coat is composed of three quite distinct layers of smooth muscle fibers*, an outer longitudinal, a middle circular, and an inner longitudinal. The inner layer (m m, Figs. 1, 2, 3) is very probably the muscularis mucosae of mammals much developed, so much developed indeed as to be, on an average, in the chicken quite as thick as the outer layer, while in the English sparrow, and the sparrowhawk (Fig. 21) it is developed so much as to be as thick as both the other layers taken together. In the last two mentioned, and probably in others, the outer layer is so thin as to be easily overlooked. This fact has probably led some authorities * to say that the muscular coat of the alimentary canal in birds is made up of only two layers, an outer circular and an inner longitudinal, just opposite, as they say, to that in the mammals. This, of course, could only be the case if we consider neither

*See Der Bau der Vogel, p. 291, von William Marshall, Leipzig, 1895.

the muscularis mucosae to exist in mammals (which is indeed harder to demonstrate, as a rule. than the outer longitudinal layer in even so small a bird as the English sparrow, but which is nevertheless generally recognized by histologists) nor the outer longitudinal layer in birds. But this latter may be demonstrated by a most cursory microscopical examination not only of the oesophagus but also of any part of the intestine of the chicken. The intestine is mentioned in this connection for the muscular arrangement is, in general, the same here as in the oesophagus and the same misapprehension has been held concerning it.

The outer muscular layer (o m l, Figs. 1, 2, 3,) is composed of bundles of muscle fibers, which, even in the undistended condition of the oesophagus, are seen to be loosely connected by connective tissue. Between the outer and middle muscle layers is loosely woven connective tissue. The middle muscle layer (m m l, Figs. 1, 2, 3) is also composed of loosely connected bands which probably do not extend entirely around the oesophagus. Between the middle and the inner layers is another vascular sheet of loose-woven connective tissue.

The inner muscle layer*, the connective tissue layers above and below it, and the mucosa are all thrown into from 5 to 8 longitudinal folds (Fig. 1) which are so great as almost to fill the lumen of the oesophoagus. The loose arrangement of the muscular bundles and of the connective tissue, and the strong foldings of the comparatively unelastic mucosa account for the great expansibility of the oesophagus.

Between the inner muscle layer and the stratified squamous epithelium is a layer of loose connective tissue (ct, Figs. 2, 3, 4,) containing blood-vessels, lymphatics, and large compound tubular glands. These glands often have a diameter as great as the thickness of all the muscle layers taken together. The connective tissue in which they are situated is so disposed as to make a sort of capsule for them. The cells (mg, Figs. 3, 4, 23) lining these glands

*In the English sparrow and the sparrowhawk the inner muscle layer enters very little into the formation of the folds.

are columnar and stain but little with hematoxylin. Their nuclei are near the attached cell ends. The glands are connected with the free surface of the mucosa by short tubular necks lined with columnar cells which gradually shorten toward the open end of the tube. The septa or partitions in the glands are composed of connective tissue, the meshes of which are more or less completely filled with adenoid tissue. In many cases this adenoid tissue seems to have intruded into the compartments of the gland usually occupied by the columnar cells. When this has occurred in two or three compartments the intrusion has the form of a trangle (Fig. 4) with the apex toward the center of the gland. The adenoid tissue often takes the place of nearly the whole gland.

The inner coat (m u, Fig 2), the mucosa, a stratified squamous epithelium, rests on a connective tissue matrix, often called the tunica propria. Projections from the tunica propria, in the form of small papillae, extend into the overlying membrane. The deeper cells of the mucose are of a more or less globular shape and have large nucleia while the cells near the surface become flattened in a plan, parallel to the surface.

The proventriculus (pr. Fig. A.) or glandular forestomach, is situated at the posterior end of the oesophagus and at first sight might be taken simply as an expanded portion of it. It is better, however, on account of the peculiar structure of its mucosa, to consider it as a particular organ of digestion. It has a length of about 4 cm in the adult chicken and is separated from the stomach by a constricted portion in which the circular muscular layer is much increased in thickness forming a sort of sphincter. Its walls are quite thick and thc lumen large but not filled, as in the oesophagus, by strongly marked longitudinal folds. In fact the folds are not much developed so that the expansibility must be very much less. Its inner surface is covered by minute elevations easily visible to the naked eye, having in their tops minute openings which lead to the interior of the glands beneath. The surface between the elevations is covered with numerous short fine projections which give it a velvety appearance.

Under the microscope the three muscular layers (m c, Fig. 8) are seen to be practically the same as in the oesophagus. The essential difference between the oesophagus and the proventriculus lies in the glands and the mucosa, the glands (pg, Figs. 6, 7, 8) lie beneath the mucosa, within a layer of connective tissue which separates them from the inner muscular layer on the one hand and from the mucosa on the other and forms a sort of a connective tissue capsule for them. These glands are very large, often having a diameter as great as five times the thickness of the muscle layers put together. They are of the compound tubular type (pg, Figs. 22, 6) with large lumens and are so closely packed together that sometimes the sides become flattened like cells in a honeycomb. In the chicken there are sometimes two layers of glands (pg, Fig. 3) but sometimes a gland, roughly conical in shape (pg, Fig. 25,) will reach from the bottom of the gland layer to the short tube reaching to the free surface. Sections from embryos (pg. Fig. 7) show that the glands are formed by evaginations from the mucosa. The shape and size evidently depend upon the relative time of the out-pocketing of the individual glands and their mutual interference in growth. The glands in the sparrow-hawk (pg, Fig. 6) are more regular in size and shape. They have the general shape of a truncated cone whose upper and lower diameters vary but little. They are arranged in one single layer. The cells lining the tubules, which reach the central lumen, are of a somewhat globular type, of a granular appearance, staining yellow with picric acid. The granules seem to be the part to take the stain. Their round nuclei are nearly centrally placed. The change from the oesophageal to the proventricular glands is made a little before the change from the stratified mucosa of the oesophagus to the mucosa of the proventriculus, so that the mucosa of the oesophagus extends over the first proventricular glands.

The mucosa of the proventriculus (m u, Fig. 25), between the elevations through which the glands open, is covered by villi-like projections which in turn are covered with columnar cells having oval nuclei placed below the middle and having free ends little stained by hematoxylin or picric

acid. These villi-like projections are often so closely placed that the spaces between their basal ends take the appearance of crypts of Lieberkuhn.

The stomach, or gizzard, of the chicken is situated in the median line under the posterior ends of the liver lobes. It is an oval body having diameters of about 6 c m and 4 c m. The proventriculus opens into the anterior end a little to the right and the duodenum opens from it within 2 c m and rather in front of the proventricular opening. The outer surface is covered by the usual peritoneal membrane. The muscular coat is very highly developed and is attached to tendinous plates on the sides. The same greatly developed muscular tissue is found in other granivorous birds but in birds of prey it is not so well developed. The interior coat, or mucosa, adheres so loosely that it may be peeled off with the fingers. In the chicken part of this layer is indurated into a kind of horny material. When the sides of the lumen of the stomach are brought into close opposition by the contraction of the powerful muscles, the stomach, aided by this horn-like material and such little stones and sand as the bird has swallowed, becomes an efficient grinding machine. The microscope shows the outer muscle layer to comprise the greater bulk of the muscle of the stomach. In the kingfisher the inner muscle is thin, the middle layer twice as thick, and the outer eight or ten times as thick as the inner. The muscle tissue is not nearly so much developed, is more loosely packed than in the chicken and the layers of connective tissue occupy greater space and are looser.

Immediately above the inner muscle layer, or muscularis mucosa are situated the stomach glands. These glands extend down from the free surface of the stomach to about the position of the inner muscle layer and are lined with short columnar or globuar cells with very large nuclei containing several nucleoli. Between the tubes lies a mesh of closely woven connective tissue. On the surface between the openings of these glands stand short villi-like projections (Fig. 9) covered with comparatively long columnar cells with nuclei near the base. In the embryo (Fig. 10)

the stomach glands are seen to be formed by the foldings of the mucosa.

In all the sections of the stomach of the chicken, sparrow-hawk, and kingfisher, examined, a colloidinous substance which took a yellow stain from picric acid, was found, filling these glands and often extruded from their mouths and retaining the shape of the tubes from which it evidently came. This was inferred to be a secretion from these glands having some use in digestion. If this is true, it would tend to controvert the statement of those authorities* who hold that the stomach has no other than a mechanical function.

In this connection, in order to find out a little about the function of the glands of the proventriculus and the stomach, the following series of experiments were performed. The secretion from the proventricular glands of a 100-day old chick was obtained by scraping with pressure over the inner surface of the proventriculus with a dull knife, thus squeezing it out. This was placed in a 1-10% solution of formaldehyde, acidified with 2-10% HCL and into a portion of it was placed some prepared blood fibrin and the whole kept at a temperature of about 100 degrees Fahr., for about 12 hours. It was then tested with potassium hydrate and a dilute solution of copper sulphate when the usual pink color indication for the detection of peptones was given. The inner membrane from the stomach of the same chicken was then taken off, washed and macerated in a 1-10% solution of formaldehyde and with this solution the experiment was repeated exactly as with the proventricular juice and with exactly the same result—an indication of peptones. As checks to these experiments, blood fibrin was put into distilled water and kept at the same temperature for the same time as the others. By the same test no peptone was shown. Then some blood-fibrin in an acidified formaldehyde solution was put through the same process with no indication

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*See Wiedersheim and Parker's Comparative Anatomy of Vertebrates, p. 262; Shipley and McBride's Zoology, p. 492; International Encyclopaedia, Vol. 1, p. 351.

of peptone. The whole series of experiments go to show that pepsin is secreted in both the proventriculus and in the stomach. However the data are not sufficient to make definite statements. In this connection, a study of longitudinal sections through the proventriculus and into the beginnning of the stomach will show that the stomach crypts are in appearance much like those found above the glandular layer in the proventriculus. If this is the case, there is a possibility that these crypts of the proventriculus, and not the glands there, secrete the pepsin. The whole question, however, needs further investigation.

The duodenum (duo, Fig. A) of the chicken opens from the ventral portion of the stomach at its anterior end and comprises about the first six inches of the intestine. It forms a loop about three inches long in which lies the long narrow pancreas. The pancreas is attached to both sides of the loop and holds them close together. It empties its secretion into the duodenum by two ducts—one near the beginning of the duodenum and one near its end. The liver also empties by two ducts like the pancreas. The duodenal division of the intestine seems to be a rather arbitrary one for no particular differentiation of structure is noticed in passing from what is called the duodenum to the intestine proper. The first part of the loop is called the descending, the last, the ascending duodenum. The outer serous coat is practically the same here as in all the other parts of the alimentary canal and will not be referred to further in this paper. The muscular coat (m c, Fig. 12) consists, as in the oesophagus, of three distinct layers, an outer longitudinal, a middle circular four or five times as thick, and an inner longitudinal just about as thick as the outer layer. As in the case of the oesophagus, some authorities consider the intestine to have only two muscular layers, but that there are three is very easily demonstrated, as I have already stated, in any part of the alimentary canal. Now if it can be shown that the alimentary canal of birds has three layers of muscle corresponding in fiber direction with those of mammals and that the inner layer in the bird corresponds to the muscularis mucosae of mammals then it would seem that the

evolutionary chain would be strengthened a little at this point by the filling in of this gap.

The more complete identification of the inner muscular coat of the chicken with the muscularis mucosae of the mammals has been reserved until this time because it is in the intestine that its character can best be shown. This muscular layer in all portions of the intestine lies closely under the mucosa, never being separated from it but by a more or less thin layer of connective tissue, and always sending up into the villi, and the other parts of the mucosa, strands of muscle fibers, thus making it a true muscle of the mucosa. This is especially easy to demonstrate in the large intestine (Fig. 20) of the chicken.

The arrangement of the muscle fibers in the duodenum, as in all the rest of the small intestine, differs from that of the oesophagus, in being firmly united in continuous layers instead of being composed of loosely connected bundles of fibers. This is in keeping with the less expansible character of the intestine.

Immediately above the inner muscle layer lies the mucosa proper. From this, very numerous and long villi project into the lumen so as almost to reach the center (v, Fig. 15) in young chickens. Even in the adult chicken (v, Fig. 12) the duodenal villi are remarkably long and numerous thus giving a large inner surface.

In preparing sections from the intestine of the adult chicken the villi seemed to be covered by a smooth thin membrane like the basilar membrane found under the columnar cells in mammals. This membrane was demonstrated quite conclusively and a photo-micrograph made of it. The absence of the columnar cells (v, Figs. 12, 14) was so unique and the appearance of the villi so striking that a somewhat extended investigation was made into the matter. Sections from different portions of the intestines of embryo chicks were made at intervals, from 8 days from the beginning of incubation, and on young chicks (c c, Fig. 15) from about the time of hatching to about 100 days from the beginning of incubation. In all the embryo chicks the columnar cells (Fig. 24) were very evident. At 63 days the columnar cells were evident but

had begun to fall off, many being found in the lumen of cross sections of the intestine. At 84 and 101 days, in the sections, columnar cells were generally found dissociated in the lumen but were often found detached from the villi and arranged in rows of connected cells parallel to the surface of the villi. From this it would seem that between the ages of 60 and 80 days the columnar cells had become so little persistent as to be easily detached by the ordinary methods of preparing slides. Yet in some sections from the adult (c c, Fig. 12) rows of connected cells parallel and close to the villi were found, also a few sections from the diverticulum of the chicken showed the short villi covered with columnar cells (c c. Fig. 17). Why these cells are so persistent in the beginning, in the young chicken, and wanting or very easily detached in the adult, is a question which seems to need further investigation. Columnar cells are very plainly seen in sections from the adult English sparrow, and the adult sparrow-hawk. In the intestine of of the sparrow-hawk goblet cells were found among the columnar cells. In sections from the 84 and 101-day ckicks fixed with Flemming's and Hermann's fluids and stained with iron hematoxylin, the striated border of the columnar cells was well shown.

Between the bases of the villi, and extending down nearly as far as the muscular layer are found little short crypts lined with columnar cells. These crypts may be regarded as analogous to the crypts of Lieberkuhn in mammals.

No valvulae conniventes nor Brunner's glands were found in the intestines.

In the ascending duodenum (v, Fig, 27) it was noted that many of the villi branched and some anastomosed with others. The villi in the intestine 35 c m from the stomach (v, Fig. 13) were not so numerous and were shorter than in the duodenum. At 90 c m they were still shorter and less numerous (v, Fig. 14).

As far back as 30 c m from the stomach aggregations of adenoid tissue were found in the mucosa immediately above the inner muscular layer. These lymph nodules (lg, Fig. 16) are especially numerous in parts of the diverticula, and in the intestine near their origin.

The intestine of the chicken from the stomach will probably average about 135 c m in length. At about 6-10 c. m. from the cloaca are found two diverticula (div. Fig A) given off from the sides of the intestine, extending anteriorily closely along its side and fastened to it by a loose reticular membrane. They vary in length in the chicken from 15-20 c m. Their length in the screech owl is from 7-10 c m, while in the blue-bird, English, song-and chirping-sparrow they are mere buds. It is wanting in the king-fisher. The diverticula seem to vary in length capriciously in the various species and families of birds.* The diverticula, in the chicken, near its opening, is of a less diameter than the intestine. At 5 or 6 c m it begins to expand until it is of a diameter twice as large as the intestine. In the expanded portion the muscular walls are very thin and the villi and crypts of Lieberkuhn are very short—apparently in a degenerated condition (Fig. 17). The blind end of the diverticula, within the muscular layers, is composed largely of adenoid tissue through which ramify strands of muscular and connective tissue, and and a few tubes lined with culumnar epithelium, (Fig. 16).

As the intestine comes toward the openings of the diverticula the muscular layer increases in thickness at the expense of the lumen ; the inner layer gives off an increased number of fibers to the mucosa. Near the opening of the diverticula, the muscularis mucosae and the connective tissue above and below it are thrown into longitudinal folds which become more prominent as we pass the diverticular openings into the large intestine or dickdarm (Figs. 19, 20). This may be considered to be brought about by an approximation and fusing of the villi so that the mucosa appears to be made up of smaller or larger clumps of adenoid tissue, penetrated from above by tubes, lined with columnar epithelium—crypts of Lieberkuhn—and from the bottom by bundles of connective tissue and muscle fibers.

The somewhat varying forms of mucosa in the small intestine appear comparatively simple when one considers the embryology of the subject. The mucosa of the 10-day chick is seen covered with a columnar epithelium just be-

*For a full discussion of this point see "Der Bau der Vogel," p. 323.

ginning to fold. In the the 14-day chick the epithelium is folded enough to form a few villi-like structures. By the time the chick has developed 24 days the foldings have become well developed and numerous, and take the appearance of villi. While this is going on the mucosa is thickening and little depressions appear between the bases of the villi. When the villi develop these practically become extensions of their sides making the villi appear longer. With the growth of the villi their lower parts approximate, forming tubes lined with columnar epithelium. These are the so-called crypts of Lieberkuhn. The stomach glands are developed in the same way except that the villi become so numerous and so closely crowded together, even so near their free extremities, as to form a mucosa filled with tubes. In the case of the large intestine each villi-like fold becomes greatly expanded laterally by the intrusion of adenoid tissue so that the mucosa becomes practically solid, the number of tubes being very much fewer than in the stomach.

Conclusions.

Contrary to the statements of some authorities, I find the muscular coats of the alimentary canal, in general in the bird, to be composed of *an outer longitudinal, a middle circular, and an inner longitudinal* and *not* of an outer circular and an inner longitudinal, as they say.

The inner layer, I take, for reasons set forth in the body of the paper, to correspond to the muscularis mucosae of mammals, notwithstanding the fact, that in many parts of the intestine of birds it is quite thick, while it is always very thin in mammals. The outer longitudinal coat is not mentioned by the authorities *alluded to, probably, because in many birds it is very little developed. If the view set forth here concerning these muscles is true, and I am convinced it is true in the main, it seems to eliminate a sup-

*Wm. Marshall in Der Bau der Vogel, pp. 291, 319, Leipzig. 1895, states very clearly the apparent position of the authorities on this subject.

posed difference, hard to account for, between birds and mammals and closes up a little gap in the evolutionary chain.

Peptones seem to be formed by the action of the secretions from *both* the proventriculus and the stomach. The data on this at my hand, however, are not yet sufficient to justify definite conclusions. In regard to this many authors say the stomach has only a mechanical function, while one (Jobert) says the real gastric juice is secreted only in the stomach. (See references on this subject in body of paper).

The cells of the intestines of adult birds, especially of chickens, seem a great deal less persistent than in the young, so much less indeed, that by the ordinary methods of preparing microscopic sections, it is impossible to say conclusively that they are present in the adult, although they are *probably* there.

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Key to Drawings.

oe.....oesophagus
cr.....crop or ingluvies
pr.....proventriculus
st.....stomach
des duo.....decending duodenum
asc duo.....ascending duodenum
sm int.....small intestine
l. int.....large intestine
div.....diverticulum
fc.....fibrous coat
mc.....muscular coat
mu.....mucosa
ct.....connective tissue
o m l.....outer muscular layer

m m l.....middle muscular layer
m m.....inner muscular layer or muscularis mucosae
mg.....mucous glands
cc.....columnar cells
pg.....proventricular glands
v.....villi
lg.....lymph glands
cr L..... crypts Lieberkuhn

DESCRIPTION OF FIGURES.

