greater the more severe the rigors of climate encountered in the respective *areas of territory* from which statistical returns are cited. Thus in the Gulf coast region the proportion of deaths from consumption per one thousand deaths is about equal among the whites and blacks; but in the Middle Atlantic coast region the difference of numbers shown is a very distinct one.

In five specified areas of territory the exact proportion is as follows:—

The Number of Deaths from Consumption in 1,000 *Deaths from all Causes.*

	Whites.	Colored.
Middle Atlantic Coast Region	140.9	175.1
South Atlantic Coast Region	88 0	105.5
Gulf Coast Region	115 8	120.6
The Interior Plateau	138.4	126.7
The Ohio River Belt	150.7	238 1

Thus, while in the first case there is a difference of 34.2, in the third — the Gulf coast region — there is only a difference of a little less than 5; while in the fifth case a difference of 87.4 in the number of deaths per 1,000 from consumption exists.

We have, therefore, it seems to the writer, sufficient grounds upon which to advance the theory that the more patent condition of the nasal canals in the colored race is largely responsible for the more frequent occurrence in this race of lung disorders, as compared with the white races, in the United States.

Diseased conditions of the nasal canals in the dark race resulting in stenosis are especially rare; while, as every physician engaged in the clinical study of these disorders will testify, a condition of stenosis is one of the most common, and among the first, symptoms of disease involving this portion of the air tract in individuals of European descent.

It is unnecessary to say that the inference must not be drawn that a condition of stenosis is a safeguard against lung disorders. Any condition of the nasal passages which results in or necessitates *mouth-breathing* directly favors diseases of the lungs.

When a condition of the nasal passages exists prohibiting the free passage of air through them, the professional services of a physician or surgeon should be sought to remedy this defect. And since, as has been said, the nasal passages should be considered an integral part of the respiratory tract, the remedy should constitute not merely the rendering of this organ patent, but should also aim to restore it to a condition in which it may regain the ability of performing its normal functions of moistening, of warming, and of purifying, by freeing from irritating factors, the inspired air.

It is impossible to state how far the remedial effects of selection or evolution are modifying the peculiarities of anatomical structure of the nasal passages of the black race in the United States.

That these peculiarities become less prominent along with other racial peculiarities of the descendants of the negro race is, however, very evident to the accurate observer. To the untrained eye, the external characteristics of this organ are undergoing modification, and to clinical observers a like change is noted in the internal structure; but just how far this may be due to the admixture of white blood, and how far to selective and developmental modification, is beyond the power of the writer to estimate.

PROFESSOR W. S. BAYLEY of Colby University, Waterville, Me., has collected into a volume, with a separate title-page and index, notes on mineralogy which have appeared during 1892 in the *American Naturalist*. Professor Bayley is the editor of the Department of Mineralogy and Petrography of the *Naturalist*, and these notes summarize the papers that have been published during the past year. The volume will prove useful to those who wish to be posted on the literature of these two branches of science.

THE EFFECT ON THE COLLEGE CURRICULUM OF THE INTRODUCTION OF THE NATURAL SCIENCES.[1]

BY W. L. POTEAT, WAKE FOREST COLLEGE, N.C.

THE natural sciences are at last firmly lodged in the college curriculum. They are a recent importation. Their exact position and relations are scarcely yet settled, and one may easily fall into the mistake, on the one hand, of unwarranted precision in setting forth their present status, and, on the other, of overconfidence in predicting their ultimate influence upon the culture of our higher institutions of learning. Our observation, however, has probably extended over a period sufficiently long to yield some reliable results, which at this stage of it may well be brought together.

I. What were the circumstances under which the sciences gained a place in our educational machinery?

The college curriculum in its present form is the result of a gradual growth from very ancient and rude beginnings. As in a living organism, the successive modifications of the bulk and complexity of its structure have been closely dependent upon its environment. It responds with great sensitiveness to changes in the world about it. Hence it comes to pass that the apparatus and methods of culture of one period and race differ more or less widely from those of all other periods and races. The history of this development is inextricably intertwined with the progress of external events. We must look, therefore, without, if we would find the explanation of the last great modification of the means of education.

