If in closing I may briefly epitomize, it seems to me, that the best results may be obtained in physiologic instruction in the schools as follows:

1. Text-books written by able teachers who know the subject at first hand should be provided.

2. The fact should be emphasized that physiology is very real, and that every one may demonstrate upon himself many of the most striking and fundamental phenomena; for example, how quickly will the pupil see that it is not necessary to go to the teacher or to the book to find out the number of heart-beats and respirations per minute, and that both are greatly accelerated by exercise or excitement.

3. Anatomy should not overshadow physiology, but nice structural adaptations whereby specific functions are performed may be pointed out and worked upon with great advantage; for example, the valves in the heart, the veins and lymphatics, the forms of the joints, etc. Such knowledge is interesting and would aid all. Perhaps also it might arouse some slumbering genius whose future efforts would reveal adaptations now hidden.

4. The teacher should inspire his pupils with respect for the human body and its powers, and with due sympathy for all living things. Lastly, he should impress upon them with solemn earnestness the fact that their physical and moral health is largely in their own hands, and that the physical and moral laws of their being are inexorable.

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at the University one in eight was dropped, showing that the more poorly prepared were those who came for examinations including physiology. Physiology papers of 195 of the latter class have been looked over with reference to determining the quality and kind of preparation made, as taken from answers to questions.

The average standing of the 195 was.....53%
The average standing of those having dissection and drawing.....59%
The average standing of those having nothing but books.....47%
The average standing of those self-prepared.....59%
The average standing of those having previous college training.....66%

DISCUSSION OF PROF. GAGE'S PAPER ON PHYSIOLOGY IN THE SCHOOLS.

IT is fitting that the address on physiologic instruction should be given by a Cornell professor. For, in 1868, at the suggestion of the first president of that institution (the Hon. Andrew D. White) the entire Freshman class attended a course on physiology and hygiene during the first term; the examination questions were such as were asked in medical schools at that time, and diagrams were required of both macroscopic and microscopic structures. The choice of the speaker was equally happy; for the year of his graduation, 1877, was memorable in the annals of Cornell, in that then first physiology became a requirement for admission. Furthermore, Prof. Gage is a master in the elucidation of the fine anatomy of animal tissues which aids so materially the comprehension of function, and his address last summer as President of the American Microscopical Society, 'A Plea for Physiologic Histology,'* well merits mention in this connection.

If I commence with an emphatic corroboration of his complaint as to the inadequacy of existing text-books, it is because no other want has been more constantly and keenly felt by me during the twenty-eight years in which I have delivered 40 courses of lectures upon physiology (one-fourth of them in medical schools), and have addressed upon the subject more than 4,000 individuals.

From the nature of the case a text-book can never be *complete*. But the other four of what I call the five C's may surely be

*SCIENCE, August 23, 1895.

attained, viz., it should be *correct* so far as it goes and so far as existing knowledge permits; it should be *concise*, *consistent* and, above all things, CLEAR.

For use in systematic instruction the textual form of a scientific manual should be neither that of a treatise to be perused nor that of a lecture to be spoken. The paragraphs should be short, categoric and visibly, as well as logically, coordinated and subordinated.

It is probable indeed that one of the grounds for the success of mathematics and linguistics as disciplinary studies is the relative perfection of their pedagogic methods, and especially the way in which the general rules and exceptions thereto are set forth.

As to the *writer of a text-book*, if the book fulfills the requirements perhaps its source is of little moment. But even if this be not conceded I fear the limitation indicated by Prof. Gage is practically unattainable. With the absolute convictions natural to comparative youth, he is perhaps so sure that "a little knowledge is a dangerous thing" as to forget that, if that pithy saying be strictly true, no one of us can regard himself as altogether safe. Indeed, it is now many years since any one person could obtain *all* physiologic information at first hand. I trust, therefore, that Prof. Gage may assent to this less stringent statement: The writer of a text-book should have made some real contribution to physiologic method, fact or idea.

Like the teacher, the writer of a text-book needs to guard against the temptation to subordinate the needs and capacities of the learner to the supposed necessity for exhibiting his own erudition. The wisest of teachers is he who knows just what to omit.

In general method there is too often a direct inversion of the natural order. Children should be led to sing before they talk; they should be taught to draw before they write; and they should be encouraged to *observe* before they are compelled to think. In observing and reflecting they should be neither pushed nor pulled, but guided.

As applied to physiologic instruction, instead of '*verba et præterea nihil*,' or even many words illustrated by a few random demonstrations, there should be numerous and well devised experiments upon which the pupils should reflect and comment. In short, in the place of what may be called *inducation* there should be sought a true *education*. Contrary to the Scripture phrase, the kingdom of science cometh *with observation*.

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GEOLOGICAL ATLAS OF THE UNITED STATES.

FOLIO 16, KNOXVILLE, TENNESSEE–NORTH CAROLINA, 1895.

THIS folio, by Arthur Keith, consists of six pages of text, a topographic sheet, a sheet showing the areal geology, another showing the economic geology, a third giving structure sections, and a fourth giving columnar sections. The folio describes that portion of the Appalachian province which lies between parallels 35° 30′ and 36° and meridians 83° 30′ and 84°. This district contains about 968 square miles, divided between Knox, Sevier, Bland and Jefferson counties, in Tennessee, and Swain county, in North Carolina.

The text begins with a general description of the province, and shows the relation of this part to the whole. The local features of the drainage by the Holston, Tennessee and Little Tennessee Rivers and their tributaries, such as the Little Pigeon and Little Rivers, follow next in description. The various forms of the surface are pointed out, such as East Tennessee Valley, Smoky Mountains and Chilhowee Mountain, and their relations to the underlying rocks are emphasized.

Under the heading 'Stratigraphy' the