FIGURES
A..... To show parts of alimentary canal
1. .....Cross section oesophagus 24-day chick
2.....Cross section oesophagus adult chicken
3.....Longitudinal section oesophagus of adult chicken
4.....Oesophagus gland adult chicken
5..... .....Longitudinal crop of adult chicken
6.....Proventricular gland of a sparrow-hawk
7..... .Cross section of proventriculus of a 14-day chick
8.....Cross section of proventriculus of a 24-day ckick
9.....Stomach of a 24-day chick
10.....Stomach of a 14-day chick
12.....Decending duodenum of an adult chicken
13..Small intestine 30 c m from the stomach, adult chicken
14..Small intestine 90 c m from the stomach, adult chicken
15.....Small intestine of a 24-day chicken
16.....Diverticulum of English sparrow
17.....Diverticulum of adult chicken in expanded portion, cross section
18.....Diverticulum of adult chicken, middle portion cross section
19.....Large intestine near diverticula, adult chicken
20.....Cross section large intestine farther down
21.....Cross section, oesophagus of the sparrow-hawk
22.....Proventricular glands, adult chicken
23 .....Columnar cells in an oesophageal gland, chicken
24.....Villi 24-day chick
25.....Longitudinal section, proventriculus 42-day chick
26.....Stomach, king-fisher
27.....Ascending duodenum, adult chicken

DEPARTMENT OF BIOLOGY
OHIO UNIVERSITY

Figure A

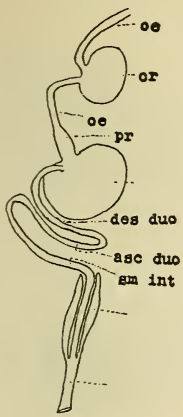

Figure 1.

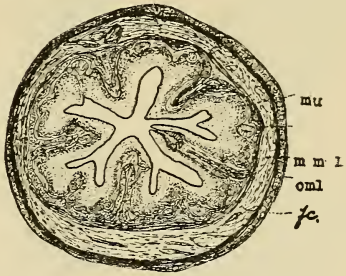

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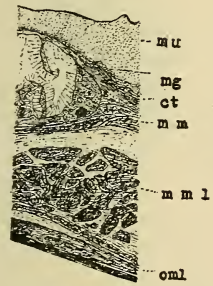
Figure 3.



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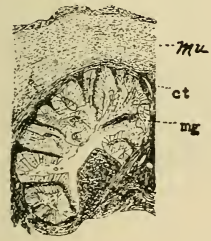

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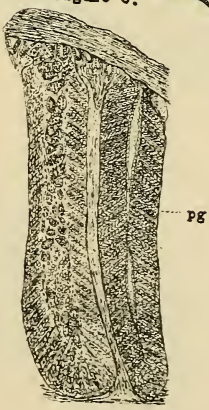

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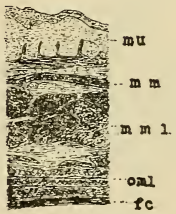

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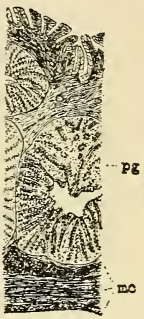

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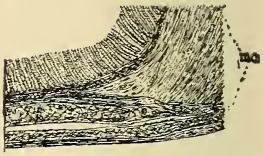

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Figure 14.

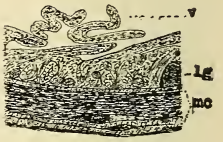

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Figure 12.

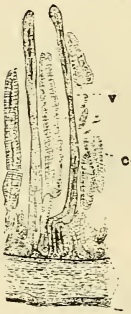

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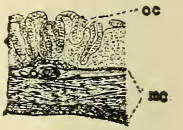
Figure 17.



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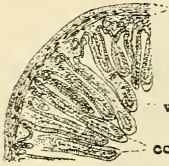

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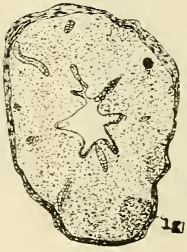

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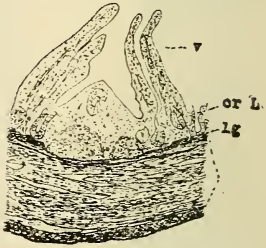

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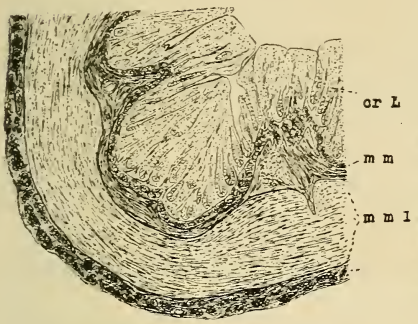

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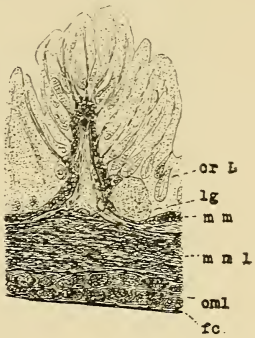
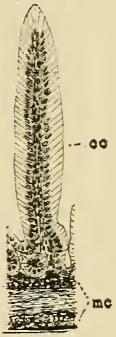


Figure 21.

Figure 22.

Figure 24.



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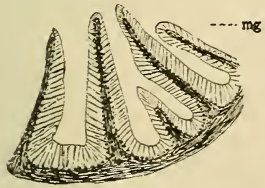

Figure 25.

Figure 26.

"The Relation of The Grain-Size of Soft Steels to Their Magnetic Permeability Characteristics.*

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This thesis presents the results of an investigation made in the Physical Laboratory of Ohio University.

The object of the investigation was to determine the relation between the grain-size of soft steels and their respective permeability characteristics.

As an immediate outgrowth of the application of the microscope to the study of rocks—the science of petrography—the microscope was in turn applied to metals, thus forming the comparatively new science—Metallography.

Dr. Henry Clifton Sorby, of Sheffield, England, was the pioneer in this field, and all others who have aided so materially in the advancement of this science have followed in his footsteps.

"First of all let us ask what is metallography, what is this new science? It is not yet defined in any of our dic-

*A thesis presented to the Faculty of Ohio University for the degree of Bachelor of Science in Electrical Engineering by Chauncey William Waggoner, June 20, 1904.

tionaries, at least the meaning we give it. To arrive at an accurate conception of what metallography is, it is well to look into the origin of this science. When Dr. Sorby, the eminent English microscopist, first placed upon the stage of his microscope a piece of steel properly polished and etched, he discovered that the structure of the metal was not unlike that of igneous rock; that it was made up of constituent parts which possessed all the characteristics of minerals; and just as the study of rocks brought into existence the science of petrography, so from the study of metals was developed the science of metallography."*

Metallography is more than a merely descriptive science. It has its applied side as well: that is, it not only deals with the relations existing between the structure and different heat treatments to which the steel has been subjected in the process of manufacture, but it also deals with those physical properties which are of such vast importance to the engineer.

First, let us study some of the constituents that may be recognized under the microscope. If we were to examine a polished specimen of any pure metal—say gold, for example—we should find it to be made up of a number of irregular polyhedric grains. The size of the grains in the same metal varies with the heat and mechanical treatment to which the metal has been subjected.

Prof. Sauveur says, "Generally speaking, it may be said that the higher the temperature and the slower the cooling, the larger these grains."

In steels these grains are made up of a combination of pure iron and carbon, which is present in steels as a carbide of iron, Fe 3 c. Mineralogical names have been given to these constituents of iron. That part which constitutes the mass of carbonless iron has been called *Ferrite;* the carbide of iron has been called *Cementite* because of its abundance in cemented steels. These two constituents form in parallel layers and constitute a mechanical mixture, which owing to its appearene is called *Pearlite.* In a micrograph

*Prof, Albert Sauveur in "The Use of the Microscope in the Determination of the Properties of Steel." Proceedings of the Engineers' Society of Western Pa. Vol. XVIII, No. 9, Pg. 454.

of soft steel one sees only a large percentage of white grains and a small percentage of dark particles. The white grains are those of pure iron or ferrite. One would say then, without reflection, that the dark portions consisted of the pure carbide. This is not the case, for when the dark portion is examined under the very high power, these dark patches are made up of alternating plates of pure iron and carbide of iron—pearlite. Now if we were to add some carbide to the steel the dark portions would increase and the white, in proportion, would decrease; i. e., if we have more carbon, we have more pearlite and correspondingly less ferrite. If we increase continually the carbon content, we must reach a point after awhile where there will be no ferrite in the steel. This is found to exist when the steel contains about 0.8% of carbon, and the steel at this point is said to be saturated. If we still farther increase the carbon we get a very high carbon steel finally containing about 2.50% of carbon, where the steel is made up of two constituents—the dark, as before, and a light constituent standing in relief. This light constituent is pure cementite, and represents the excess over the necessary amount to form pearlite. The ferrite, or the pure iron, is very soft; cementite, on the other hand, is extremely brittle and hard; therefore pearlite which is a compound of ferrite and cementite is between these two in hardness. In high carbon steels, we have an excess of cementite; in low carbon steels, an excsss of ferrite; while saturated steel is made up entirely of pearlite.

A further study of this science led to the discovery of a very close relation between the structure of steel and its heat treatment. If we take a number of bars of steel of exactly the same chemical composition and give them slightly different heat treatments we will have as many widely differing structures as we would expect of so many steels of different chemical compositions.

This shows the limitations of chemical analyses, and shows also that the physical properties depend not only upon the chemical composition but upon the structure, as well.

The physical properties of steel depend upon: (a) ulti-

mate chemical compositon. (b) The mechanical work, such as rolling hammering, cold rolling, etc., which has been done upon it. (c) The heat treatment which it has undergone; i. e., the temperature to which it has been heated, the duration at that temperature and the rate of cooling, etc.

The relation of the structure, or more specifically, the grain-size, to the various physical properties, such as tensile strength elastic limit and ductility have been studied thoroughly,* but the fact that an important property—magnetic permeability—had not been investigated occasioned the undertaking of this thesis.

It has been determined that the magnetic properties of steel are governed by the same factors which determine its physical properties of strength, hardness, etc.; but magnetically, steel seems to be more sensitive, especially to the influence of heat treatment. The effect of composition and treatment thus become a more complicated problem when considered in reference to the magnetic properties than in reference to the general physical properties.

The effect of the three variables which determine the properties of steel are so interconnected that it is impossible to decide whether a noted change in properties is due solely to a known change in one of the three variables, or whether it is the result of that change with the added influence of the unknown change in one or both of the other variables. It is necessary, therefore, so far as possible, to eliminate changes in two of the variables.

Having discussed the microscopic structure of steel, the constituents which go to make it up, and the conditions which modify this structure, we shall turn to the magnetic side to consider one of its most important properties—permeability.

Let us take a magnetic force due to the circulation of an electric current in a coil of wire, and let it act on the space occupied by the air; there would result a certain number of lines of force in that space. "In fact, the intensity of the magnetic force, symbolized by the letter *H*, is often expressed by saying that it would produce H magnetic lines

*Iron, Steel, and other Alloys—Howe, Chap. IX.

per square centimeter in air. Now, owing to the superior magnetic power of iron, if the space subjected to this magnetic force were filled with iron instead of air, there woud be produced a large number of magnetic lines per square centimeter. This large number in the iron expresses the degree of magnetization in the iron; it is symbolized by the letter *B*. The ratio of B and H expresses the permeability of the material. The usual symbol for permeability is the Greek letter *u*. So we may say *B* is equal to *u* times *H*."*

Ewing describes this property in the following manner: "If the rod is of iron, nickel or cobalt, it will be found that the number of lines of induction B per square centimeter within the rod is much greater than the number of lines per square centimeter within the field. This fact may be expressed by saying that the material of the rod is more *permeable* with respect to lines of magnetic induction than is the space or the medium surrounding it. In Faraday's expressive language, the material of the rod has greater conductivity for the lines of induction than the surrounding space or medium has. We may think of the lines as crowding by preference into the rod, finding an easier path through it than through the surrounding medium."†

Our particular problem in this thesis is to discover how this magnetic permeability is affected, if at all, by the grain-size and structure of the steel.

Method, Construction and Arrangement of Apparatus.

It is necessary first to procure a suitable permeameter with which to measure the permeability of the sample rods. For this purpose, a permeameter after the modification of the Hopkinson apparatus made by Mr. Burton of the University of Wisconsin was constructed. A description of this is found in Jackson's Electro-Magnetism, pp.

*Thompson's "Lectures on the Electro-Magnet." Pg. 55.

†"Magnetic Induction in Iron," Pg. 15. (1900).

44-5. Vol. I. This arrangement has the magnetizing coil on the yoke instead of on the test piece as is found in the Hopkinson arrangement. As shown in plate I the yoke is a heavy forged piece of Swedish iron around which the magnetizing coil of 3256 turns was wound. The small coil of 106 turns surrounds the accurately turned test piece and the ends are bolted down by caps and screws into the yoke. The advantage of this special arrangement is that it provides a nearly complete magnetic circuit, and since the yoke has a larger mean area than the cross-section of the test piece, the number of lines of force passing through the coil is therefore greater than the number passing through the test piece. The yoke and bar method therefore eliminates the end effect, so objectionable in the bar methods by completing the magnetic circuit through the iron.

The method of measuring B and H was by the use of a ballistic galvanometer connected as shown in plate II.* In this experiment of Rowland, B was measured by reversing the magnetizing current and taking one-half the ballistic effect. The ballistic effect of breaking the circuit was also noted. This subtracted from half the deflection of the galvanometer due to the reversal, gave the residual magnetism at each stage in the magnetizing process.

This ballistic method as indicated above depends upon measuring the transient electric pressure induced in the small test coil wound around the test piece when the induction in the test piece is changed. When the current from the dynamo is sent around the large coil on the yoke a certain induction is set up in the yoke and test piece. Now if we break the flow of current, we set up a certain current in the small coil surrounding the test piece and this current is shown by a deflection of the needle of the galvanometer. If a current of short duration, compared with the vibration of the needle, be passed through the galvanometer, the coulombs of electricity which pass will be proportional to twice the sine of one-half the angle of the first swing of the needle. But if the angular value of

*See Ewing's "Magnetic Induction in Iron." p. 73. (1900)

the throw be small, the sine is proportional to the arc, and the quantity of electricity is proportional to the throw. The throw of the needle is read by means of a telescope showing the reflection of a meter scale from a small mirror on the needle of the galvanometer. Then in order to know how much current is induced in the small test coil by the breaking of the circuit, it is necessary to know how much current is required to cause a throw of the galvanometer over one division of the scale. This is done by discharging a standard condenser of known capacity through the galvanometer and reading the throw. If a condenser of P microfarads capacity be charged by E volts pressure, the charge is $Q=\frac{PE}{1000000}$ coulombs. If the charge be passed through a ballistic galvanometer, giving a scale reading of θ divisions, the constant is evidently $K=\frac{PE}{1000000}\theta$

H, the magnetizing force in the large coil, is developed in the following manner: Thompson in his "Electricity and Magnetism" Art. 312, proved that the potential at any point due to a closed circuit, is due to the product of the current strength, turns of the circuit, and the solid angle subtended by the current at that point. That is, $E=n C\phi$, E being the potential, C the current, n the number of turns, and ϕ the solid angle. If the point be taken very close to the plane of the circuit, ϕ becomes 2π on one side and -2π on the other side of the plane. Hence the potential changes by $4\pi nC$ in passing from one side of the plane to the other and $4\pi nC$ ergs of work are done in moving a unit pole around the circuit from one point to the other; i. e., $W=4\pi nC$. If c be used to represent current in amperes instead of in absolute units, the work becomes $W=\frac{4\pi nC}{10}$ since the ampere is $\frac{1}{10}$ the absolute unit of current. Since work is equal to *force* × *distance*, there follows, $W=\int H\,dl$ and hence $\frac{4\pi nC}{10}=\int H\,dl$.

But l in this case is fixed, i. e., it is the mean length of the test bar within the two legs of the yoke, and then we can write the formula $H=\frac{4n\pi C}{10l}$. From which H is easily calculated since we know the number of turns to be 3256 on the large coil, and the current C and the length l of the test piece are measured directly.

Now to find B it is necessary to find N, the total number of lines of force, since B is the number of lines of force per square centimeter of test bar. If we take a coil of wire of a certain area when lying on a horizontal table, it encloses a certain number of lines of force due to the vertical component of the earth's magnetism. Now let us turn it over quickly and we find that the number of coulombs of electricity flowing through any circuit connected to the coil is $Q=\frac{E\,t}{R}$ where t is the time occupied in reversing the coil and R is the resistance of the circuit. Now in a similar manner it has been found that if we wind a small test coil of n_1 turns upon a solenoid and reverse the current in the solenoid, there will be an average of $E=\frac{2Nn_1}{10^8t}$ induced in it. Now $Q=\frac{2Nn_1}{10^8R}$, and substituting the last value for E in this equation, we get $Q=\frac{2Nn_1}{10^8R}$ or $N=\frac{10^8RQ}{2n_1}$, the meaning of which is that the total number of lines of force which pass through the test piece is determined by the product of the quantity of electricity by resistance divided by the number of turns in the small coil.

From the knowledge or N, we get B by dividing it by the area of the bar in square centimeters. This value of B is placed in the second column of the data and is marked B (rev.,) i. e., the induction due to reversals. When we break the current in the large coil a certain number of lines of force are set up, but it is found that the magnetization of the bar does not wholly disappear. What remains is usually called the residual magnetism, and this has been calculated as explained on p. 9, and placed in the third column of the data, and is marked B (resid.) Metals which retain residual magnetism when the external force has been withdrawn are said to possess retentiveness. This residual magnetism is of course destroyed when the current is reversed, i. e., sent in the opposite direction through the coil. The magnetic permeability is then, as mentioned before, the ratio of B to H.

In this experiment 15 rods from the various steel mills

were tested for the permeability and the values of B, H and u calculated.

For purposes of comparison, not all the steels examined were soft steels. A few hard, high carbon steels were examined and their permeabilities were measured.

Since in the experiment it was intended only to compare the grain-size of soft steels and their permeability, the carbon content, the heat and mechanical treatment were not ascertained—in fact in some cases these very necessary data could not be obtained. It was necessary therefore to take the finished specimen, examine its structure, measure its magnetic permeability and note the results.

Now something as to the method of examining the structure under the microscope. Owing to the lack of a polishing machine, the specimens were prepared for microscopic examination by Prof. Albert Sauveur, one of the foremost investigators in this field, in his laboratory at Boston, Mass. Briefly, the specimens were prepared in the following manner: The test rods were mostly "rounds" ½" in diameter. From one end of each of the 15 rods a sample, about ½" in length was cut, and one end was polished for examination.

The polishing consisted first in filing, sawing or grinding the specimen against an emery wheel, then rubbing on emery cloth and paper of increasing degrees of fineness. Ultimately it is polished on leather with fine jeweler's rouge, or it may be buffed against a leather polishing machine. In order to increase the definition of the grain, the specimen is *etched* with a solution of iodine or nitric acid. The specimen is then ready for examination under the microscope.

At once one can see that an ordinary microscope arranged for transparent biological work would not serve for the examination of an opaque object, and it was necessary to provide for a reflecting lens in the barrel of the microscope which should admit the source of light, reflect it at 45° down on the specimen and thence to the eye. This arrangement is called Sorby's 45° reflector. The source of light used was an incandescent gas light with a reflector behind and some condensers in front.

After a preliminary examination of the structure, a micrometer was placed on the microscope and the degree of magnification was accurately determined. Then with the micrometer the average grain-size was measured. Three fields were taken, one at the edge of the specimen, one at the center, and one between these two. Three most characteristic grains were measured in each of these three fields and the average diameter noted.

After determining the grain-size, the field was photographed by means of a micro-photographic camera. The specimens were examined under a constant power—150 diameters, for purposes of comparison.

For graphic methods of comparison, curves were plotted between H and B (rev.,) H and B (resid.,) and u and B.

The following data were taken and the results calculated as shown in the tables.

For further information concerning the preparation and examination of specimens see—

Practical Microscopic Analysis for Use in Steel Industries, by C. H. Risdale. The Metallographist, Vol. III, p. 64.

The Technology of Microscopic Metallography, by H. L. Chatlier. The Metallographist, Vol. IV, p. 1-22.

The Crystalline structure of Metals, by J. A. Ewing and Walter Rosenhain. Vol. III, p. 94. The Metallographist.

The Microscopic Study of Metals, by W. M. Stine. The Journal of Applied Microscopy, March, 1900. p. 786.

ROD No. 2. Diameter 1.22 cm.