Of course, science in some form and to some extent had a place in education long before the period which I now have in mind. On the other hand, in some quarters it may be said to be still fighting for recognition even at the present moment. Moreover, periods glide insensibly into succeeding periods. There are no sharp lines in nature. For that reason there can be none in history. And yet, in order to avoid confusion and irksome modifications of every statement, I must be allowed to draw a somewhat arbitrary line and consciously to foreshorten the stages of a continuous advance.

For reasons which seem to me sufficient, I draw the line at 1859, the date of the publication of the "Origin of Species," and characterize the 35 years following as the period of science in education. It will, perhaps be agreed that no book in the domain of science, not even excepting the work of Bacon or Newton, has produced an influence so far-reaching and so profound. This date I fix upon the more willingly, inasmuch as it marks the new birth of the science of biology, which has affected all departments of human thought more deeply and permanently than all the other sciences. And it I have chiefly in mind on the present occasion.

The characteristic feature of the intellectual life of the period since the publication of the "Origin of Species" is the ferment precipitated by its doctrine. And the education of the period, in its spontaneous adjustment to external conditions, wears the same unsettled complexion, with science for its dominant tone. The middle decades of this century are unrivalled in all the thrilling history of the development of natural knowledge. The "Report on the Progress of Science" during the twenty years next following the Revolution of 1789 and read before the Emperor Napoleon in 1808, while it records some great names, contains nothing to match the record of the forties and fifties. And the next thirty years carried the wave of discovery and generalization but little higher. But about 1840 the spirit of scientific inquiry grew more intense, laid under contribution a larger number of rarely equipped minds, and pressed forward to attack the problems of the physical universe with a degree of vigor, boldness, and consecration which could not fail of brilliant achievements. Since that epoch the application of machinery to industrial production and to locomotion and intercommunication has revolutionized our common lives and given us new standards of comfort and activity. This revolution in the external aspects of modern civilization, it must be observed, "has been preceded, accompanied,

[1] Abstract of a paper read before the North Carolina College Association at Raleigh, Feb. 25, 1893.

and in a great measure caused by a less obvious but no less marvellous increase of natural knowledge, in consequence of the application of the scientific method to the investigation of the phenomena of the material world." The three great achievements which give our period its unique position in the annals of science are, the doctrine of the molecular constitution of matter, the doctrine of the conservation of energy, and the doctrine of evolution. They relate and unify an otherwise bewildering chaos of observation and experimentation. They have not, as Professor Huxley has said, fulfilled Bacon's conception of the aim of science and superinduced new forms upon matter, but they have in a sense created nature anew. They have given it a new voice. They have invested it with a new dignity and fascination.

Now, the subjects of study, under the stimulating influence of these great generalizations had, near the beginning of our period of science education, multiplied with amazing rapidity. And each new comer at once upon arrival challenged the pre-emptive right of its predecessors to the whole territory of education. Moreover, it was at once apparent that many of the new subjects yielded themselves with great hopefulness to the function of mental culture and had, besides, an important bearing on the practical conduct of life. Should the new knowledge, which in a thousand quiet ways was spreading into the thought of the times and recasting it, be kept dark to the minds of the young? Should they be left to the sudden and possibly disastrous shock of it when they should emerge from their cloistered life in college and find it all abroad and confronting them in every path?