H	B (rev.)	B (resid.)	u	GRAIN-SIZES.
1.85	3242.1	2218.2	1752.5	0.0358 mm. (A)
3.71	4607.2	2900.9	1241.8	0.0160
5.57	6654.9	5607.2	1194 8	0.0328
11.55	9043.9	5972.4	811.1	Mean- 0.0282 mm.
16.73	10238.4	6823.9	611.9	0.0274 mm. (B)
22.31	10921.0	7166.9	489.5	0.0244
31.61	11773.7	7337.5	372.4	0.0238
76.25	13480.6	8020.0	176.8	Mean- 0.0252 mm.
125.59	14504.4	8361.3	115.4	0.0138 mm. (C)
152.48	15187.0	9043.9	99.5	0.0178
171.08	15349.6	9214.6	89.7	0.0270
				Mean- 0.01953 mm.
				Total Mean- 0.02646 mm.

ROD No. 3. Diameter 1.22 cm.

H	B (rev.)	B (resid.)	u	GRAIN-SIZES.
1.85	2875.5	2198.95	1554.3	0.0496 mm (A)
3.71	4228.7	2875.5	1139.8	0.0240
5.57	6427.7	4736.2	1153.9	0.3000
11.15	9811.07	6766.0	979.8	Mean-0.03452. mm.
16.73	10487.3	7104.3	626.2	0.0296 mm. (B)
22.31	11502.2	7780.9	515.5	0.0324
31.61	12009.6	7950.0	379.9	0.0390
74.38	13193.7	8457.5	176.4	Mean-0.03366 mm.
120.87	14546.9	9134.1	120.3	0.0268 mm (C)
163.64	14885.2	9134.1	90.9	0.0232
165.50	15054.3	9269.4	90.9	0.0320
				Mean-0.02733 mm.
				Total Mean- 0.3187mm.

ROD No. 4. Diamerter 1.56 cm

H	B (rev.)	B (resid.)	u	GRAIN-SIZES.
1.85	2503.2	1668.8	1353.1	0.0260 mm (A)
3.71	3650.5	2398.9	983.9	0.0352
5.57	5423.6	3754.8	973.7	0.0322
11.15	6258.0	3546.2	561.3	Mean-0.03146 mm.
16.73	9387.0	6049.4	561.0	0.0216 mm. (B)
22.31	10638.6	6466.6	476.8	0.0296
31.61	11681.6	6883.8	369.5	0.0272
76.24	13759.6	7926.8	180.4	Mean-0.02613 mm.
122.13	14810.6	8552.6	120.5	0.0228 mm. (C)
183.64	15436.4	8761.2	94.9	0.0232
169.22	15540.7	8865.8	91.8	0.0284
				Mean- 0.0248 mm.
				Total Mean- 0.02746 mm

ROD No. 6. Diameter 1.58 cm.

H	B (rev.)	B (resid.)	u	GRAIN-SIZES.
0.929	611.1	203.7	664.9	0.0320 mm. (A)
1.394	814.8	203.7	586 1	0.0260
1.673	1527.7	712.9	914.7	0.0344
1.85	2240.7	1222.2	1211.1	Mean- 0.0308 mm
3.71	3259.2	2037.0	878.4	0.0284 mm. B
5.57	5092.5	3462 9	914.2	0.0304
11.15	7944.3	5296.2	712.4	0.0392
15.80	9166.5	5907.3	580.1	Mean-0.03266 mm
20.45	10185.0	6111.0	498.0	0.0212 mm. C
31.61	11407.2	6518 4	360 8	0.0176
72.52	13036.8	7333.2	179.7	0.0292
117.15	13749 7	7842.4	117.3	Mean-0.02266 mm
158.06	14462.7	8148 0	91.5	Total Mean-0 028706 mm

ROD No. 7. Diameter 1.56 cm.

H	B (rev.)	B (resid.)	u	GRAIN-SIZES
0.929	834.4	00.00	898.1	0.01880 mm (A)
1.394	625.8	208.6	450.2	0.0296
1.766	1460.2	834.4	829.6	0 0176
2.32	2294.6	1251 6	889.0	Mean-0.0220 mm.
3.71	3441.9	2190.3	927.7	0.0180 mm. (B)
5.57	6215.0	3337.6	1115.8	0.0276
11.15	7822.5	5100.7	701.5	0 0244
16.73	8969.8	5632.2	536.0	Mean-0.02333 mm
22.31	10012.8	5632.2	448.8	0.0180 mm.
34.40	11160.1	6153.7	324.4	0.0136
79.96	12724.6	6675.2	159.1	0.0180
124.59	13663.3	7196.7	109.6	Mean-0.01653 mm
171.08	14602.0	7718.2	85.3	Total Mean-0.02062 mm.

ROD No. 12. Diameter 1.28 cm.

H	B (rev.)	B (resid.)	u	GRAIN-SIZES.
0.929	620.0	155.0	667.5	0.0136 mm. (A)
1 776	930.0	310.0	527 8	0 0096
1.85	3410.0	2170.0	1843.3	0 0120
3.71	5270 0	3720 0	1420.4	Mean- 0.01173 mm
5 57	8060.0	6045.0	1440.2	0.0164 mm. (B)
11.15	11625.0	8525 0	1042 6	0.0116
16.73	12710.0	8990.0	759.7	0.0080
22 31	13330 0	8990.0	597.5	Mean-.0.0120 mm
33.47	14880.0	9920.0	353 1	0.0080 mm. C
78.10	16740.0	10540.0	214.3	0.0140
124 59	17940.0	16850.0	143.9	0.0072
				Mean- 0.00973 mm.
				Total Mean- 0.01118 mm.

ROD No. 15 Diameter 1.28 cm.

H	B (rev.)	B (resid.)	u	GRAIN-SIZES
1.39	387.5	77.5	277.9	0.0160 mm (A)
1.85	465.0	155.0	251.3	0.0120
2.78	2325.0	1550.0	836.3	0.0160
3.71	3720 0	2635.0	1002.7	Mean- 0.01746 mm.
5.57	5890.0	4595.0	1053.5	0.0164 mm. (B)
11.15	9610.0	7440.0	861.8	0.0088
16.73	11470.0	8570.0	685.6	0.0164
22.31	12400.0	8680.0	555.8	Mean- 0.01368 mm
32.54	15035.0	10695.0	462.0	**Total Mean- 0.01566 mm**
76.24	15500.0	9160.0	203.3	
122.73	16295.0	9765.0	133.5	
169.22	17825.0	10695.0	105.3	

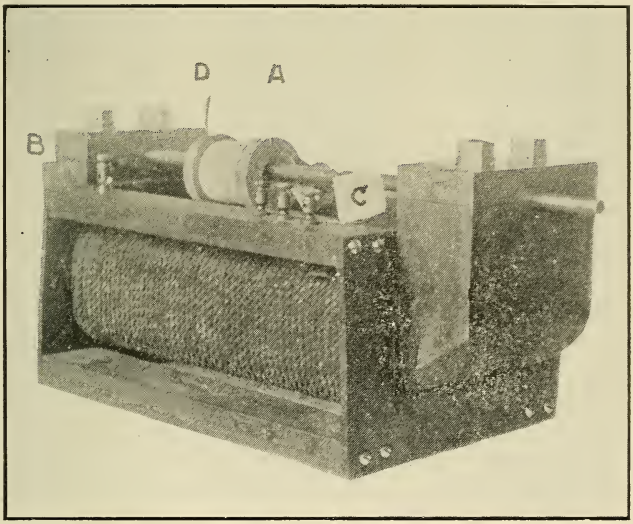
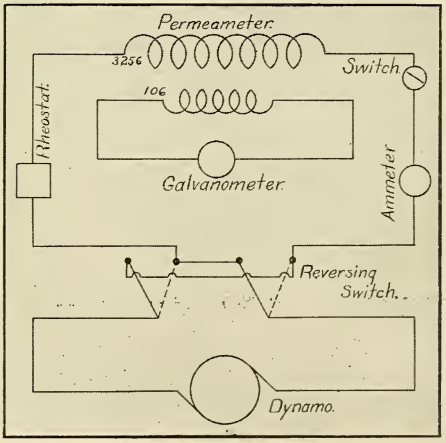


PLATE I.



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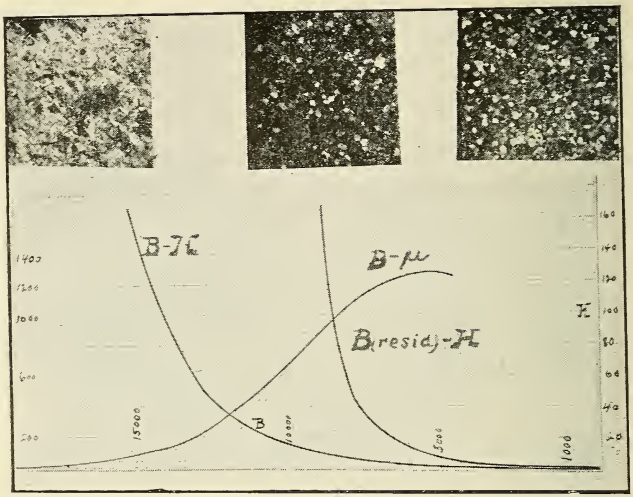

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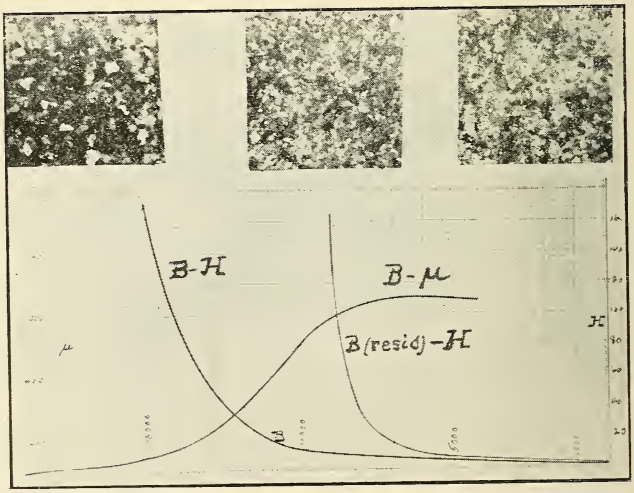

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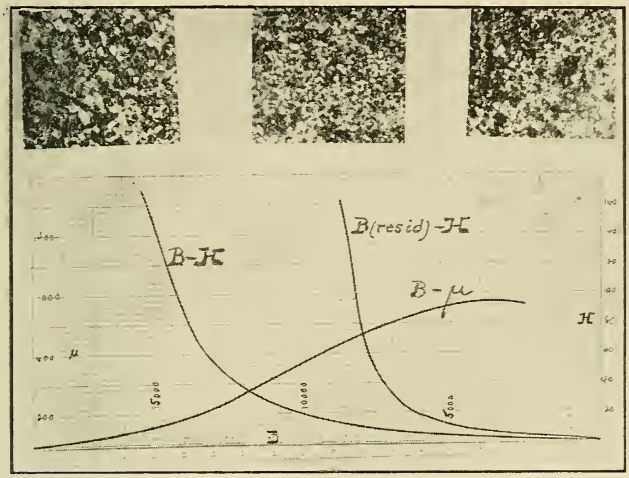

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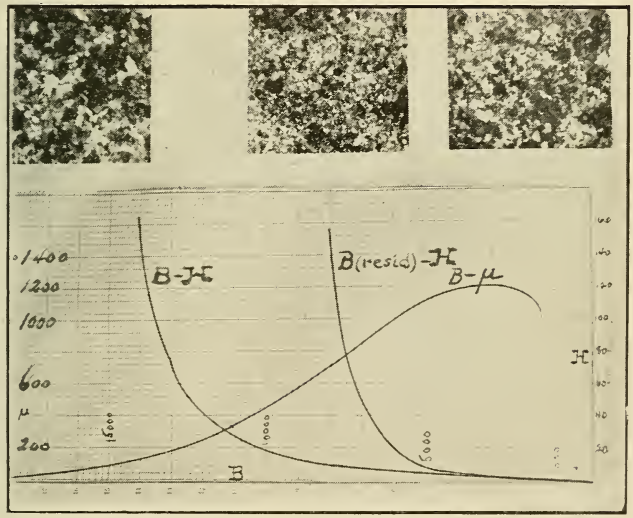

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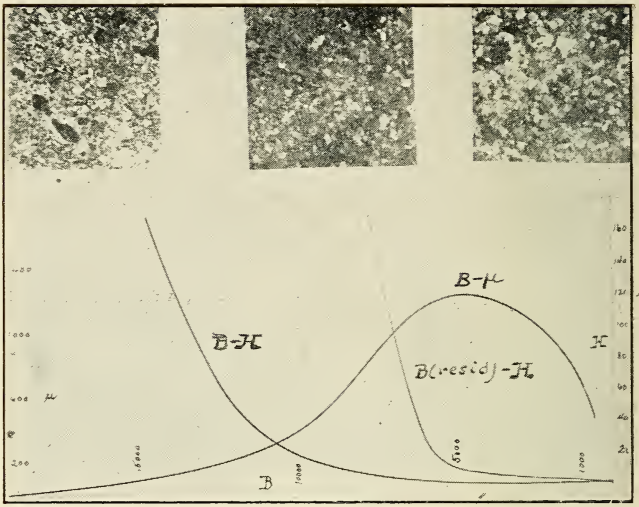

PLATE VII.

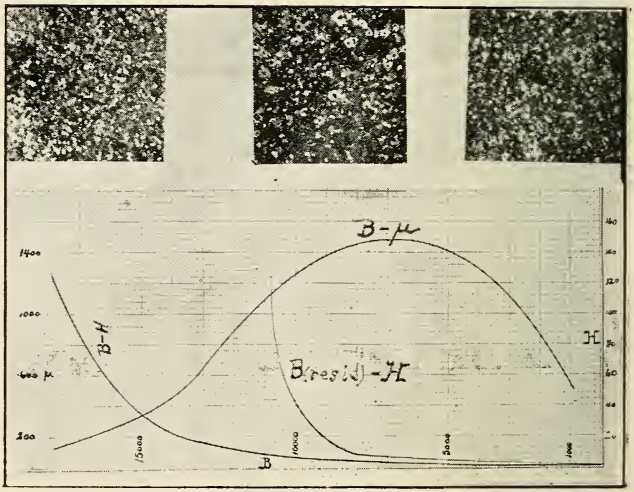

PLATE VIII.

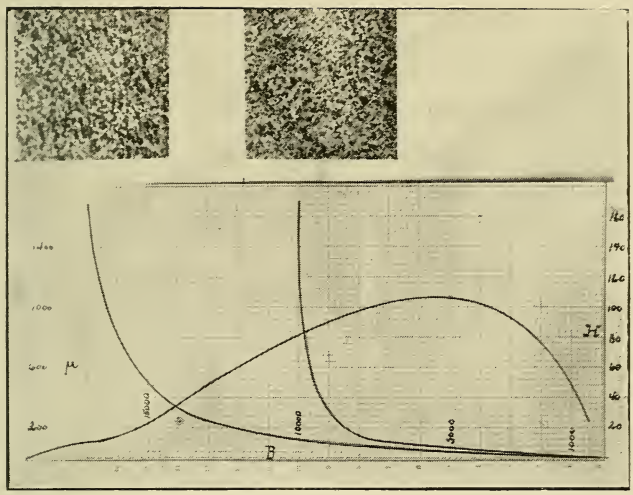

PLATE IX.

Conclusion.—In this investigation only soft steels have been particularly studied but some hard steels have been thrown in to give some means of comparison for the structure of soft steels. Nos. 2, 3, 4, 6, 7, 12, and 15 are the representative soft steels and show clearly the granular structure. *An examination of the date on the above-mentioned steels show in general, that as the grainsize increases the permeability decreases.*

However the individual data are not concordant, probably owing to the extreme difficulty of measuring accurately the grainsize, since in some cases the outlines were not clearly defined. This same general law is also observed in the case of hard steels of low permeability. In No. 12 which is a rolled steel the structure is peculiar: and it is exceptional also in that while its permeability is high, its retentivity is also very great. The effect of the finishing has been apparently to give a high retentivity. However the remainder of the soft steels show in general that the retentivity increases with grain-size.

As stated in the introduction, the three variables which affect the structure are chemical composition, heat treatment, and mechanical treatment, and hence for a definite knowledge of exact relations, two of these causes should be eliminated while the third is studied.

Therefore future investigation along this line should consist in obtaining samples of the same chemical composition and observing the effect on the permeability and grain-size of varying heat treatment. Another set of experiments also should be made on the effect of varying the mechanical treatment.

I wish to acknowledge my thanks to the following steel manufacturers who kindly submitted samples for examination:

The Republic Iron and Steel Co., Youngstown, O.

The Finished Steel Co., Youngstown, O.

Pratt and Inman, Boston, Mass.

George Nash and Co., Chicago, Ill.

It remains for me to thank Dr. W. F. Mercer, of the Department of Biology, for his assistance on the microscopic work on the thesis, and to Prof. A. A. Atkinson, of

the Department of Physics, whose encouragement and assistance made this investigation possible.

Physical Laboratory,
Ohio University,
Athens, O.,
June 20, 1904.

Summer School of Ohio University.

ATHENS. OHIO.

(JUNE 19, 1905-JULY 28, 1905.)

General Information.

Attendance Statistics:—The attendance of students at the Summer School, of Ohio University, for the last seven years, is herewith shown:—

YEAR.	MEN.	WOMEN.	TOTAL.
1898	27	25	52
1899	38	23	61
1900	36	29	65
1901	45	57	102
1902	110	128	238
1903	159	264	423
1904	194	363	557

The figures given above do not include the number of pupils enrolled in the Training School or the number of School Examiners, Principals, and Superintendents who attended the "Conferences in School Administration" held the last two weeks of the term.

In 1904, the students came from all sections of Ohio and represented about four-fifths of all the counties of the

state. Kentucky, Virginia, West Virginia, Pennsylvania, and New Jersey were represented in the 557 names enrolled in the summer of 1904.

Needs Considered and Courses Offered.—In arranging the courses of study for the Summer School of 1905, the various needs of all classes of teachers, and those preparing to teach, have been carefully considered and fully provided for. About one hundred courses are offered and that number of classes will recite daily. Teachers and others, seeking review or advanced work, should plan early to attend the session of 1905 which will begin June 19th and continue six weeks.

Faculty.—A faculty of twenty-five members will have charge of the instruction. Please to note that all the instructors, with one exception, are regularly engaged in teaching in Ohio University. Those who enroll in the Summer term are thus assured of the very best instruction the University has to offer.

Selected Work.—Why not examine the catalogue and determine now the course you wish to pursue, and then begin at once to work out systematically the studies of that course? If you are a teacher of experience, or if you have had previous collegiate or high-school training, you will doubtless be able to do at home, under our direction, some systematic reading and study which will help to shorten the time otherwise required in college.

Courses of Study.—Summer-School students should decide upon a regular course of study to be pursued systematically. Credits and grades from other schools should be filed with the President of the University, thus enabling the student to secure an advanced standing. Work begun during the Summer term may be continued from year to year and much work may be done at home, by advanced students, under the direction of the various heads of University departments. Teachers should pursue such studies as will give them credit on one of the regular courses. A diploma from the State Normal College should be the goal of every ambitious teacher.

Reviews.—Ample provision has been made for the needs of young teachers, and those preparing for examinations,

by means of thorough reviews in all the studies required in city, county, and state examinations. Students preparing to teach, or preparing for any advanced examinations, will find excellent opportunities at Athens.

Primary Teachers.—Special attention is called to the fact that the State Training School, or Model School, will be in session during the Summer term. In this school emphasis is placed upon the training of primary teachers. Almost every teacher in the rural schools has primary classes to instruct. City teachers will also find this course especially valuable. Every teacher of the rural schools will have an opportunity to receive instructions in the best methods of teaching as applied to primary schools.

Home Study.—Opportunity for home study will be offered only to advanced students, who will take examinations in the studies so pursued, or otherwise satisfy the professor in charge that the work has been satisfactorily done.

Expenses.—No tuition will be charged. The registration fee of $3.00 will entitle students to all the privileges of the University, save special instruction in private classes. Boarding in clubs, per week, costs from $2.00 to $2.25; and at Women's Hall, $2.75. A student may attend the Summer School of six weeks and pay all expenses, except the railroad fare, on from $20.00 to $25.00. By observing the strictest economy less than this would be required. Applications for rooms should be made before June first, but students who do not wish to engage rooms in advance will experience no trouble in getting promptly located.

Ample Accomodations.—No school town can offer better accomodations at more reasonable prices than Athens. Nicely furnished rooms, convenient to the University, may be rented for $0.75 a week, including light, fuel, bedding, towels, and everything needed by the roomer. This rate is given where two students occupy the same room. If occupied by one student, such rooms usually rent for $1.00 a week. It is safe to say that four-fifths of the rooms rented to students are rented for $0.75 each per week.

Women's Hall.—Rooms in Women's Hall range a little higher than the prices before named. Ladies wishing rooms in Women's Hall should engage them in advance,

as such rooms are in demand. Athens can easily accommodate a large number of students. At the close of the first day of the Summer term of 1904, every student had been eligibly located. Accommodations for at least 200 additional students were available.

Free Lectures.—Arrangements have been made for free lectures to be delivered in the Auditorium of the University within the period required by the Summer term.

Teachers' Conferences.—At least two conferences—one hour each—will be held each week. These will be led by members of the Faculty and others familiar with the working of the public schools and experienced in school methods and management.

Ohio School Laws.—Particular attention will be given to the provisions of Ohio's new school code. Hon. E. A. Jones, State Commissioner of Common Schools, will give a series of informal "talks" on some of the most interesting features of the present Ohio School Laws. Classes in School Administration will consider the provisions of the entire school code.

Laboratories, Etc.—The laboratories, museums, art studios, library, and gymnasium of the University will be accessible to students free of charge.

Text-Books.—All text-books will be supplied at the lowest prices possible. Students should bring with them as many supplementary texts as convenient.

Range of Studies.—The following subjects will be taught during the Summer term. Prospective students may see that almost every subject in the various University and Normal College courses will be presented during the Summer term. Students who do not find in the following list of subjects the studies they wish to pursue will be accomodated if a sufficient number of requests for other work are made. The classes regularly scheduled are as follows: Arithmetic (two classes), Grammar (two classes), U. S. History (two classes), Algebra (four classes), Public-School Drawing (three classes), Free-Hand Drawing (three classes), Bookkeeping (two classes), General History, Physiology, Psychology, Anatomy, Political Economy, Beginning Latin, Caesar, Vergil, Cicero, Advanced Latin,

Physics (two classes), Electrical Engineering (two classes), History of Education (two classes), Principles of Education (two classes), School Management, School Administration, and School Law, the Elementary Course of Study, Primary Methods, Special Methods in School Studies, Pedagogical Conferences, Political Geography, Commercial Geography, American Literature, English Literature, Preparatory Rhetoric, College Rhetoric, Shakspere, Tennyson, Paidology, or the Science of the Child (four classes), Elementary Chemistry, Qualitative Analysis, Organic Chemistry, Stenography, Typewriting, Elementary Manual Training, Physical Laboratory, Chemical Laboratory, Biological Laboratory, Nature Study, Botany, Observation in Model School, Teaching School, Civil Government, Plane Geometry, Solid Geometry, Trigonometry, How to Teach Reading, Sight-Reading (in music), How to Teach Public-School Music, Vocal Music, Chorus Work, Beginning German, Advanced German, Beginning French, Advanced French, and other subjects if a sufficient demand is made at the opening of the term.

Other Branches.—Arrangements can be made by students attending the Summer term for private lessons in Greek, Latin, German, French, Spanish, Psychology, Pedagogy, Voice Culture, Piano, Organ, Violin, Higher Mathematics, Philosophy, and other branches scheduled in any of the University courses. The cost of such instruction, in each branch, will not exceed $5.00 for the full term of six weeks. Inasmuch as the work offered in the regular classes of the Summer School covers so wide a range of subjects, it will be, in most cases, a matter of election on the part of students if they take *private* instead of *class* instruction.

Summer-School Advantages.—Besides having an opportunity to pursue systematically almost any study desired, under the direction of those regularly employed in this work, the student of the Summer School enjoys the advantages of the acquaintance, friendship, and counsel of many prominent superintendents, examiners, principals, and others who are always on the lookout for progressive, well-qualified teachers.

How to Reach Athens.—Athens is on the main line of the

following railroads: Baltimore and Ohio Southwestern, Hocking Valley, and Ohio Central Lines. Close connections are made with these lines at the following-named places: Cincinnati, Loveland, Blanchester, Midland City, Greenfield, Chillicothe, Hamden Junction, Parkersburg, Marietta. Middleport, Gallipolis, Portsmouth, New Lexington, Lancaster, Logan, Thurston, Zanesville, Palos, Columbus, Delaware, Marion, Toledo, and other points. Students may leave their homes in the most distant part of the state and reach Athens within a few hours.

Requests for Names.—Superintendents and teachers are requested to send to the President of the University the names and addresses of teachers and others who would likely be interested in some line of work presented at Ohio University. *The Ohio University Bulletin* is sent free and regularly to all persons who desire to have their names enrolled on the mailing list.

Conclusion.—The President of the University will cheerfully answer any questions teachers or others desire to ask. The many addresses made by members of the faculty the past year, and the large quantity of printed matter sent out, have served to give prominent attention to the work of the University and the State Normal College. In this way thousands of people have learned to know something of the broad scope of work undertaken at Athens. The hundreds of students who have come to us the past year have helped very largely in imparting information to friends of education throughout the State concerning the extent and character of the work accomplished here. For the year ending March 18, 1904, the total enrollment was 833 different students. The total enrollmeut of different students for the college year ending June, 1905, will not fall below 1,000. For latest catalogue, other printed matter, or special information address

ALSTON ELLIS,
President Ohio University,
ATHENS, OHIO.

What Teachers will find at Ohio University, Athens, Ohio, when their Schools close in 1905.

The new Ohio school law requires elementary day schools to continue "not less than thirty-two" weeks in a school year. Schools that began before the middle of September, 1904, will close the school-year about the middle of April, 1905. Schools that opened any time in September, 1904, will close not later than the end of the first week in May, 1905.

The Spring term of Ohio University, at Athens, Ohio, will open March 27, 1905, and close with Commencement Day, Thursday June 15, 1905. Students who enter the University not later than May 8, 1905, will yet have six weeks of the Spring term to receive instruction in classes specially planned and organized for their accommodation.

Among the new classes that will be formed about May 11, 1905, those of special interest to teachers and prospective teachers will be as follows: Normal Arithmetic, Advanced Grammar, Rhetoric, English Literature, U. S. History and Civil Government, and General History.

Each of these classes will be open to new students and will be in charge of a capable and experienced instructor. Only a just portion of the usual term fee of $5 will be charged students who enter at the time of the forming of these special classes.

Attempt will be made to articulate all this work with the work outlined for the Summer term, June, 19, 1905 to July 28, 1905, in such a way as to give all students entering the special classes of the Spring term and thereafter the regular classes of Summer term, from ten to thirteen weeks' consecutive work in such branches of study as they may elect to take up. This arrangement of studies will meet the wants of all teachers, desiring more than the six weeks of instruction in the Summer term, whose schools close within the Spring-term period. Ample arrangements will be made for the educational wants of all students who enroll for the regular Summer term, full particulars of which are now being incorporated in a circular designed for wide distribution among Ohio teachers.


SIGILLUM UNIVERSITATIS OHIENSIS
RELIGIO DOCTRINA CIVILITAS
PRAE OMNIBUS VIRTUS
MDCCCIV

SUMMER SCHOOL, JUNE 19, 1905—
JULY 28, 1905

NEW SERIES VOL. II., NO. 3

Ohio University Bulletin

TABLE OF CONTENTS

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OHIO UNIVERSITY

ATHENS, OHIO

Announcement of Courses of Instruction

COLLEGIATE AND NORMAL

FOR THE SESSION OF

SUMMER SCHOOL

June 19 to July 28, 1905

UNIVERSITY CALENDAR, 1905

Monday, January 2.....Registration of Students
Tuesday, January 3.....Opening of Winter Term
Friday, March 17.....Close of Winter Term
Monday, March 27.....Registration of Students
Tuesday, March 28.....Opening of Spring Term
Sunday, June 11.....Beginning of Commencement Week
Thursday, June 15.....Commencement Day
Monday, June 19.....Opening of Summer Term
Friday, July 28.....Close of Summer Term
Monday, September 11.....Registration of Students
Tuesday, September 12.....Opening of Fall Term
Friday, December 22.....Close of Fall Term

1905.
PRESS OF F. J. HEER,
COLUMBUS, OHIO.

PROVISIONS OF NEW SCHOOL LAW FULLY MET BY OHIO UNIVERSITY.

On April 25, 1904, the Governor signed a bill, passed on the same day by the General Assembly, and known as the Harrison Bill. It thus became a law, and is usually referred to as the "Harrison School Code." Although it is not in the true sense a "Code," it does contain more provisions on a greater variety of subjects than most bills. While it includes only a small fraction of all the school law now valid in Ohio, its provisions are mainly new and not very well known by a large number of teachers and school-board members. This is not hard to explain. Only 4,000 copies of the "Code" were printed and distributed, and many teachers and school officials neglect to call upon their county auditors for copies of the complete edition of the school laws, issued in the summer of 1904.

A few of the many provisions of the new law that should be widely known and clearly understood, may be summed up as follows:

Boards of Education may now levy twelve mills for school purposes, exclusive of such levy as may be necessary to take care of such indebtedness as may have been incurred by bond issues. (See Section 3959.) Under certain conditions a board of education may levy an additional mill for library purposes. (See Section 3998-4.) The state levy for the "State Common School Fund" is now one mill, instead of .95 of a mill. The apportionment of the "Common School Fund," on the basis of the enumeration, has been increased from $1.50 to $1.70 per enumerated pupil. The levy which a board of education may make has been increased 20 per cent., and the increase in the "State Common School Fund" is about $100.000 a year, while the increase in the "Common School Fund" is about $240,000 a year. These increased revenues

ought to make it possible for boards of education to get better teachers and pay better wages.

The minimum term in all elementary schools is now eight months instead of six, as formerly. (See Section 4007.) All elementary schools in the same township or other district shall be in session the same length of time. While Section 4007-4 says that a third-grade high school shall be in session not less than seven months, other sections say that all teachers shall be employed for a term not less than eight months, unless to fill out the unexpired term of some one else. This means that very few teachers will be free from their school duties earlier than the 1st of May, unless they resign their positions. Ohio University has made ample provisions for teachers who may wish to enter college soon after closing their schools. The Spring term begins March 27, 1905; but students who enter not later than May 8 will have six weeks of the Spring term. Special classes will be organized to meet the needs of students who can not profitably be assigned to classes already in progress. It is proposed to organize new classes in the following subjects at least, if there is a demand for them at that time: Normal Arithmetic, Advanced Grammar, Rhetoric, English Literature, U. S. History and Civil Government, and General History.

The new school law also makes several new requirements concerning teachers' certificates. Sections 4071 and 4074 provide for the uniform examination of teachers throughout the state, the questions to be prepared by the State School Commissioner or under his direction. Teachers of elementary schools must hold Elementary Certificates, and superintendents and teachers in high schools must hold High-School Certificates. This requirement went into effect September 1, 1904, as far as all the certificates issued since then are concerned; but all teachers must hold such certificate by September 1, 1905. All teachers applying for elementary certificates must pass an examination in Literature in addition to the branches formerly required. No certificate will be valid after September 1, 1905, unless the holder has passed an examination in Literature. Reports from scores of county examiners, from all sections of Ohio, show that up to January 1, 1905, not more than 2 per cent. of the teachers had taken the

required examination in Literature. This means that 98 per cent. of the teachers of the state must pass such examination between January 1 and September 1, 1905. The examinations the coming summer will be crowded with applicants to take the examination in Literature.

Ohio University has made ample provision for teachers who must pass these examinations. During each term in the year not less than four classes in Literature are maintained, and during the Spring and Summer terms special effort will be made to meet fully the needs of all teachers.

High-school teachers and superintendents who do not hold High-School Life Certificates find the requirements still harder than do elementary teachers. They must pass an examination in Theory and Practice of Teaching, Physiology and Hygiene, Literature, General History, Algebra, and Physics, and four branches elected from the following: Latin, German, Rhetoric, Civil Government, Geometry, Physical Geography, Botany, and Chemistry, making ten subjects in all. This must be done before September 1, 1905, unless the teacher or superintendent holds a High-School Life Certificate. If he is the holder of a Common-School Life Certificate he must pass an examination before the county or city board, in such required and elective subjects as are not on his life certificate.

The needs of such teachers and superintendents have been most carefully considered, and fully met by Ohio University and the State Normal College. Classes will be found in every subject required on such certificates, and during the Spring and Summer terms special attention is given to all these subjects from the standpoint of the needs of such teachers and superintendents. Not only is the subject-matter of these various branches fully presented in the class by able and experienced instructors, but the best methods of teaching these branches are fully discussed and illustrated.

The new laws concerning our schools contain many features that are far reaching in their importance. It thus behooves every teacher to become thoroughly familiar with all the provisions of the school laws of our state. Courses of instruction are offered each term, looking to a clear understanding of these laws. The law requiring an approved course

of study in every school in Ohio makes it necessary for teachers to study the principles of education underlying the course of study, and several courses are offered in these subjects. No teacher can fail to find just what he needs when he comes to Ohio University, whether at the beginning of a term or after the term is well advanced.

HENRY G. WILLIAMS.

Good Advice. — Dr. C. B. Taylor, of McArthur, one of the school examiners of Vinton County, conducts an educational column in one of the Vinton County papers. In a recent issue he has the following: "I have no time to answer your letters individually. Let me bunch about twenty that ask the same questions, and answer them all at once. To those of you who want to do some college work, and yet must teach school because of a lack of money, let me say that the Normal College of Ohio University at Athens gives you just the chance you want. Most of your schools will end before the 10th of May. The Spring term at Athens begins March 27. You can get the work of half that term, attend the summer school for six weeks, beginning June 19, and get home in time to have a month of rest and play before your school begins in the fall. You can teach two-thirds of the year and go to college the remaining third by this plan, and you will find that classes are formed at the middle of the Spring term so that you can drop right in where you want to begin without losing a day. Go there and get deepened, broadened, and strengthened. You will never regret it."

WHY EDUCATE?

The Individual. — The end of all real education is to build up strong, vigorous, consistent, and beneficent personalities. A person is one who thinks and feels and wills — the degree of whose power, coupled with the proper exercise of that power, constitutes the wealth of personal life. All vital progress begins and ends with persons. Below the range of personality lies the unconscious world. Blind instinct rules here, shaping its forms in accordance with laws inherent in nature laid down by One whose personality embraces the identity of thought and will. No schools are erected for these forms of life. No destiny awaits them. Life offers no cup of sorrow or of joy. They live and die conscious of no reward, of no loss, of no defeat. They respond to environment with the precision of machines. Death comes without regret, for life has yielded no experience. Their lives are more like the fairies referred to by Macaulay, who are born every morning, whose mission is to play upon the fields of Paradise and to give pleasure and, at night, to die and be forgotten.

Above the line separating this lower life from the life of human beings all is different. With self-conscious, self-active, self-determining life is associated responsibility. With responsibility is associated freedom of choice. With freedom, good and evil, and in the possibilities of success or failure involved in these lies, at least in great part, the source of those energies engaged in working out the solution of the problems of life.

Education, in its general meaning, implies the drawing out of latent power. Broadly speaking, all conditions of life educate. Life, we say, is a great school whose processes and requirements end only with the grave. The narrower sense in which the term is used, and the most current, refers to the conscious efforts by individuals or peoples to fashion the

character of youth in accordance with accepted ideals. How great the boon conferred by a sound and generous education can be appreciated in full only by its recipients. Outward successes are pleasant. Ability to achieve results gratifies the self; but what constitutes the choicest portion of life is the possession of the consciousness of personal worth whether expressed in terms of intelligence, feeling, or service. Because youth is unconscious of its high estate there is owed to it, by its superiors, the care and culture demanded by its natural powers.

Why send to college? Because, as has been well said, no other place offers such an assembly of advantages. Here are gathered out of many communities and homes the most ambitious youth. Here are found men and women fitted by study, contemplation, and experience, to minister to the wants of youth. Here are found in laboratories, museums, and libraries, the results of the world's best thought. Wisdom and cheer and hope meet the young man upon the very threshold of his career and unfold the future before his wondering gaze. And the results are not doubtful. All experience confirms by unmistakable and overwhelming evidence the value of an education to him who properly appreciates it. Take the evidence supplied by an analysis of the factors found in the publication entitled *"Who's Who in America."*

Out of ten thousand seven hundred and four names of persons over thirty years of age, whose general merit and position seemed to entitle them to mention in this publication, and taken from fifteen millions of such persons in the United States, not one representative is found of the class of uneducated numbering one million seven hundred and fifty thousand. Thirteen hundred and sixty-eight names represent the great class, numbering twelve million, which had received a common school education only, or one to nine thousand. Those who had received a high-school education and who number six hundred and sixty thousand, are represented by one thousand six hundred and twenty-seven names or one to four hundred. The college people, numbering three hundred and twenty-six thousand, are represented by seven thousand seven hundred and nine persons or one in forty-two. These deduc-

tions, vouched for by competent authority, are eloquent with unmistakable meaning. If to this be added the facts that 64% of the present United States Senate, 56% of the National House of Representatives, 65 to 75% of our presidents, cabinet officers, judges of national and state courts, and state executives, 90% of our ministers, 85% of our professional teachers, 60% to 70% of our lawyers, physicians, dentists, and pharmacists, 40% of our bankers, 30% of our editors, and at least 25% of those directing the working and business energies of the country, are college-trained men, no further comment needs to be made as to the practical availability of education with regard to what the world calls success.

The reason of this is not far to seek. The power which controls life is personality, and personality is constituted out of spiritual gifts. In college the youth is brought into direct contact with the vast wealth of experience gained by humanity in its progress through the centuries, and under conditions most favorable for its assimilation. He comes into vital touch with her great men and women, her poets, prophets, kings, statesmen, philosophers, and scientists. He ascends to their point of view and gains their perspective. It is all a species of vicarious atonement. The world works, experiments, succeeds or fails, and offers it all to the youth. He learns to know what to avoid, what to accept, and above all he learns to realize the absolute certainty of the moral law.

"My will fulfilled shall be,
In daylight or in dark;
My thunderbolt has eyes to see
Its way home to the mark."

With lessons so profoundly significant he creates for himself a world as rich and varied as he is able to make it.

In the midst of such surroundings his formative years are spent. He learns the value of ideals and feels their influences. He comes to see that life is, or ought to be, consecrated to service and that suitable reward under some form will inevitably follow. He learns, or may learn if he will, to distinguish between rewards and rightly to apportion their value. Thus

fortified he is qualified in measure to go forth into the world not only equipped with powers rendered keen by exercise upon difficult problems, but filled with hope and capable of anticipating fortune and finding her upon her own ground.

The Family. — A second profound reason for the full and adequate education of youth is to be found in its direct and indirect influence upon the home. The home is the very bulwark of all life whether social, political, or religious. No gift can be rendered by the individual to society, the state, or the church, comparable to a home which embodies within it a high sense of intellectual as well as moral values. Its influence is, or ought to be, paramount in determining the aspirations of youth. If it be asserted that many of our most distinguished personages have come from homes without much formal education, it may be replied with profound truth that the spirit which animated those homes, where extreme self-denial was practiced, often made possible aspirations and desires, which were breathed into the soul of the children, for which the opportunity of satisfaction was denied by conditions beyond control.

The most implacable foe to the home is not poverty but sordid greed. Greed finds a firm ally in ignorance. Education multiplies wants but at the same time exalts their character. It increases the tension of the struggle to gratify them but at the same time it lends dignity and worth to the conflict. It lifts it above low ends. It consecrates endeavor. It hallows the combatant. It creates honor. It assigns ends of permanent worth. It would be very hard to say which were the greater character, Daniel Webster or the father who in humble life toiled that his son might realize his inherent greatness; Garfield or the little woman whose sacred dust, consecrates with his, the noble tomb erected to his memory.