It *was* resisted at the threshold. Nor should we be surprised. Conservatism is not passivity, mere resistance. It is rather an active force. It is not rest, but momentum. Whatever interposes itself to modify or deflect this current must be prepared for a collision. Illustrations abound throughout the history of education. Cato the Censor opposed strenuously the introduction of Greek into the Roman education. "Believe me," he wrote to his son, "the Greeks are a good-for-nothing and unimprovable race. If they disseminate their literature among us it will destroy everything." Again, we find that in the sixteenth century Latin and Greek, which in the nineteenth have held the ground against science, had themselves to win their way into the schools against "the 'Parva Logicalia' of Alexander, antiquated exercises from Aristotle, and the 'Questiones' of Scotus." Thomas More wrote to the dean of a school in London in which the new learning was recognized, "No wonder your school raises a storm, for it is like the wooden horse in which armed Greeks were hidden for the ruin of barbarous Troy."

But there are two features of the resistance to science in the curriculum, which, so far as I know, are peculiar to this last growth-pain of the educational ideal. The first springs out of the fear that what may be called the poetry of life will be rudely dealt with by the scientist, who comes upon the stage with the clatter of retorts and instruments, with a pigeon-hole for every sentiment and a physical test for every phenomenon of the soul. The inimitable Charles Lamb, on the side of prose, supplies an illustration of this feeling in the essay on "The Old and the New Schoolmaster," wherein he confesses his sins against science, saying, "I am a whole encyclopædia behind the rest of the world," while he but poorly conceals his disgust at the pretensions of the modern successors of "those fine old pedagogues who believed that all learning was contained in the languages which they taught." Representing the poets, John Keats, in "Lamia," exclaims sadly:—

> "Do not all charms fly
> At the mere touch of cold philosophy?
> There was an awful rainbow once in heaven:
> We know her woof, her texture; she is given
> In the dull catalogue of common things."

In Poe's "Sonnet to Science" we meet the same regretful aversion. A still more recent voice is raised in the prose and poetry alike of the late Mr. Matthew Arnold.

I own that I share in some measure this repugnance to bare, unrelated facts and the spirit of irreverence. But it is coming to be generally recognized that science does not rest in analysis, which is but its method to reach a higher synthesis. A catalogue of isolated facts, accumulated it may be with the infinite pains of an army of workers in field and laboratory, is of small value or significance except as it may contribute to the establishment of some great generalization or unifying conception. And, further, I doubt that the wholesome sense of mystery is dissipated by the progress of science. Her torch grows brighter with each passing year and shoots its rays farther into the surrounding darkness, but mystery walks ever at her side. She springs more questions than she solves. And so an increasing reverence is not only consistent with a widening intelligence, but in its higher and richer phases is dependent upon it. I believe, with the weighty testimony of George Eliot and Herbert Spencer and the practical illustration of the late Poet Laureate, that the knowledge of processes and causes, so far from clipping the wings of the imagination, in reality enlarges the sphere of its flight.

The second peculiar feature of the opposition to science in the curriculum alluded to above is the fear of its effect upon religious beliefs in the minds of the young. It would be easy to multiply illustrations of the supposed antagonism between religion and science, for it has had an unbroken succession from the trial of Socrates to the trial of Briggs; but I forbear. Here, again, the opposition is melting away as the limitations and real bearing of scientific inquiry are perceived.

So, then, we may repeat what was said in the beginning. The battle of the natural sciences for recognition in the schools is won. Universally won in theory, but the actual occupation of all the conquered territory is yet to be effected. As a rule, the entrance has been made in the higher institutions first. In England, the study of the earth and its productions is still but scantily represented in the instruction afforded by its great fitting schools. The case is much the same in our own country. Even where the sciences are taught in the primary and high schools it is too often book science, which is usually better not taught at all.

In North Carolina we may not say that so much as a beginning has been made in science teaching in our public schools and academies. I would respectfully submit it to the wisdom of this Association whether it should not take it upon itself to promote in some practical way the introduction of the natural sciences into these schools. Might not the colleges and State University help forward this reformation by publishing certain elementary courses in science as required for entrance? So far as I have been able to ascertain, Trinity, Wake Forest, and Guilford are the only institutions in the State that make such requirements.