Adequate cause must be assigned in accounting for effects. Something cannot come from nothing. Emerson and Lowell and Longfellow and Holmes and Bryant sprang from what has been felicitously styled the Brahman class of New England. By what conditions was that class created? By law — by favoritism — by chance? No. By the same conditions which, under free and impartial government, make possible

all other forms of worth — noble homes amidst communities of educated citizens who realize the worth of education and make provision for it.

He who will investigate the history of Massachusetts and will compare the number of her distinguished sons and daughters with the wealth of educational opportunity offered by that glorious old commonwealth will have occasion both to wonder at and esteem the precision with which renown follows upon the exercise of fidelity to high ideals; and if he will, with Galton, trace the operations of the same forces in England, he will be witness to the same truth realized on a yet broader scale. A home presided over by an educated parentage is a better home every way, other things being equal, than one not so endowed. If the eternal qualities of manhood and womanhood can not be trusted to receive and assimilate true education without impairment of capacity to found and maintain worthy homes, what hope remains for the future of the race? It is a reflection both upon intelligence and birthright to affirm the impossibility of devising and applying systems of education of such a character as to exalt personal worth and efficiency and thereby to confer a boon of inestimable value upon the humblest. Education begins in the home and returns blessing and honor upon the home. Unless it proceeds from there it will not return.

Society. — When one considers the innumerable opportunities that offer for influencing life through personal conversation, that here alone are settled the really great issues of the world, that while one's words should be, "Yea, yea; Nay, nay," in the sense of simple and absolute truthfulness, yet ignorance and inability to comprehend greatly tend to obscure vital questions, that the pernicious fads and "isms" with which the world has always been so sorely troubled, and by which its progress has been hindered, find their roots and sources of vitality largely in the dangerous power of half-truths, made dangerous by the existence of so many poorly educated persons, that conversation and its opportunities extend to every rank and condition of life, that it is the only avenue whereby a man is able to influence the character of the children of his hearthstone, his neighbor, friend, associate

in every line, and when, above all, it is considered how words constitute the very essence of life and reveal as nothing else can the fundamental worth of the individual, and if to this be added the thought that the utterance of speech tends to confirm opinion and solidify character along the lines of expressed conviction, it cannot fail to become apparent how vital is that training which qualifies youth for service through language with which we bless or with which we curse. Well did Cardinal Newman write —

"Prune thou thy words, the thoughts control
That o'er thee swell and throng;
They will condense within thy soul,
And change to purpose strong."

The Church and the State. — The problems which, perhaps, most thoroughly test the intelligence of the people and whose solution determines the public welfare, are those connected with and springing from the administration of government and religion. The profoundest aspirations of the soul are at root religious. Whether men will or not they cannot ignore these questions.

Nor can political questions be disregarded except at the peril of the individual. Aristotle observed that man is a political creature. It is the same as to say that nature has willed him to manifest himself in this way. The state becomes his protector, his inspiration, his hope, his glory. By means of the state he realizes his personality. It is indeed his larger self. Thus it becomes true that patriotism is one of man's noblest traits although, as Dr. Johnson cynically observed, it may become the last refuge of the scoundrel. But powerful and beneficent states cannot be erected upon ignorant or unsound foundations; and while intelligence is no necessary ground of virtue, yet it may be affirmed that the temptations of ignorance are infinitely greater and more numerous than those which assail intelligence.

While it is true, in a measure and possibly entirely, that all great and vital questions are at bottom moral questions, their tendencies are not easily discerned. The simple questions

of right and wrong as between man and man are more easily apprehended. But problems involving intricate processes of reasoning, economic questions, those embracing many interests, whose just solution allays the sense of injury while the reverse fans the flames of discontent, the working of the vast and intricate machinery of government of a great people — all require intelligence on the part of the people and this the more in lands where the people rule.

It is this feeling that lies at the bottom of the wonderful energy and interest expended upon our system of public education. But while education is a public question it can only become so because it is a private and an individual one. Each person must educate himself and those for whom he is responsible. The admission and acceptance of responsibility by the individual, is what makes possible collective growth and power. More than that, there is no natural limit to that responsibility. The obligations which compel the parent to send his child to the public school compel him to send him to college if ability, on the part of the parent to perform the service, is clearly met by capacity on the part of the child for a correspondingly larger work, both public and private. The problem of problems is how and by what avenues the child may be led so that he may become the most effective instrument in behalf of the public welfare.

Moreover, with changing standards, with larger opportunities for service, with greater demands for moral and intellectual power, with which to carry on a government dealing with questions of growing complexity through world-wide connections, the obligation to seek an *adequate* education presses more closely home. That which was adequate a few short years ago is no longer so. The possibilities of success are shifting to higher planes of thought and feeling. College-trained men must meet college-trained men or else fail under the competition. But above all, it ought to be the one exceeding joy and comfort of parentage to make this provision for childhood. It is its crowning grace to realize that life and energy and wisdom have been given for the express purpose of transmitting the baser into the higher metals. Education founded upon Christian morals has become in this

country and in England, at least, the philosopher's stone. The extraordinary growth of the Anglo-Saxon peoples and, with this growth, the immense increase in the common comforts of life through mastery over nature find in Christian education their true explanation. It is for this we should educate, that the individual may be quickened in mind and heart and body in order that he may serve the great institutions of life — "the powers that be which are ordained of God," the family, society, the state, the church, in order that through their strength founded in justice, wisdom, and love, they may in turn encompass the individual, however lowly, endow him with their power, confer upon him his birthright, and redeem him to a life of worth and happiness.

FREDERICK TREUDLEY.

A Strong Testimonial. — "What we were very much pleased to note was that most of the members of the faculty are on the sunny side of forty, and that those on the other side seem determined to carry the sunshine of youth to the farthest shores of existence. There are no clashings, bickerings or contentions at Ohio University, as there are at too many institutions of learning. Not the least interesting department to us was the Training School. This is an ordinary district school (set apart by the Athens Board of Education), with three model teachers and a supervisor, who illustrate methods of teaching. The young man or woman who feels a desire to adopt the noble profession of teaching could not find anywhere a better place in which to learn how to teach. There is practice as well as theory.

"We like Ohio University. We like the way it is conducted, professionally and commercially. We like the hand-in-hand and heart-to-heart way every one connected with it works in and for it. The result of this work is splendid. Would we had more time and space to devote to a more lengthy description of the institution and the great good it is doing."—*The Public School Journal.*

STANDARDS OF PREPARATION FOR ELEMENTARY TEACHERS.

Standard in Prussia. — The highest conception held by any nation of the world of what constitutes a proper preparation for elementary school work is that held by Prussia. The preparation required, not in theory but in practice, of elementary teachers in Prussia, when translated into American equivalents, is equal in time to the period required to complete a full course in the best Ohio colleges, and it is equal in quality to about two and a half or three years of academic college work, and about one and a half or two years of professional study. In other words, it is equivalent to the courses leading to the Teacher's Diploma in such schools as the School of Education of the University of Chicago and the Teachers' College of Columbia University.

Standard in France. — Although the standard in France is somewhat lower than in Prussia, yet before an elementary teacher is appointed to a position in the primary elementary schools of France, he is required to have completed the course of the higher elementary school and a three-year normal-school course. That is, the preparation actually required of elementary teachers in France is equivalent to graduation from a first-class American high school and the completion of a two-year course in a normal school where the entrance requirements are high-school graduation. In other terms, the preparation actually required of the elementary teachers of France is equivalent to that possessed by those who graduate from the "Course in Elementary Education for Graduates of High Schools" as offered by The State Normal College of Ohio University.

Standard in the United States. — There is, at present, in the United States no generally accepted statement of

what the preparation of elementary teachers ought to be; yet such a conception is gradually crystallizing, and if formulated would read: "No one ought to teach in the elementary school who has not the attainment presupposed in the possession of a high-school diploma and who, in addition, has not the scholarship, culture, and professional interest gained from two years' study in a normal school or school of equivalent standard and purpose." This is practically the recommendation of every committee of national importance that has studied and reported upon the subject. The American standard of the preparation of elementary teachers may therefore be said to be, high-school graduation plus two years of special academic and professional preparation.

Actual Standard in Ohio. — What the actual standard of preparation in Ohio is can best be judged by the preparation of those who are now engaged in teaching in the elementary schools of the state. The statements with reference to the actual preparation of the elementary teachers of Ohio are made upon the basis of replies received from nine hundred inquiries addressed to the elementary teachers of four typical counties. *These statements are to be taken as tentative and suggestive only.*

For purposes of clearness, elementary teachers have been divided into two classes, rural school teachers and graded school teachers. The approximate actual academic and professional preparation of each class, in turn, is given.

(a) The Approximate Actual Academic and Professional Preparation of Rural School Teachers of Ohio. —

1. Academic Preparation. — If we consider, first, the academic preparation of the teachers at work in the rural schools of the state, we find, in the light of our replies, that:

(*a*) 20% have completed the work of the rural school and they have had no further academic preparation.

(*b*) 13% have completed the work of the rural school and, in addition, have attended high school an average of 10 months.

(*c*) 14% have completed the work of the rural school and have attended some normal school an average of 10 months.

(*d*) 3% have finished the work of the grades only and have passed directly into the school as teachers.

(*e*) 39% of the rural teachers are graduates of high schools. High-school graduation marks, however, the academic attainments of these teachers.

(*f*) 8% have completed the work of the high school and, in addition, have attended a normal school an average of 7 months.

(*g*) 3% have graduated from high school and have also attended college an average of 7 months.

In general terms, then, it may be said: one-fourth of the rural teachers of Ohio have had no academic preparation other than that received in the rural or graded common schools; a second fourth have had, in addition to the work of the rural or graded school, an average of one year's additional academic preparation; three-tenths have had the academic preparation attained through the completion of a high-school course; and two-tenths have, above and beyond the work of the high school, an average of 7 months' additional academic preparation.

2. Professional Preparation. — Turning to the professional preparation of the rural teachers, we find that:

(*a*) 80% of them have had no professional preparation whatever.

(*b*) 20% have devoted an average of 7 months to professional study.

This professional preparation has been obtained invariably in connection with academic preparation and, therefore, represents no additional time devoted to preparation over and above that accredited to academic preparation.

(b) The Approximate Actual Academic and Professional Preparation of Graded School Teachers. — With the facts with reference to the preparation of rural teachers in mind, we now turn to a similar study of graded-school teachers.

1. Academic Preparation. —

(*a*) 4% have merely a rural school education.

(*b*) 11%, in addition to attendance upon rural schools, have attended some normal school for an average of 6 months.

(*c*) 3% are common-school graduates only.

(*d*) 4%, in addition to the work of the grades, have received an average of 8 months' instruction in high schools.

(*e*) 51% are graduates of high schools, but have had no further schooling.

(*f*) 11% have added to their high-school course by an average attendance, at some normal school, of 5 months.

(*g*) 15% have, in addition to their high-school course, an average of 5 months' college instruction to their credit.

To summarize: one-fourth of the graded-school teachers of Ohio have an academic preparation but little better, or equivalent only, to that given by the rural or graded schools; one-fourth have the academic attainments acquired from the completion of a high-school course; and one-fourth have received an average of 5 months' instruction beyond that of the high school.

2. Professional Preparation.—

(*a*) 73% have no professional preparation.

(*b*) 27% have devoted an average of 8 months to professional study of different kinds.

As with the rural teachers, the professional preparation, of those having it, represents no additional time devoted to preparation beyond that accredited to academic work.

(c) Contrast Between Actual Standard in Ohio and Standard in the United States. — Just what the standard of preparation for elementary teachers in Ohio is, is brought clearly to light if a comparison is made between the approximate actual academic and professional preparation of the elementary teachers of Ohio and what this preparation ought to be as fixed by the best American standard. The American standard of preparation for elementary teachers is, as

we have seen, high-school graduation plus two years of special academic and professional preparation.

In the light of this standard, we will compare, first, the academic and professional preparation of the rural teachers of Ohio as we have found it. Disregarding the distinction between academic and professional preparation, and making the comparison upon the basis of time, we find in round numbers that:

(*a*) One-fourth of the rural teachers of the state are short 6 years in preparation. That is, before they would have a preparation equal to high-school graduation plus two years of special academic and professional training, they would have to devote, in addition to the time already spent, 6 more years to preparation.

(*b*) A second fourth are short 5 years of training.

(*c*) Four-tenths are short 2 years of training.

(*d*) The final one-tenth are short 1⅓ years of preparation.

On the basis of the same comparison, we find that:

(*a*) One-fourth of the graded school teachers of the state are short 5½ to 6 years of preparation.

(*b*) One-half are short 2 years.

(*c*) The final one-fourth are short even more than one year.

In view of these facts, it is obvious that the actual standard in Ohio for the preparation of elementary teachers is exceedingly low, even when compared with the American standard, to say nothing of a comparison with the Prussian standard.

If the actual standard of Ohio for the preparation of elementary teachers were formulated it would be something as follows: graduation from the rural or graded common schools plus two years of additional academic training. Special professional preparation is unnecessary. Common sense, observation, and experience are sufficient, even though the law requires an examination in the theory and practice of teaching.

What the Standard of Ohio Ought to Be. — In view of the standards of preparation for elementary teachers as

held by other nations and as held, at least in theory in the United States, what ought to be the standard in Ohio? Even if we must refuse the Prussian conception as too high under present conditions to serve as a working ideal, we ought not to accept anything less than the best American conception of what the preparation of the elementary teacher should be. That is, we ought not to accept as our working standard anything less than high-school graduation plus two years of special academic and professional instruction as the minimum preparation for teaching in the elementary schools. This ought to be the lowest conception of preparation that any one who aspires to become an elementary teacher should have; this ought to be the lowest ideal of preparation that the state holds before its elementary teachers. High-school graduation plus two years of special academic and professional training ought to be made the standard, in Ohio, of preparation for elementary teachers.

FRANK P. BACHMAN.

Student Expenses. — "Ohio University being a state institution, supported in greater part by state appropriations, is not a money-making concern. It can afford to pay, and does pay, for the best instruction and the most serviceable and modern of equipments. It is possible for a student to complete a year in the University at a total expense of $125. When a student spends more than $200 annually, at Ohio University, he is unnecessarily prodigal of his money. A number of students find employment, in Athens or vicinity, whereby money is earned to meet, wholly or in part, their college expenses. It is the exceptional student, however, who can do much outside work and maintain desirable standing in his classes at the same time."—*Athens County Gazette.*

OHIO UNIVERSITY.

Origin and Location. — Provision for the Ohio University was made in the terms of purchase, by the Ohio Company, of lands from the United States in 1787.

The University was organized under an act of the Legislature passed in 1804. Its Trustees are appointed by State authority.

The First Building was erected in 1817. It is now known as "Central Building," and is the oldest college edifice northwest of the Ohio river.

Athens, the seat of the University, is situated in Southeastern Ohio. It is accessible from the east and west by the Baltimore and Ohio Southwestern railroad and its branches; from central and northern Ohio, by the Columbus, Hocking Valley, and Toledo, and the Toledo and Ohio Central railroads.

The lover of natural scenery cannot fail to be charmed with its picturesque surroundings. The winding valley of the Hockhocking and the wooded hills beyond present a series of lovely views from the University; while the wide prospects, as seen at certain seasons from some of the neighboring summits, are seldom surpassed in quiet and varied beauty.

The University Campus is a beautiful ten-acre tract of ground located in the city of Athens. Its gradual slopes are covered, in many places, with forest trees, and its lawns are kept in presentable and pleasing condition the year round. Athens is an ideal place for the location of an institution of learning.

The University Buildings, seven in number, are grouped on the highest ground of the campus. "Ewing Hall," named in honor of Hon. Thomas Ewing, of the Class of 1815, is a handsome building in which may be found the

assembly room, art rooms, various class-rooms and the administration offices.

The Normal College Building, now one year in use, is the only building in Ohio, erected at state expense, given up wholly to the training of teachers for service in the public schools. It is one of the largest, best, and most costly buildings on the grounds.

The "Carnegie Library," now nearing completion, is situated in the southwest corner of the campus. It presents a fine appearance and suggests the practical service it will render the educational work of the University when fully equipped and in running order — as it soon will be.

The buildings known as the "East Wing" and the "West Wing" are nearly as old as the Central Building. They afford classroom and laboratory facilities for certain departments of instruction as well as comfortable quarters for a number of students.

The "Old Chapel," so-called, stands apart from the other buildings. Some of the work of the College of Music is carried on in this building. Here the Athenian and Philomathean literary societies have commodious and well-furnished rooms. On the first floor is an assembly room often used when narrower quarters than those found in the assembly room of Ewing Hall are desired.

Courses of Study for the Summer School of Ohio University, 1905

FACULTY.*

ALSTON ELLIS, PH. D., LL.D.,
President.

HENRY G. WILLIAMS, A. M.,
Dean of the State Normal College.

	Hours of Credit.
Elementary Course of Study, Collegiate	45
School Administration and School Law, Collegiate	30
School Management and School Law, Collegiate	24

CHARLES WILLIAM SUPER, PH. D., LL.D.,
Professor of Greek and Dean of the College of Liberal Arts.

European History, Collegiate	45
Greek, two classes, Collegiate	45
Mythology and Folklore, Preparatory	36

DAVID J. EVANS, A. M.,
Professor of Latin.

American Literature, Preparatory	60
General History, two classes, Preparatory	60
Latin: *De Senectute* and *De Amicitia,* Collegiate	60

FREDERICK TREUDLEY, A. B.,
Professor of Educational Methods.

English Literature, two sections, Preparatory	60
Physical Geography, Preparatory	60
Methods in Geography, Collegiate	36
Tennyson, Collegiate	45

WILLIAM HOOVER, PH. D., LL. D.,
Professor of Mathematics and Astronomy.

First Term Algebra, Preparatory	75
Third Term Algebra, Preparatory	60
Fourth Term Algebra, Collegiate	45
Solid Geometry, Collegiate	60

EDSON M. MILLS, A. M., PH. M.,
Professor of Mathematics.

Ray's Higher Arithmetic, two sections, Collegiate	48
Second Term Algebra, Preparatory	55
Plane Geometry, Preparatory	60
Plane Trigonometry, Collegiate	45
Mathematical Geography, Preparatory	48

ALBERT A. ATKINSON, M. S.,
Professor of Physics and Electrical Engineering.

GEORGE E. MCLAUGHLIN,
Assistant in Electricity.

RHYS D. EVANS,
Assistant in Physics.

First Term Physics, with Laboratory Practice, Preparatory	75
Second Term Physics, with Laboratory Practice, Preparatory	60
Junior Physics, with Laboratory Practice, Collegiate	48
Electrical Catechism, Collegiate	30
Electrical and Magnetic Calculations, Collegiate	48

BREWSTER OWEN HIGLEY, PH. M.,
Professor of History and Political Economy.

American History, Preparatory	60
American History, Collegiate	45
Political Economy, Collegiate	30
Civics, Preparatory	45

OSCAR CHRISMAN, A.M., PH. D.,
Professor of Paidology.

Paidology — Childhood, Collegiate	45
Paidology — Youth, Collegiate	36
Paidology — Abnormal Child, Collegiate	45
Elementary Psychology, Preparatory	75
Junior Psychology, Collegiate	45

WILLIAM FAIRFIELD MERCER, PH. D.,
Professor of Biology and Geology.

WILLIAM F. COPELAND, PH. M.,
Assistant in Biology.

Elementary Botany, Preparatory	60
Botany, Collegiate	60
Nature Study, Collegiate	48
Elementary Physiology, Preparatory	75
Physiology, Collegiate	48

WILLIAM B. BENTLEY, PH. D.,
Professor of Chemistry.

First Term Chemistry, Collegiate	60
Second Term Chemistry, Collegiate	44
Organic Chemistry, Collegiate	45
Qualitative Analysis, First Term, Collegiate	36
Qualitative Analysis, Second Term, Collegiate	45

EDWIN TAUSCH, PH. D.,
Professor of Modern Languages.

Beginning German, Preparatory	60
Advanced German, Collegiate	48
Beginning French, Collegiate	48
Advanced French, Collegiate	48

FRANK P. BACHMAN, A. B., PH. D.,
Professor of the History and Principles of Education.

Elements of Theory and Practice. Preparatory	36
Introduction to the Principles of Education, Preparatory	33

Principles of Education, Collegiate..... 33
History of Education, Great Educators of the Eighteenth and Nineteenth Centuries, Collegiate..... 44

ELI DUNKLE, A. M.,
Associate Professor of Greek and Principal of the Preparatory Department.

Beginning Latin, Preparatory..... 60
Cæsar, Preparatory..... 60
Cicero's Orations, Preparatory..... 60
Vergil, Preparatory 60

HIRAM ROY WILSON, A. M.,
Professor of English.

Grammar, two sections, Reed & Kellogg, Preparatory.... 60
Advanced Grammar, Preparatory.....36
Elementary Rhetoric, Preparatory..... 60
Shakespeare, Collegiate..... 60

CHARLES M. COPELAND, B. PED.,
Principal of the Commercial College.

Milne's Practical Arithmetic, Preparatory..... 60
First Bookkeeping, Collegiate..... 60
Second Bookkeeping, Collegiate..... 60
Commercial Law, Collegiate..... 33

LLEWELLYN L. CANFIELD,
Supervisor of Music, Public Schools, Defiance, Ohio.

Grade Music, First Primary,
Grade Music, Second Primary,
Voice Culture in the Grades.
Choral Class.

☞ **Normal-College Credit.**

EMMA S. WAITE,
Principal of Model School.

Primary Methods for Graded Schools, Collegiate..... 30
Conferences on Primary Methods for Graded and Ungraded Schools, Collegiate..... 30
Teaching, Collegiate..... 30

CORNELIA I. GASKELL,
Instructor in Drawing.

I. Public-School Drawing, Preparatory..... 30
II. Public-School Drawing, Preparatory..... 22
III. Public-School Drawing, Preparatory..... 24
Freehand Drawing, Collegiate..... 30
Hand Work, Normal College, Collegiate..... 33

MINNIE FOSTER DEAN,
Instructor in Stenography and Typewriting.

Beginning Typewriting.....
Advanced Typewriting.....
Beginning Stenography..... 30, or more
Advanced Stenography..... 30, or more

LILLIE A. FARIS,
Critic Teacher, First Grade.

Primary Methods for Ungraded Schools, Collegiate..... 30
Classroom Teaching, 8 to 11 o'clock A. M.

AMY M. WEIHR, PH. M.,
Critic Teacher, Second Grade.

Classroom Teaching, 8 to 11 o'clock, A. M.

OLIVE A. WILSON,
Critic Teacher, Third and Fourth Grades.

Classroom Teaching, 8 to 11 o'clock, A. M.

LENORA BELLE BISHOP, PH. B.,
Librarian.

Library Hours: —

8:30 to 11:30 o'clock, A. M.
2:00 to 5:00 o'clock, P. M.
Saturdays, 8:30 to 11:30 o'clock, A. M.

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* Note that, with one exception, the Faculty of the Summer School is made up of Professors and Instructors regularly connected with OHIO UNIVERSITY and THE STATE NORMAL COLLEGE.

The position occupied, in the University Faculty, by each instructor is shown by the italicized words. The subjects in charge of each instructor are clearly given in connection with his name. Hours of credit, for each subject, are shown by the numbers on the right hand margin of the page. *In no case will more than* 120 *hours' college credit be given to any student for work done in the Summer School.*

It is not advisable for a student seeking college recognition to undertake more than sufficient to round out the required hours of credit. When subjects selected by a student foot up more than the prescribed hours of credit, they may be taken, subject to the approval of the Committee on Classification, but the total hours of credit will, *in no case, be permitted to exceed the* 120-*hour limit.*

Students taking work for which no college credit is asked will be permitted much freedom in the choice of studies. All such, however, are strongly advised *not to attempt too much.* In most branches of study double work is done, and students should bear that fact in mind in selecting their work. In but few cases can students take with profit *more than three recitations daily — even this chiefly where review work is selected.*

It will be seen that full provision has been made for 107 recitations daily, not to mention the daily laboratory practice connected with the scientific studies, the daily teaching in the *three training schools,* and the facilities for reading and investigation afforded within the hours when the University Library is open.

Schedule of Recitations of the Summer School of Ohio University, Athens, O.

JUNE 19, 1905 — JULY 28, 1905

(*The figures in parentheses indicate the number of recitations per week.*)

7:00 **A. M.** — Tennyson (5), Ray's Higher Arithmetic, Section I. (5), First Term Physics (5), Political Economy (5), Paidology,— Childhood (5), College Physiology,— Laboratory, Mon., Tues., and Wed. (3), Qualitative Analysis, Second Term (5), History of Education,— Great Educators of the Eighteenth and Nineteenth Centuries (5), Vergil (5), Shakespeare (5), Milne's Practical Arithmetic (5), Public-School Drawing I. (5).

7:50 **A. M.** — Greek (5), General History, Class I. (5), English Literature, Section I. (5), First Term Algebra (5), Advanced Physics (5), Paidology,— Youth (5), College Physiology,— Laboratory, Mon., Tues., and Wed. (3), First Term Chemistry (6), Advanced French (5), Introduction to the Principles of Education (5), Public-School Drawing II. (5), Advanced Typewriting (5), Teaching.

9:00 **A. M.** — School Administration and School Law (5), Second Term Algebra (5), Third Term Algebra (5), Elementary Physics,— Laboratory (5), United States History,—Preparatory (5), Paidology,— Abnormal Child (5), Nature Study,— Laboratory, Saturday (1), Advanced German (5), Cæsar (5), Advanced Grammar (5), First Bookkeeping (5), Public-School Drawing III. (5), Teaching.

9:50 **A. M.** — Elementary Course of Study (5), Cicero de Senectute et de Amicitia (5), Methods in Geography (5),

Plane Geometry (5), Elementary Physics,— Laboratory (5), Nature Study,— Laboratory, Saturday (1), Elementary Physiology (5), Organic Chemistry (5), Principles of Education (5), Grammar, Reed & Kellogg, Section I. (5), Conferences on Primary Methods for Graded and Ungraded Schools (5), Second Bookkeeping (5), Grade Music, First Primary (5), Freehand Drawing (5), Teaching.

10:40 **A. M.** — School Management and School Law (5), Physical Geography (5), Solid Geometry (5), Elementary Physics,— Laboratory (5), Electrical and Magnetic Calculations (5), Freshman United States History (5), Junior Psychology (5), Qualitative Analysis, First Term (5), Beginning German (5), Cicero's Orations (5), Grade Music, Second Primary (5), Hand Work, Normal College (5), Typewriting I. (5).

1:30 **P. M.** — Mythology and Folklore (5), English Literature, Section II. (5), Plane Trigonometry (5), Second Term Physics (5), Elementary Psychology (5), College Botany, Mon. and Tues. (2), College Botany,— Laboratory, Wed., Thurs., and Fri. (3), Beginning French (5), Beginning Latin (5), Elementary Rhetoric (5), Commercial Law (5), Voice Culture in the Grades (5), Stenography I. (5).

2:20 **P. M.** — Greek (5), American Literature (5), Fourth Term Algebra (5), Mathematical Geography (3), Advanced Physics,— Laboratory (5), College Botany,— Laboratory, Wed., Thurs., and Fri. (3), Nature Study, Mon. and Tues. (2), College Physiology, Thurs. and Fri. (2), Chemical Laboratory, Mon., Tues., Wed., and Thurs. (4), Elements of Theory and Practice (5), Grammar, Reed & Kellogg, Section II. (5), Choral Class (5), Stenography II. (5), Primary Methods for Graded Schools (5), Primary Methods for Ungraded Schools (5).

3:10 **P. M.** — European History (5), General History, Class II. (5), Ray's Higher Arithmetic, Section II. (5), Advanced Physics,— Laboratory (5), Electrical Catechism (5), Civics (5), Elementary Botany (5), Nature Study,

Thurs. and Fri. (4), Second Term Chemistry (5), Schoolmaster's Conference — last two weeks — 3:10 to 5:00 o'clock P. M.

SUMMER TERM.

June 19 to July 28, 1905.

This term is arranged to accommodate those who are otherwise employed during the regular terms and to afford college students an opportunity to continue their studies. All collegiate instruction will be given by members of the regular Faculty and the requirements and the credits in the various branches taught will be the same as in other terms.

Ohio University, by tradition and experience, has ever been in close touch with the public-school system of the State. Many of the graduates, and many who left the undergraduate classes without completing a course are now engaged in teaching. Of the students now in attendance upon college classes at least one-third have had successful experience in teaching. This institution was one of the first in Ohio to establish and maintain with credit a Department of Psychology and Pedagogy.

THE STATE NORMAL COLLEGE.

In March, 1902, the General Assembly of Ohio enacted the "Seese Law" establishing two State Normal Schools. One of these is The State Normal College of Ohio University. The provision for the support of this State Normal School is sufficient to enable the Trustees to maintain a high-grade institution where the teachers of the State may obtain superior professional training. The Ohio University Summer School will maintain regular departments of The Normal College, and work done in the Summer School will entitle the student to credit on a regular college course.

Inquiries. — *If you do not find in this circular the information you are seeking, kindly write to the President of the University. If your inquiry pertains to the work of any particular department, it would expedite matters if you would*

direct your inquiry to the head of the department, as noted in the list of Faculty members given elsewhere.

THE FACULTY.

The Faculty is a very strong one, composed of those who are regularly engaged in the work of the University. It would seem hardly necessary to call attention of prospective students to the fact that this is a guaranty of high-grade work, and that the work done in the Summer School will be up to regular college grade in every respect. College credit will be given for all work done. For the number of hours of credit allowed on each course, see the several courses offered.

THE COURSES OF STUDY.

Courses of study have been provided to accommodate the following classes of students: Those doing regular college work who wish to continue their college studies during the summer; those young people who are preparing to teach and who are desirous of getting the very best professional equipment; teachers of some experience who wish to review and take advanced work; teachers who are preparing for required examinations; teachers and others who are preparing to enter one of the regular University or Normal-College courses, and wish to bring up back work in order to be able to enter a college course without conditions; teachers and others who are prepared to carry regular college work; superintendents and advanced teachers who are seeking a broad professional training.

SCHOOL ADMINISTRATION, SCHOOL MANAGEMENT, COURSES OF STUDY, AND SCHOOL LAW.

School Administration and School Law. — This is Sophomore work in the Normal College course in "Secondary Education" and comprises a careful study of the leading problems in School Administration as they present themselves to

principals, high-school teachers, superintendents, and those looking forward to the work of the supervisor. The following outline of the term's work indicates in a general way its nature: —

1. The School System.— Origin and Growth of the Public-School System; The Factors in the School Organization; and Relation of the School to Other Factors in our Civilization.

2. The Superintendent.— History of Supervision as a Policy in American Schools; Qualifications of the Superintendent — Educational, Professional, Social, and Political; Powers and Duties of the Superintendent; and His Relation to the Board of Education, the Teachers, the Pupils, the Patrons, and the Community.

3. The Superintendent's Administration Policy.— Ideals in Supervision; Determining Factors in School Administration; and The Literature of Supervision.

4. The Teacher.— Qualifications — Natural and Acquired; The Training of the Teacher; The Teacher as a Factor in Administration; Relations of the Superintendent and the Teacher; Means and Methods for the Growth of the Teacher While in the Corps; Teachers' Meetings and How Conduct Them; Teachers' Institutes; and Teachers' Salaries.

5. The Course of Study.— Determining Factors; The Elementary School Curriculum; The High-School Curriculum; The Course of Study and Ohio School Law; The Teacher and the Course of Study; The Course of Study and Growth; and Literature of the Course of Study.

6. Classification and Promotion of Pupils.— Methods in Vogue Discussed; Grading the Ungraded School; Rational Bases of Promotion; The Shearer Plan; the Batavia System; and Examinations and Promotions.

7. School Architecture.— Essentials in a One-Room School Building; Plans for Schools of Two, Three, Four, Six, Eight, and More Rooms; School Decorations; and Grounds, Games, School Gardens, etc.

8. Ohio School Law.— Salient Features Touching Teachers, Supervision, Courses of Study, Examinations, and Revenues; and Prospective Needed Legislation.

9. Some Administrative problems.— The Appointment of Teachers; The Selection of Text-Books; The School and the Community; The Board of Education; The Certification of Teachers; and The City Training School.

The above course will be given by means of lectures, class recitations, and special reports by members of the class, all being directed by an outline to govern the necessary reading and study on the part of the student. No particular text will be used but the student will be directed to the following: —

Proceedings of the National Educational Association, Reports of the U. S. Commissioner of Education, *Educational Review,* Report of the Committee of Ten, Report of the Committee of Fifteen, Pickard's *School Supervision,* Dutton's *School Management,* Ohio School Laws, Reports of Various State Superintendents of Instruction, Leading Educational Journals, Special Reports on Problems of School Administration. All these will be placed within easy reach of the student. Thirty hours', or a full term's credit will be allowed.

The Elementary Course of Study. — This is a course designed especially for teachers of elementary schools and for superintendents of such schools. It is required Sophomore work in the Normal College and elective in all other courses in the University. Forty-five hours', or a full term's credit will be given.

The work is based on "The Report of the Committee of Ffteen," and "A Course of Study for Ohio Schools." The fundamental principles expressing the aim of education are made the basis upon which the course of study for elementary schools is constructed. A careful analysis of the aims, means, and methods in each branch in the curriculum is presented and the teacher, whether in the graded or in the ungraded school, is shown how to secure the best results through the economy of correlations and the wise use of consistent methods. The Course in Language through each grade separately is thoroughly discussed and the materials, means, and methods are considered. Emphasis is placed upon Reading, Language,

Composition, and Literature in each grade in the elementary school. Then follows a similar course in Arithmetic for each grade from the first to the eighth inclusive. Nature Study, Geography, History, Physiology and Hygiene, and the other subjects in the course of study of the elementary schools receive similar attention. The teacher of the ungraded school will find this course to be a great inspiration and aid to him in grading his school to a course of study.

School Management and School Law. — This is a course designed for teachers of elementary schools, whether city, village, or country. It is collegiate work and twenty-four hours of collegiate credit will be given. All the principal problems of school management will be considered and such phases of Ohio School Law will be discussed as touch the following topics: — The teacher, his powers and duties, teachers' examinations, the Patterson law, the High-School law, centralization and consolidation, revenues, rights of pupils and patrons, teachers' institutes, and other practical subjects. Emphasis will be given to the study of the problems of School Management — discipline, the course of study, methods of teaching the various branches, grading, classification, and promotion of pupils, in short, *how to succeed as a teacher.* The text used as the basis, is Dutton's *School Management,* published by Charles Scribner's Sons. Other textbooks that will be useful to the student are White's *School Management,* Roark's *Method in Education,* Hinsdale's *The Art of Study,* Tompkin's *Philosophy of Teaching,* James's *Talks to Teachers,* and McMurry's *Method of the Recitation.*

HISTORY AND PRINCIPLES OF EDUCATION.

Elements of Theory and Practice. — This is a regular course offered in the second year of the "Course of Elementary Education for Graduates of Common Schools." It is designed especially to meet the needs of those preparing to take the county examinations for the first time, and for those who have taught but a short time and have had little or no preparation for the examination in Theory and Practice. Thirty-three hours' credit.

Introduction to the Principles of Education. — This course is regularly given in the third year of the "Course in Elementary Education for Common-School Graduates," and in the first year of the same course for "High-School Graduates." It constitutes the first real pedagogical work of the Normal College and serves as a basis for all later work, such as "Methods," "School Management," and should be taken before these more advanced courses. This course is especially designed to meet the general pedagogical needs of the common-school teacher in the classroom and will serve as a preparation for county and state examinations. McMurry's *Elements of General Method* and Dewey's *Ethical Principles Underlying Education* will be used as texts. Thirty-three hours' credit.

Principles of Education. — This course is given in the Junior year of the regular Normal-College courses in Secondary Education and in Supervision. It is designed for advanced students, teachers of experience, and superintendents. It purposes to give a conception of the broad underlying principles determining all school work. The first half of this course will be given, and the following topics will be considered: (1) The Individualistic Character of Society; (2) The Social Character of the Individual; (3) The Individual as an Impulsive, Rational Being; (4) Psychic Development; (5) The Aim and Meaning of Education. Thirty-three hours' credit.

Great Educators of the Eighteenth and Nineteenth Centuries. — This is the regular work offered in the Sophomore year of the Normal-College courses. The method of study will be, first, a general review of the determining factors in the civilization of the period; second, a consideration of the educational theorists; third, a study of the educational practice of the period as seen in the aim of education, school system, grades of instruction, curriculum, methods, teachers, discipline, and school organization; fourth, a discussion of the permanent phases in the educational work of the period. Forty-four hours' credit.

PAIDOLOGY AND PSYCHOLOGY.

In this department work is so arranged that students who are able to attend college only during the summer may, by judicious choice, complete all the required work within four summer terms. It will be best for those who attend throughout the year to take their paidology and psychology during the regular terms. For the summer of 1905, work in paidology and psychology will be offered as designated below.

Paidology (Childhood). — Five hours per week recitations and three hours per week laboratory, with forty-five hours' credit. Childhood is the period of life following infancy and includes the time of life from about two and a half years of age to near ten years of age. In this course are studied the general characteristics of childhood, diseases of this period, the senses, mental and physical development, care of children, etc., such as may be needed to give an understanding of this time of life.

Paidology (Youth). — Five hours per week recitations and two hours per week laboratory, with thirty-six hours' credit. Youth is the period of life that extends from the end of boygirlhood till full manhood is reached. In this study effort is made to ascertain what are the conditions of life here, especially inquiring into the habits, characteristics, and ambitions of this period.

Paidology (Abnormal Child). — Five hours recitations per week, with forty-five hours' credit. Defective children, delinquent children, dependent children, wildings, and exceptional children are studied under this heading. Knowlege of the first four classes leads up to a better understanding of exceptional children, the ones that cause so much trouble in the school.

Psychology (Elementary). — Five hours of recitations per week, with seventy-five hours' credit. This is required in the courses in Elementary Education. This subject is intended to precede, and form a basis for, the Introduction to the

Principles of Education and the work in Methods. The text-book is Halleck's *Psychology and Psychic Culture.*

Psychology (Junior). — Five hours of recitations per week, with forty-five hours' credit. This is the first term's work of the regular Junior psychology and must be taken before the second term's work can be entered upon. The text-book will be Titchener's *Outline of Psychology.* Only students of Junior rank, or higher, will be permitted to take this subject. Those who will be in college the Fall term are requested to wait till then for this work.

THE MODEL SCHOOL.

The Normal College has under its direct supervision and control a Model School, where skilled teachers of broad training and experience are to be found giving the best instruction by the most approved methods. Teachers should understand the theory of education, but they must know more than mere theory. They must be able to apply theory and adapt it to conditions and environment. One of the most essential features in the training of teachers is the observation and practice work in the Model School.

During the Summer term, a Model School consisting of four grades will be conducted by Miss Emma S. Waite, Principal, assisted by Miss Lillie A. Faris, First Grade Critic, Miss Amy M. Weihr, Second Grade Critic, and Miss Olive A. Wilson, Third and Fourth Grade Critic. In other words, the entire Training School force will be at work during the Summer term. The Model School will be regularly organized and the children will receive systematic instruction. After each lesson in Methods or Theory, the entire class will be taken into the Model School, and an opportunity given to see an application of the methods just discussed in class.

Care has been taken to arrange the Method classes so as to make it possible for students to get credit for a full term's work. All who desire this credit must take methods for either Graded or Ungraded schools together with Conferences on Methods.

An opportunity to teach will be given only to those who have completed Elementary Psychology, Introduction to Principles of Education, and Methods. Exceptions may be made, however, in the case of some whose unusual experience and preparation would seem to warrant special consideration.

In all regular courses in The State Normal College a minimum of 115 hours of teaching is required, and regular collegiate credit will be given for work done during the Summer term.

PUBLIC SCHOOL MUSIC.

Classes will be formed as follows: Music in the grades, notation and sight-reading, and chorus work.