In order to learn the position of the natural sciences in the higher education in North Carolina, I have made a canvass of the leading colleges, with the following tabulated result, which takes no note of elective classes, but only of prescribed:

Prescribed Recitations per week for four years for Bachelor of Arts:

	Total.	Nat. Sci.	Biology.	Percentage in Nat. Sci.	Percentage in Biology.
Davidson	65	4	0	6.1	0
Elon	69	10	.5	14.4	.7
Guilford	72	10	0	13.8	0
Trinity	67	4	0	5.9	0
University	61.5	6.5	0	10.5	0
Wake Forest	64	10	2	15.6	3.1

II. We may now consider specifically the effects which the natural sciences have produced upon the college curriculum.

1. The first which I shall mention recalls the physicist's doctrine of impenetrability. When science entered, room had to be made for it. That necessitated a movement of the constituent molecules of the curriculum upon one another, with the result of relaxing its rigidity. From the solid it passed to the semi-fluid state.

In America three expedients have been employed in the accomodation of the new subjects in the four years' college course. At first they were treated as "extras." Later they were admitted on terms of equality with the languages and mathematics, and all suffered some abatement in extent and thoroughness, it being held that elementary knowledge of all was more valuable for the purposes of a liberal education than extended knowledge of the remainder in case of the omission of science. The third expedient is as yet new, but has more than approved itself as the only one that can meet the conditions. I refer, of course, to the elective system. It is liable to abuse, perhaps it has been abused; but, under carefully weighed restrictions, it adds greatly to the culture-power of any curriculum. The disadvantages of the rigid curriculum are too apparent for statement. How many men have not achieved distinction in spite of the inflexible grind of the old college mill. On the other hand, how many single-gifted men have not been headed off and imprisoned in the unvarying meshes of collegiate requirements. Emerson speaks somewhere of "those classes whose minds have not been subdued by school education."

2. Closely associated with the relaxation of the rigidity of the form of education is the new conception of educational values that has resulted from the introduction of science instruction. The study of antiquity has lost somewhat of its prestige as a preparation for the life of to-day. But if the Greek and Roman life and literatures have lost their supremacy in general, they have not lost their disciplinary and quickening power for a certain order of minds. And to erect a scientific curriculum which should rigidly exclude these, as I believe Mr. Spencer proposed, would be a blunder only less disastrous than the reorganization of their old monopoly which was disintegrated by science.

3. I now mention last the catalytic force of science in the curriculum. Its presence has wrought the rejuvenation of the older subjects by supplying the illustration of a new and contagious method. They have acquired a new point of view, and in their treatment the emphasis is not now where it once was. They are immensely the gainers in educational value and in vitality. The ease and promptness with which they have responded to this scientific influence is the best guarantee of their permanence in the scheme of culture. The "new psychology," the "new political economy," and the "new history" may be mentioned as illustrations of this transformation. The Latin and Greek languages are no longer an end in themselves, but merely a means to the reproduction of the wonderful thought and life of the Latin and Greek peoples. Even theology, which, according to Macaulay, is the most rigid and unprogressive of all the systems of human thought, is showing signs of movement in response to the influence of the natural sciences – in particular, of biology.

THE MARINE BIOLOGICAL LABORATORY.—SIXTH SEASON, 1893.

IN addition to the regular courses of instruction in zoölogy, botany, embryology, physiology, and microscopical technique, consisting of lectures and laboratory work under the constant supervision of the instructors, there will be a number of lectures on special subjects, by members of the staff. A course of lectures in Embryology will be given by Professor Whitman; on the Morphology of the Vertebrate Head, by Dr. Ayers; and two or more courses in Invertebrate Zoölogy, by Drs. Bumpus, McMurrich, Rankin, and Morgan. There will also be ten or more evening lectures on biological subjects of general interest. Among those who may contribute these lectures may be mentioned, in addition to the instructors above named, the following: Drs. E. A. Andrews, Johns Hopkins University; Howard Ayers of the Allis Lake Laboratory; Professors W. G. Farlow, Harvard University; William Libby, Jr., Princeton College; J. M. MacFarlane, University of Pennsylvania; C. S. Minot, Harvard Medical School; E. S. Morse, Salem; H. F. Osborn, Columbia College; John A. Ryder, University of Pennsylvania; W. T. Sedgwick, Massachusetts Institute of Technology; E. B. Wilson, Columbia College.