Grade Music.— In the first primary, rote singing, and how to teach it; staff drill, when to begin it; tone lengths, short and long notes, measure and beating, etc., will be considered. In the second primary, there will be a brief review of the foregoing followed by blackboard and staff drills with attention to some of the more difficult problems in rythm and measure. Rote singing.

Voice Study in the Grades. — Special attention will be given to the study and care of the voice. How to obtain clear, pure tones; how to make singing pleasant and profitable; and how to make the study of music of moral and mental benefit will be shown.

Sight Singing. — As sight singing is one of the ends to be attained in the study of music in our schools, and since no teacher can easily teach singing without a fair degree of efficiency therein, due attention must be given to this part of the work. A class in sight singing will be organized.

Chorus Work. — A choral class will be formed. An important part of the work of this class will be a consideration of these questions: How to introduce music into the high school, and how to maintain interest in it.

Voice Culture by Private Instruction. — One who has received careful instruction can the better teach others. Suc-

cessfully to teach children the proper use of the voice, which should be done by imitation in the primary grades, a teacher should know first how to use his own voice. Students in the Summer School can secure private instruction in Voice Culture at reasonable rates.

Summer School Orchestra. — Those who have ability to use some musical instrument are requested to bring it with them that they may join the Summer School Orchestra.

ART DEPARTMENT.

Art study is no longer looked upon as superfluous. In our schools and colleges it is coming more and more to have a permanent place. It trains the powers of observation, develops creative imagination, and aids in forming clear mental images. It is a means of expression, a help in all other studies, and, rightly directed, should lead also to a love and appreciation of the beautiful in nature and in art. There is the practical side to art training also — for art and industry go hand-in-hand. No matter what a man's occupation may be, he can do his work better for the hand and eye training to be obtained from the study of drawing.

Freehand Drawing. — Pencil and charcoal will be used in the study of perspective and in the work from objects, cast, and nature.

Public-School Drawing. — For the teacher, the work in Public-School Drawing will be given with this end in view — that the student may not only learn to draw himself, thus broadening his own powers and culture, but how the subject should be presented and taught to children as well. Pencil will be the medium most used, though students will be expected to do considerable work at the blackboard.

First Term Drawing. — Free-hand Drawing of flowers, fruits, vegetables, and trees. Perspective principles taught through the study of cylindrical and rectangular objects, singly and in groups. In addition to work with the pencil, students will work at the blackboard, being taught to sketch with chalk freely and rapidly.

Second Term Drawing. — More advanced work in free-hand drawing will be taken up. Most of the time will be devoted to the subject of construction, particularly to what is called Mechanical Drawing. This will include only such work as is suitable for the schoolroom — working drawings, patterns, and constructive design.

Third Term Drawing. — Work from objects and nature in pencil and brush and ink. Sketching from figure pose. Composition in connection with Representation and Decoration. Study of pictures and artists.

Elementary Manual Training. — A course in paper folding, clay modeling, cardboard construction, and raphia and reed work, planned for primary and intermediate grades but suggestive for a course for higher grades, will be offered.

ENGLISH.

English Grammar. — Two classes in Grammar, elementary and advanced, will be formed. The former class, for the better ordering of the work, will recite in two sections. The advanced course, Technical Grammar, will deal with the different idioms, constructions, and usages which are so often a source of difficulty to teachers. The elementary work will follow the general text-book plan. In both classes, emphasis will be placed on the method of presenting the subject. Thirty-six hours' Normal College credit will be given for the advanced work.

Elementary Rhetoric. — Composition work will be the chief feature of this course. Methods of teaching composition in the grades will be discussed. The theory phase of this term's work will not be neglected.

History of English Literature. — The course in the History of English Literature covers five hours of recitations per week and is intended to meet, in part, the needs of teachers preparing for examination and, in part, the needs of those who wish to pursue the subject from the point of view of its progress and development. Halleck's *History of English Literature* will be the basis of instruction, supple-

mented by Palgrave's *Golden Treasury of Songs and Lyrics.* This is a preparatory subject. Sixty hours' credit, or one term's work in British Authors, will be given. The class will meet in two sections.

American Literature. — Newcomer's *History of American Literature* will be used as the basis of instruction. The work of the term will include a general review of early American literature and special study of Franklin, Irving, Cooper, Bryant, Hawthorne, Emerson, and Thoreau. Five recitations per week. Students expecting to obtain the credit of one term's work, or sixty hours, allowed this subject will be required to read freely from the works of the authors named.

Shakespeare. — In the classroom, "Julius Caesar," "Macbeth," "King Lear," and "Hamlet" will be studied. Four plays will be read rapidly by the student outside of the classroom. In addition, lectures will be given upon topics relating to Shakespeare. Students will be asked to report upon readings from Lee, Moulton, Dowden, Lounsbury, Hudson, Brandes, and others. Sixty hours of college credit will be given.

Tennyson. — The work in Tennyson, five hours per week, will include the study of "In Memoriam," "Idylls of the King," "The Princess," and such other portions of the poet's works and art as time will allow. Students will need a standard edition of Tennyson's poems, the expense of which need not exceed one dollar. Forty-five hours' credit.

GEOGRAPHY.

Physical Geography. — The aim of instruction in this branch of study will be to exhibit, as far as possible, the life-processes at work in producing existing forms. Lantern slides will be used and Tarr's *New Physical Geography* will be the text. This is a preparatory study, with sixty hours' credit.

Methods in Geography. — The work in geography, five hours per week, will include both subject-matter and method,

and will consist of lectures and assigned readings. The aim will be to impart insight into the more vital aspects of this subject, considering the world as an ever-changing expression of divine intelligence. Thirty-six hours' credit.

Mathematical Geography. — Heretofore, this subject has not been made a branch of study in any of the courses offered in the Summer term. Its importance, however, warrants that some consideration be given to it. No class is regularly scheduled, but should there be a demand, on the part of the students, for instruction in this subject, a class will be formed to meet their wants.

HISTORY, CIVICS, AND ECONOMICS.

U. S. History. — In this subject two courses are offered. The first is the regular course offered in the Spring term of the Freshman year. The text-book used will be *The Life of Lincoln,* in the American Statesman Series, supplemented by collateral reading. One term of collegiate credit is given.

The second class in this subject is primarily for the benefit of teachers. The subject will be taken up by periods and topics. Any good text may be used as a guide in the class work. The class will be expected to refer to the standard authorities in the Library. The great historical questions which arose in the different periods will be discussed as fully as time will permit.

General History. — Two classes in General History will be formed. The first will take up the preparatory work as scheduled for the Fall term, second year, in the courses of study followed in the State Preparatory School. The ground covered will be Ancient History to the end of the Macedonian Empire. Sixty hours' credit. The second class will take a hasty review of General History, emphasizing somewhat the contributions of Greece and Rome to modern civilization. This is the class designed particularly for those reviewing for examination. College credit will not be given. Myers's *General History* is the text-book used in both classes.

Modern European History. — This class will use Schwill's *History of Modern Europe.* The class will be given permission to choose for the term's study either the period from the Protestant Reformation to the French Revolution of 1789, or from the French Revolution to the present time. One term of collegiate credit is given for either one of these courses.

Civics. — The effort will be made, in this course, to trace the development of our system of government, local and national, from the Colonial Period to the present. *Actual Government* in the American Citizen Series will be the text used. The course will be more advanced than the work heretofore given in Civics. One term of preparatory credit is given.

Political Economy. — The class in this subject will use Laughlin's *Elements of Political Economy* as a text. Frequent reference will be made to other books, pamphlets and magazine articles bearing upon the different subjects under discussion from day to day. One term of collegiate credit is given.

MATHEMATICS.

First Term Algebra, using Fisher and Schwatt's *Rudiments of Algebra.* This is a new and fresh text, and is well adapted to the wants of those beginning the subject, serving particularly as model-work for teachers.

Second Term Algebra, using Fisher and Schwatt's *Higher Algebra.* The work of this class will begin with Type Forms, Chapter VI, and will include Factoring, Highest Common Factor, Lowest Common Multiple, Symmetry, Fractions, and Simple Equations of all kinds, to Evolution, Chapter XVI. Factoring and its applications will have close attention.

Third Term Algebra, using the *Higher Algebra* of Fisher and Schwatt begun in the previous term's work. The work done will start with Evolution and include Inequalities, Surds, Imaginaries, Quadratics, Ratio and Proportion, and the Progressions. This is a preparatory class.

Plane Geometry, using the abridged edition of Phillips and Fisher. The work of this class will cover the entire five books. The fundamental working theorems and problems of this subject will be carefully selected and arranged in a sequence both logical and psychological. The locus, symmetry, and limits will receive careful consideration. A strong feature of this work will be the application of the principles mastered to the solution of original exercises.

Solid Geometry, using the abridged text of Phillips and Fisher. All the four books will be taken, including all the original exercises. Constant attention will be fixed on the ultimate theorems to be established, and thus the continuity and logic of the work will be made prominent. The idea of *the locus* will dominate much of the work, and considerable drill in mental geometry will be given.

Freshman Algebra, continuing the *Higher Algebra* of Fisher and Schwatt, and starting with Harmonical Progression. In addition, the chapters on the Binomial Theorem, Logarithms, Permutations and Combinations, Variables, and Limits, together with the remaining part of the text excepting Chapter XXXVI. In Chapter XL, all that will be done will contribute to a good working knowledge of Newton's, Horner's, and Cardan's solutions of higher numerical equations.

Plane Trigonometry, using Wentworth's latest revised text with tables, omitting Chapter VI. Careful attention to the fundamentals of the subject will be given, and there will be full drill on the applications to original exercises of every variety.

Advanced Arithmetic. — The work of this class is especially designed to meet the needs of teachers. The work done will be an excellent preparation for those who contemplate taking State or county examination for teachers' certificates. Special emphasis will be given to the following subjects: Arithmetical Analysis, Percentage and its Applications, and Mensuration. Forms of solution and methods of teaching will be prominent features of the work. Ray's *Higher Arithmetic* will be used as a basis. Normal-College credit, 48 hours, will be given. The class will recite in two sections.

COMMERCIAL COLLEGE BRANCHES.

Bookkeeping, Course I. — This course is for beginners and will include Budgets A and B of the Sadler-Rowe system, with numerous supplementary exercises. Ample practice will be given in opening, keeping, and closing such modern single and double entry books as are used in the simpler kinds of business, also in drawing and recording business papers, in rendering statements and balance sheets, in tracing errors, in changing from single to double entry, in adjusting interest between partners, etc. Students who take this course should be able to meet the requirements of teachers in High Schools or to keep an ordinary set of books.

Bookkeeping, Course II. — This course is open to those who have had Course I. or its equivalent, and includes the higher forms of accounting used in wholesale, manufacturing, banking, and by corporations and commission merchants. The organization and management of partnerships and corporations are explained and the Voucher System is carefully studied. While this course is indispensable for the ambitious accountant, it is valuable in training and information to persons in any occupation. Sixty hours of college credit will be allowed for either course.

Commercial Law, First Term. — The subjects of Contracts and Negotiable Paper will be studied in a general way. A number of reported cases will be considered to show the application of principles. This is a required subject in the Commercial and Four-Year Electrical courses and elective in all others. There will be three recitations per week, for which thirty-six hours of college credit will be given.

Milne's Practical Arithmetic. — This class will make a general review of the subject and the work is planned to meet the needs of those preparing to take a teachers' examination or to teach in the schools. The text is used only as a basis of the work, and numerous outside problems will be given. Particular attention will be given to oral and written analysis. There will be five recitations per week.

Stenography. — Classes in stenography will be formed for beginners, as well as for advanced students. Thirty, or

more, hours' credit will be given, according to the amount of work done.

Typewriting. — All students who take stenography are given regular instruction in typewriting. The department has an ample supply of new standard machines, which are at the disposal of its students for as much daily practice as they can arrange to take.

PHYSICS AND ELECTRICAL ENGINEERING.

Preparatory Physics. — This is the work required regularly of all students in the third year of the Preparatory course. The text-book used is Carhart and Chute's *High School Physics;* for the present Ayres's laboratory manual will be used as a guide for the laboratory work. The course will be adapted to the needs of students, (1) who have never studied Physics; (2) who have, in high schools or elsewhere, studied a text-book, but have not had any laboratory work; (3) who have had the equivalent of one term in Physics, and wish to take up the second term's work; (4) who wish to review the whole subject of Physics preparatory to an examination in the subject. There will be five recitations each week. Graduates of First-Grade high schools, or teachers of Physics in the same, are credited in college with the text-book work, but will be required to do the laboratory work, if this has not been done systematically elsewhere. The time required for the completion of the whole course of laboratory experiments will be three or four hours daily for the six weeks, and for one term's work about two hours per day.

The first term includes Properties of Matter, Mechanics of Fluids and Solids, and Heat; the second term, Electricity and Magnetism, and Light. This applies both to the class work and the laboratory exercises. Teachers of high-school classes will find the laboratory work particularly valuable to them. Complete and systematic notes are required to be written on each exercise in a book adapted to the purpose, so that in addition to the educational value of the course to the student himself he also acquires certain forms and methods

and suggestions which will be of material service to him in teaching his own classes. Credit, seventy-five hours for the first term and sixty hours for the second term.

Advanced Physical Laboratory. — This is the laboratory work required of Juniors in the Scientific course and in the course in Electrical Engineering. It presupposes knowledge of the course described above or its full equivalent. Four laboratory hours each day will be required. No particular manual will be specified, though the course includes exercises of an advanced character from several sources, to which references are given. Fifty hours' credit will be given for this work.

There will also be an advanced course adapted to the requirements of those, if any, who may have had the Junior course, or its full equivalent. This will consist of absolute measurements in Magnetism and Electricity, three hours each day, giving a credit of thirty hours.

Electrical Engineering. — (1) This will be a beginner's course for those who expect to continue the subject later, and for teachers and others who desire to learn the fundamental principles of Electrical Engineering. There will be five recitations a week, and fifty hours of college credit will be given. The text-book will be Atkinson's *Electrical and Magnetic Calculations.* This course will be of great service especially to teachers in Physics, since it will give such a drill in the fundamental principles of electricity and magnetism, and their applications, that this portion of Physics will seem afterwards very easy. It may also be the means of introducing some to a new and an attractive line of work which they may wish to pursue at a future time.

(2) This is also a course for beginners, and covers in an elementary way the general principles of electricity and magnetism, and their application by means of the question and answer method. Shepardson's *Electrical Catechism* will be the text-book used, and a credit of fifty hours will be given.

BIOLOGY.

Physiology. — The course offered for the Summer term is the course given during the Spring term of the college year. Forty-eight college hours will be allowed for the completion of this course. The course will consist of at least two lectures or recitations of one hour each and two laboratory sections of two hours each, every week of the term. This will be a course of actual demonstration of the functions of the different organs of the body. For example, the student actually tests the action of the reagents found in the gastric juice upon the food principles. He then uses the gastric juice prepared from the stomachs of different classes of animals, and tests its action upon different foods, the changes thereby being brought before the eye.

Teachers' Course in Physiology. — This course will be intermediate between an elementary and an advanced course. It will include recitations, dissection of the cat or the dog, the study of the microscopical structure of the organs of the body, and general discussions of methods of teaching physiology in the public schools. In case any student should want credit for this course, sixty hours of preparatory credit will be allowed.

Entomology, or Nature Study. — Insects will be the basis of study. The plants associated with the insects will be studied and their relations pointed out. The anatomy of the insect will be studied from the locust, dissections being made by the students. Two lectures, recitations, or field trips will be made; and two laboratory sections of two hours each will be held each week of the term. The course will be scrictly scientific while the plan will be to adapt it to the wants of public-school teachers. It is designed to create an interest among the teachers in nature study, in order that they may stimulate to better advantage the observing powers of the pupils who come under their instruction. Collections of insects will be made and classified, thereby gaining the required knowledge to make a private collection or one for each public school. Forty-eight University hours will be allowed upon the completion of this course.

Elementary Botany. — This course is the one given during the Winter term of the college year. It will consist of laboratory work upon the seed and the growing plant, and the preparation of slides for the study of structure. The recitations will cover the regular work of systematic botany including the analysis of plants. No attempt will be made to make an herbarium but a few plants will be analyzed to illustrate the method. Fifty-five preparatory hours will be allowed for this course.

College Botany. — The same course as that given in the Fall term will be followed. Study begins with the plant cell and traces the development of the plant through the successive orders to the flowering plants. Attention will be given to living plants, including plant physiology, and a general consideration of all the life principles involved in plants. Sixty University hours will be credited for the completion of the scheduled work.

The Stereopticon will be used to illustrate the lectures referred to above. It will also be used in demonstrating many principles which will come up for study. Lectures of a popular nature will be given from time to time, to which all members of the Summer School are invited.

CHEMISTRY.

General Descriptive Chemistry. — First term, six recitations and ten hours' laboratory work per week are required. The work covered will be that of the first term of the regular college course. Newth's *Inorganic Chemistry,* Holleman's *Inorganic Chemistry,* or Remsen's *College Chemistry* will be used as a reference book.

Second term, five recitations and eight hours' laboratory work per week are required. The work will be that of the second term of the regular college course and must be preceded by the work of the first term.

Qualitative Analysis. — Practical work in the detection of inorganic substances, both acid and basic. To secure

the best results, students in this course should devote their entire time to it.

Organic Chemistry. — A short course is offered in this subject. Previous training in chemistry is essential.

Quantitative Analysis. — Practical work in gravimetric and volumetric analysis. Open to students who have done work in qualitative analysis.

Other work may be had in chemistry provided there is sufficient demand for it.

LATIN, GREEK, AND MYTHOLOGY.

Five classes in Latin will be offered. Each class will recite five times per week, and the work will cover one regular college term.

Beginning Latin. — Students taking this subject will be expected to complete the first fifty lessons in Collar and Daniell's *First Year Latin.*

Caesar. — This class will take up the Gallic War, beginning with the first book.

Cicero. — The first three orations against Catiline will form the subject of study in this author.

Vergil. — The Æneid, Books I. and II. The subject of scansion will receive attention, and some work will be done in Latin prose composition.

Freshman Latin. — One term's work in Freshman Latin will be finished, with a credit of 60 hours. The *De Senectute* and *De Amicitia,* of Cicero, will be read. The class will recite five times a week — four times in the text and once in Latin composition.

In reading the Roman authors just named, a careful study of forms and syntax is considered essential. Students should be provided with Latin grammars. Any standard text may be used.

Greek. — No work will be offered in Beginning Greek, as the Summer term is too short to make it worth while; but

provision will be made for those students who have gone beyond the elements, and such reading matter will be selected as is best suited to their stage of advancement. Two classes will be formed.

Mythology and Folklore. — A course is offered in the study of myths, folklore, and kindred subjects. The object will be to trace, in outline, the function of the imagination in the life-history of the race in so far as it is repeated in the life-history of the civilized child. Greek mythology will be taken as the basis of this study, but it will be correlated with that of the Germanic races and with the most important mediæval legends.

GERMAN AND FRENCH.

The five classes offered for the Summer term are designed to articulate with the regular work of the University.

Beginning German and French. — These are Fall term studies with 75 and 60 hours' credit respectively. When taken in the Summer term, they naturally demand double work and very close attention. A knowledge of these languages opens up to the student a new world which will ultimately widen his horizon in every province of human thought.

Advanced German and French. — Advanced German is Freshman work of the Winter term. Advanced French is equivalent to two terms' work as a Junior elective. The subject-matter of the latter may be fiction, history, or science in order to meet the needs of the student. The purpose of these advanced studies is not only to strengthen the grammatical and syntactical knowledge of the languages possessed by the student, but also to reflect in subject-matter the civilization and culture of Germany and France.

Scientific German. — The course in Scientific German will serve those who, for practical purposes, as engineers, chemists, or biologists, desire to obtain ability better to consult manuals and essays written in the German language. Students who wish to take up work beyond the courses above

offered, can, no doubt, make satisfactory arrangements with the instructor.

THE SCHOOLMASTERS' CONFERENCE.

Ever since the opening of the State Normal College of Ohio University it has been the policy of those ordering its work to hold up before the teachers and the educational leaders of the state high ideals of efficiency and service. Not only have the professional needs of the teachers of our elementary and secondary schools been recognized and provided for in the courses of instruction regularly offered each term, but the needs of the school administrators — superintendents, principals, and examiners — have received careful attention and the best thought the institution is able to give educational questions.

Annually, about the first of April, a two-day session of The Schoolmasters' Conference is held. To this conference have been invited such men as Dr. Frank McMurry, Dr. Charles De Garmo, and Dr. Charles McMurry. The conference for 1905 will be held Thursday and Friday, March 30 and 31, and will be conducted by Dr. Charles McMurry, of Normal, Illinois. All superintendents, principals, examiners, and college men of the state are most cordially invited.

In addition to these annual conferences early in the spring, a special conference lasting two weeks is held each year in connection with the Summer School. Throughout the entire term special conferences will be held to consider timely topics touching the work of the superintendent, principal, and examiner. These will be of the round-table nature and will be largely what those present wish to make them. But during the last two weeks of the term, that is, for the two weeks beginning Monday, July 17, 1905, the Dean of the Normal College, assisted by other members of the University Faculty and by prominent public-school men, will conduct special conferences independent of any of the regular courses in the Summer School. The topics cover some of the most vital questions confronting the educators of Ohio. These conferences will be of special interest to all having to do with ad-

ministrative work and to county and city school examiners. All are most cordially invited to attend these conferences. No charge whatever is made for this course. The universal favor with which these conferences have been received heretofore promises a large attendance upon them and a wide interest in the work undertaken. It will be a good time for school men who can not attend the entire term of six weeks to meet others engaged in work similar to theirs; and it will also be an excellent time for superintendents in need of first-class teachers to come and pick them out of the hundreds of progressive teachers in attendance.

The following topics are proposed for consideration by The Schoolmasters' Conference, July 17-28, inclusive. If the wishes and interests of those in attendance seem to indicate changes or additions to this schedule of topics, such wishes and interests will be recognized:

SCHEDULE OF TOPICS.

I. State Administrative Problems:—

a. A State Board of Education. Should we have such a Board? How appointed? How constituted? Practice and experience in other States.

b. Mandatory County Supervision with Optional Township and District Supervision. Relation of Consolidation to Supervision.

c. Uniform Courses of Study. (1) For the Elementary Schools. (2) For the High Schools. (3) For the State Normal Schools.

d. A Plan for the Re-organization of Teachers' Institutes.

II. Local Administrative Problems:—

a. School Architecture and School Decoration. The standards, aims, and means.

b. The Relation of Games and Athletic Sports to the School and its Welfare.

c. School Materials for Instruction Purposes. Of what kind? How much? Cost? Where obtained? How used? Relation to a good school. This conference will be followed by a Stereopticon Lecture on School Materials for Illustrative Teaching.

d. Professional Training of Teachers: (1) In Professional Schools. (2) In classes conducted by the Superintendent. How may the Superintendent do this? How may he stimulate professional study? The teachers' professional library. (3) The Training Class in the High School a means of preparing teachers.

III. The Curriculum:—

a. What are the principles determining its formulation?

b. What constitutes the basis of elimination of non-essentials?

c. What is the basis of relative values?

d. A State Course of Study. (See Topic *c* under *I.*)

IV. The Recitation:—

a. What is the aim of the Recitation?

b. Elements of strength and weakness in the Recitation.

c. Lesson Plans; Essentials; importance; basic principles.

d. Principles of Instruction applied to the Recitation.

e. The tests of a good Recitation.

f. What constitutes a Good Question in Recitation? A good Answer?

V. The Teacher:—

a. What is good teaching? By what marks may it be known?

b. What are the most fruitful points of view from which the teacher should be encouraged to look upon the work of education?

c. Teachers' Examinations: (1) The Uniform Examinations in Ohio. (2) What constitutes a good Examination Question? Specific illustrations to be given.

(3) Scholastic Pre-requisites to Admission to the Teachers' Examination. The differentiation of Teachers' Certificates.

VI. The Child.

a. Simple Means of Child Study. How teachers may learn to study children successfully. Tests of hearing, seeing, etc.

b. The two Great Punishments: Corporal and Detention. (1) Why used? (2) To whom and when properly applied? (3) What necessitates these punishments? (4) When necessary and justifiable? (5) Detention — its aim, the conditions, the effects upon pupil and teacher.

As Others See It. — "The Summer term, now an established feature of Ohio University, has grown rapidly in scope of work and student attendance within the last few years. Its range of influence touches all Ohio, and some of the adjoining states. The work for the six weeks' term, beginning June 19, 1905, will cover a broad educational field, and meet the demands of teachers of all grades, students in preparatory and college classes, and others seeking opportunities for reviews or special instruction."—*Athens County Gazette.*

GENERAL INFORMATION.

Attendance Statistics: — The attendance of students at the Summer School, of Ohio University, for the last seven years, is herewith shown:

YEAR.	MEN.	WOMEN.	TOTAL.
1898	27	25	52
1899	38	23	61
1900	36	29	65
1901	45	57	102
1902	110	128	238
1903	159	264	423
1904	194	363	557

The figures given above do not include the number of pupils enrolled in the Training School nor the number of School Examiners, Principals, and Superintendents who attended the "Conferences in School Administration" held the last two weeks of the term.

In 1904, the students came from all sections of Ohio and represented about four-fifths of all the counties of the state. Kentucky, Virginia, West Virginia, Pennsylvania, and New Jersey were represented in the 557 names enrolled in the summer of 1904.

Needs Considered and Courses Offered. — In arranging the courses of study for the Summer School of 1905, the various needs of all classes of teachers, and those preparing to teach, have been carefully considered and fully provided for. More than one hundred courses are offered and that number of classes will recite daily. Teachers and others, seeking review or advanced work, should plan early to attend the session of 1905 which will begin June 19th and continue six weeks.

Faculty. — A Faculty of twenty-eight members will have charge of the instruction. Please to note that all the instructors, with one exception, are regularly engaged in teaching in Ohio University. Those who enroll in the Summer term are thus assured of the very best instruction the University has to offer.

Selected Work. — Why not examine the catalogue and determine now the course you wish to pursue, and then begin at once to work out systematically the studies of that course? If you are a teacher of experience, or if you have had previous collegiate or high-school training, you will doubtless be able to do at home, under our direction, some systematic reading and study which will help to shorten the time otherwise required in college.

Courses of Study. — Summer-School students should decide upon a regular course of study to be pursued systematically. Credits and grades from other schools should be filed with the President of the University, thus enabling the student to secure an advanced standing. Work begun during the Summer term may be continued from year to year and much work may be done at home, by advanced students, under the direction of the various heads of University departments. Teachers should pursue such studies as will give them credit on one of the regular courses. A diploma from the State Normal College should be the goal of every ambitious teacher.

Reviews. — Ample provisions have been made for the needs of young teachers, and those preparing for examinations, by means of thorough reviews in all the studies required in city, county, and state examinations. Students preparing to teach, or preparing for any advanced examinations, will find excellent opportunities at Athens.

Primary Teachers. — Special attention is called to the fact that the State Training School, or Model School, will be in session during the Summer term. In this school emphasis is placed upon the training of primary teachers. Almost every teacher in the rural schools has primary classes to instruct. City teachers also find this course especially val-

uable. Every teacher of the rural schools will have an opportunity to receive instruction in the best methods of teaching as applied to primary schools.

Home Study. — Opportunity for home study will be offered only to advanced students, who will take examinations in the studies so pursued, or otherwise satisfy the professor in charge that the work has been satisfactorily done.

Expenses. — No tuition will be charged. *The registration fee of $3.00* will entitle students to all the privileges of the University, save special instruction in private classes. Boarding in clubs, per week, costs from $2.00 to $2.25, and at Women's Hall, $2.75. A student may attend the Summer School of six weeks and pay all expenses, except the railroad fare, on from $20.00 to $25.00. By observing the strictest economy less than this would be required. Applications for rooms should be made before June first, but students who do not wish to engage rooms in advance will experience no trouble in getting promptly located.

Ample Accommodations. — No school town can offer better accommodations at more reasonable prices than Athens. Nicely furnished rooms, convenient to the University, may be rented for $0.75 a week, including light, fuel, bedding, towels, and everything needed by the roomer. This rate is given where two students occupy the same room. If occupied by one student, such rooms usually rent for $1.00 a week. It is safe to say that four-fifths of the rooms rented to students are rented for $0.75 each per week.

Women's Hall. — Rooms in Women's Hall range a little higher than the prices before named. Ladies wishing rooms in Women's Hall should engage them in advance, as such rooms are in demand. Athens can easily accommodate a large number of students. At the close of the first day of the Summer term of 1904, every student had been eligibly located. Accommodations for at least 200 additional students were available.

Free Lectures. — Arrangements have been made for free evening lectures to be delivered in the Auditorium of the University within the period required by the Summer term.

If there is a demand for more general instruction than the classroom recitations afford, a series of day lectures on various topics of interest, particularly those relating to the science and art of teaching, will be given by members of the University Faculty and others capable of rendering such service acceptably. It is possible to have at least three such lectures each week. The supply will depend wholly upon the demand.

Teachers' Conferences. — At least two conferences — one hour each — will be held each week. These will be led by members of the Faculty and others familiar with the working of the public schools and experienced in school methods and management.

Ohio School Laws. — Particular attention will be given to the provisions of Ohio's new school code. Hon. E. A. Jones, State Commissioner of Common Schools, will give a series of informal "talks" on some of the most interesting features of the present Ohio School Law. Classes in School Administration will consider the provisions of the entire school code.

Laboratories, Etc. — The laboratories, museums, art studios, library, and gymnasium of the University will be accessible to students free of charge.

Text-Books. — All text-books will be supplied at the lowest prices possible. Students should bring with them as many supplementary texts as convenient.

Range of Studies. — The following subjects will be taught during the Summer term. Prospective students may see that almost every subject in the various University and Normal College courses will be presented during the Summer term. Students who do not find in the following list of subjects the studies they wish to pursue will be accommodated if a sufficient number of requests for other work are made. The classes regularly scheduled are as follows: Arithmetic (three classes), Grammar (three classes), U. S. History (two classes), Algebra (four classes), Public-School Drawing (three classes), Free-Hand Drawing, Bookkeeping (two classes), Commercial Law, General History (two classes), Physiology, Psychology, Political Economy, Begin-

ning Latin, Cæsar, Vergil, Cicero, Advanced Latin, Greek (two classes), Mythology and Folklore, Modern European History, Physics (two classes), Electrical Engineering (two classes), History of Education, Elements of Theory and Practice, Principles of Education (two classes), School Management, School Administration and School Law, the Elementary Course of Study, Primary Methods (two classes), Conferences on Primary Methods, Special Methods in School Studies, Pedagogical Conferences, Political Geography, Commercial Geography, Mathematical Geography, American Literature, English Literature (two classes), Preparatory Rhetoric, College Rhetoric, Shakespeare, Tennyson, Paidology, or the Science of the Child (four classes), Elementary Chemistry (three classes), Qualitative Analysis, Organic Chemistry, Stenography (two classes), Typewriting (two classes), Elementary Manual Training, Physical Laboratory, Chemical Laboratory, Biological Laboratory, Nature Study, Botany (two classes), Observation in Model School, Teaching School, Classroom Teaching (four grades), Civil Government, Plane Geometry, Solid Geometry, Trigonometry, Sight-Reading (in music), How to Teach Public-School Music, Vocal Music, Chorus Work, Beginning German, Advanced German, Beginning French, Advanced French, and other subjects if a sufficient demand is made at the opening of the term.

Other Branches. — Arrangements can be made by students attending the Summer term for private lessons in Greek, Latin, German, French, Spanish, Psychology, Pedagogy, Voice Culture, Piano, Organ, Violin, Higher Mathematics, Philosophy, and other branches scheduled in any of the University courses. The cost of such instruction, in each branch, will not exceed $5.00 for the full term of six weeks. Inasmuch as the work offered in the regular classes of the Summer School covers so wide a range of subjects, it will be, in most cases, a matter of election on the part of students if they take *private* instead of *class* instruction.

Summer-School Advantages. — Besides having an opportunity to pursue systematically almost any study desired, under the direction of those regularly employed in this work, the student of the Summer School enjoys the advantages of

the acquaintance, friendship, and counsel of many prominent superintendents, examiners, principals, and others who are always on the lookout for progressive, well-qualified teachers.

How to Reach Athens. — Athens is on the main line of the following railroads: Baltimore and Ohio Southwestern, Hocking Valley, and Ohio Central Lines. Close connections are made with these lines at the following-named places: Cincinnati, Loveland, Blanchester, Midland City, Greenfield, Chillicothe, Hamden Junction, Parkersburg, Marietta, Middleport, Gallipolis, Portsmouth, New Lexington, Lancaster, Logan, Thurston, Zanesville, Palos, Columbus, Delaware, Marion, Toledo, and other points. Students may leave their homes in the most distant part of the state and reach Athens within a few hours.

Reception Committee. — From June 17th to June 21st, inclusive, students arriving at the Athens stations will find University representatives, distinguished by the badges worn, at hand to give them all necessary direction. Students reaching Athens after June 21st will find conveyances, at the station, whose drivers will have instruction to render them every possible assistance. The aim will be to locate all comers at the least expense and with the least delay.

"The Mirror." — A souvenir edition of *The Ohio University Mirror* will be issued near the close of the Summer School. Its publication will be supervised by a Faculty Committee assisted by representatives chosen from the student body. It will contain original matter and many illustrations. It will be published for *free* distribution.

Requests for Names. — Superintendents and teachers are requested to send to the President of the University the names and addresses of teachers and others who would likely be interested in some line of work presented at Ohio University. *The Ohio University Bulletin* is sent free and regularly to all persons who desire to have their names enrolled on the mailing list.

Conclusion. — The President of the University will cheerfully answer any questions teachers or others desire to

ask. The many addresses made by members of the Faculty the past year, and the large quantity of printed matter sent out, have served to give prominent attention to the work of the University and the State Normal College. In this way thousands of people have learned to know something of the broad scope of work undertaken at Athens. The hundreds of students who have come to us the past year have helped very largely in imparting information to friends of education throughout the State concerning the extent and character of the work accomplished here. For the year ending March 18, 1904, the total enrollment was 833 different students. The total enrollment of different students for the college-year ending June, 1905, will not fall below 1,000. For latest catalogue, other printed matter, or special information address

ALSTON ELLIS,

President Ohio University, Athens, Ohio.

What Teachers will find at Ohio University, Athens, Ohio, when their Schools close in 1905

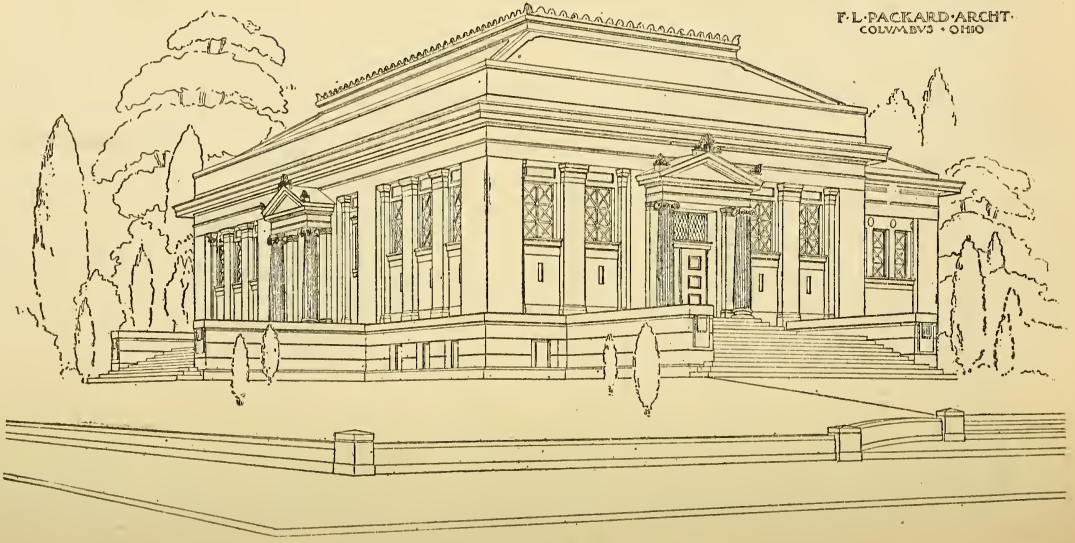
The new Ohio school law requires elementary day schools to continue "not less than thirty-two" weeks in a school year. Schools that began before the middle of September, 1904, will close the school-year about the middle of April, 1905. Schools that opened any time in September, 1904, will close not later than the end of the first week in May, 1905.

The spring term of Ohio University, at Athens, Ohio, will open March 27, 1905, and close with Commencement Day, Thursday June 15, 1905. Students who enter the University not later than May 8, 1905, will yet have six weeks of the Spring term to receive instruction in classes specially planned and organized for their accommodation.

Among the new classes that will be formed about May 11, 1905, those of special interest to teachers and prospective teachers will be as follows: Normal Arithmetic, Advanced Grammar, Rhetoric, English Literature, U. S. History and Civil Government, and General History.

Each of these classes will be open to new students and will be in charge of a capable and an experienced instructor. Only a just portion of the usual term fee of $5 will be charged students who enter at the time of the forming of these special classes.

Attempt will be made to articulate all this work with the work outlined for the Summer term, June 19, 1905, to July 28, 1905, in such a way as to give all students entering the special classes of the Spring term and thereafter the regular classes of Summer term, from ten to thirteen weeks' consecutive work in such branches of study as they may elect to take up. This arrangement of studies will meet the wants of all teachers, desiring more than the six weeks of instruction in the Summer term, whose schools close within the Spring-term period. Ample arrangements will be made for the educational wants of all students who enroll for the regular Summer term, full particulars of which are given on other pages of this pamphlet.



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Ohio University

ATHENS, OHIO

Established by Act of the Ohio Legislature, February 18, 1804.

Offers unusual advantages to students seeking a broad and liberal education. Some courses lead to DEGREES; others lead to CERTIFICATES and DIPLOMAS.

The University now has a Faculty of Forty-three Members, and includes the College of Liberal Arts, The State Normal College, The Commercial College, The College of Music, The Department of Electrical Engineering, The Department of Civil and Mining Engineering, The Department of Drawing and Painting, and the State Preparatory School.

Affiliated with Ohio University are The Cincinnati College of Dental Surgery, 231-233 West Court Street, Cincinnati, Ohio, and The Cincinnati College of Pharmacy, 614-618 West Court Street, Cincinnati, Ohio.

Facilities Well-equipped Electrical, Physical, Chemical, and Biological Laboratories; Nineteen thousand Well-Selected Volumes in Library; Gymnasium and Field Athletics under the Careful Supervision of a trained Instructor; Women's Hall, Well-Appointed and Under Efficient Management.

Courses In Arts, Philosophy, Pedagogy, and Science, leading to the degrees of A. B., Ph. B., B. Ped., and B. S. Special courses in Electrical Engineering, Civil and Mining Engineering, Business, Music, Drawing, Painting, Elocution and Rhetoric, and Physical Culture.

No Tuition Registration Fee of $5.00 per term. Spring Term will open March 27, 1905; Summer Term, June 19, 1905; Fall Term, Sept. 11, 1905; Winter Term, Jan. 8, 1906. Other expenses very reasonable.

Thoroughness Attend an old and a well-established institution which has an enviable record for *Thoroughness, Culture, and Prestige.*

Summer Term Nearly 600 students in 1904. The Summer Term of 1905 will open June 19th and continue six weeks. No Tuition. Registration Fee only $3.00, Superior Faculty of 28 members. Full College credit will be given for work done.

The State Normal College of Ohio University opened Tuesday, Sept. 9, 1902. A Training School to illustrate the best methods of teaching, is in successful operation. The work of the College has gained warm commendation from leading educators all over the country.

Catalogue, Etc. For Catalogue, other printed matter, and special information, address

ALSTON ELLIS,
President Ohio University,
Athens, Ohio.


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