The Laboratory is located on the coast at Wood's Holl, Mass., near the laboratories of the United States Fish Commission. The building consists of two stories, and has 33 private laboratories for investigators and 5 general laboratories — two for beginners in investigation in zoölogy, one for teachers and students receiving instruction in zoölogy, one for botany, and one for physiology. The Laboratory has aquaria supplied with running sea-water, boats, a steam launch, collecting apparatus, and dredges; it is also supplied with reagents, glassware, and a limited number of microtomes and microscopes. *No alcohol can be supplied beyond what is required for work in the laboratory.*

By the munificence of friends the library will be provided not only with the ordinary text books and works of reference, but also with the more important journals of zoölogy and botany, some of them in complete series.

The Laboratories for Investigators will be open from June 1 to Aug. 30. They will be equipped with aquaria, glassware, reagents, etc., *but microscopes will not be provided.* In this department there are 33 private laboratories for the exclusive use of investigators.

Those who are prepared to begin original work under the guidance of instructors will occupy tables in the general laboratories for investigators, paying for the privilege a fee of fifty dollars. The number of such tables is limited to 20.

An elementary course in vertebrate embryology will be introduced this season, designed to meet the needs of those who have completed the general courses in the Students' Laboratory. The study will be confined mainly to the fish egg as the best type for elucidating vertebrate development. Each member of the class will be supplied with material and be expected to work out each step in the development from the moment of fecundation. The aim will be not only to master the details of development but also to acquire a thorough knowledge of the methods of work. Methods of preparing surface views, imbedding in paraffin and celloidin, various methods of staining and mounting, drawing, reconstruction, modelling, etc. The course will thus combine just what is needed as a preparation for investigation.

This course will open Wednesday, July 5, and continue six weeks, and it will be conducted by Mr. Lillie and Professor Whitman. The fee for this course will be fifty dollars, and the class be limited to ten.

Applicants should state what they have done in preparation for such a course, and whether they can bring a complete outfit, viz., a compound microscope, a dissecting microscope (the Paul Mayer pattern made by Zeiss is the best), camera-lucida, microtome, etc. In case these instruments are furnished by the Laboratory, an additional fee of ten dollars will be charged therefor. No applications for less than the whole course will be granted.

The Zoölogical Laboratory for teachers and students will be opened on Wednesday, July 5, for regular courses of six weeks in zoölogy and microscopical technique. The number admitted to this department will be limited to fifty, and preference will be given to teachers and others already qualified. By permission of the director and by the payment of additional fees, students may begin their individual work as early as June 15, but the regular instruction will not begin before July 5.

Though more advanced students who may wish to limit their work to special groups will have an opportunity to do so, the regular course in zoölogy, in charge of Professor Bumpus, will embrace a study of the more typical marine forms and elementary methods of microscopical technique. The laboratory work, outlined below, will be accompanied by lectures.

July 5–8. Study of the Lobster. (General anatomy — methods of injecting — preparation of histological material.) July 11–15. Cœlenterates (*Campanularia, Tubularia, Metridium, Mnemeopsis*). July 17–22. Vermes (*Nereis, Balanoglossus,* and *Phascolosoma, Polyzoa, Bdelloura*). July 24–29. Echinoderms (*Asterias, Arbacia, Echinarachnius, Thyone*); Mollusks (*Venus, Sycotypus, Loligo*). July 31–Aug. 5. Crustaceans (*Branchipus, Pandarus, Lepas, Idotea, Talorchestia, Cancer, Limulus*). Aug. 7–15. Vertebrates (*Amphioxus, Raja, Teleost*).

The tuition fee is thirty-five dollars, payable in advance. Ap-