Resolved, That all schools having courses for the training of teachers should give instruction in (*a*) personal and school hygiene and (*b*) the principles and practise of physical training, and that each of these subjects should be given as much time as the major subjects in the course.

Resolved, That examinations for licenses to teach should include questions upon these subjects, and that the answers to such questions should be given equal weight with the answers to questions upon any other subjects.

The officers elected for the ensuing year were:

Hon. President—Theodore Roosevelt.

President—Dr. Henry P. Walcott.

Vice-President—Dr. Arthur T. Cabot.

Secretary-Treasurer—Dr. Thomas A. Storey.

Members of Council for One Year—John A. Bergström, Ph.D., Elmer E. Brown, Ph.D., W. H. Burnham, Ph.D., John J. Cronin, M.D., Abraham Jacobi, M.D., LL.D., W. H. Maxwell, A.M., LL.D., John H. Musser, M.D., John Ridlon, M.D., Myles Standish, M.D., H. P. Walcott, A.B., M.D.

Members of Council for Two Years—Walter E. Fernald, M.D., C. Harrington, A.B., M.D., C. N. Kendall, A.M., Geo. H. Martin, LL.D., J. H. McCullum, M.D., J. H. McCurdy, M.D., C. A. Moore, Edw. L. Stevens, L.H.D., J. J. Storrow, Edw. Lee Thorndike, Ph.D.

Members of Council for Three Years—Champe S. Andrews, Nicholas M. Butler, A.M., LL.D., Litt.D., Arthur T. Cabot, M.D., Frederick Forcheimer, M.D., W. E. Fischel, M.D., L. H. Gulick, M.D., M.P.E., C. W. Hetherington, Ph.D., Geo. L. Meylan, A.M., M.D., Thos. A. Storey, Ph.D., M.D., William H. Welch, M.D., LL.D.

Henry P. Bowditch, M.D., professor of physiology in the Harvard Medical School was unanimously elected first honorary member of the association.

THOMAS A. STOREY,
Secretary
COLLEGE OF THE CITY OF NEW YORK

DISCUSSION AND CORRESPONDENCE

"POPULAR" SCIENCE

IN a recent communication,[1] Mrs. Franklin enters a timely protest against the pseudo-science of the popular magazines. Every investigator of color vision must agree with Mrs. Franklin that Dr. Ayers's conception of color-blindness—as presented in the April *Century*—"belongs to the class of the antiquated and the non-scientific." And a more recent paper in the same magazine by Professor Stratton, of the Johns Hopkins University, is equally defective and misleading.

Under the title "Railway Disasters at Night" Professor Stratton discusses a topic which has aroused wide-spread popular interest. The author describes various real and fictitious defects of color vision, and from this sweeping condemnation of the color sense he infers that the "space sense" is more worthy of being entrusted with the responsibility of an accurate discrimination of signals. Accordingly, he recommends the disuse of the present system of railway signaling by means of colored lights, and advocates the substitution of illuminated semaphores which shall appeal to the "space sense." The author's argument centers around the problem of color vision, and it is chiefly to his discussion of this topic that exception must be taken. Most of the errors contained in the paper must be ignored in this brief communication; but I shall venture to call attention to two or three points which may have escaped the notice of the casual reader.

Among the reasons assigned by Professor Stratton for the alleged failure of colored signals is the following startling disclosure:

> The limitations of the normal eye are, however, not yet fully told. Even when it looks with fair accuracy at them, it is always at a disadvantage with regard to colors at night. The eye, grown accustomed to darkness, becomes exceedingly sensitive to faint lights, but it no longer detects their proper colors: "in the dusk all cats are gray." At nightfall a strange kind of second-sight comes in to supplement the vision of common day, now baffled; but this owl-sight of the human eye is able to catch bare light and shade and form, and is blind to the hue of things.

Now if the human retina really were color-blind at night, as Professor Stratton believes, he would undoubtedly have an argument against the present system of night signals; but he would be confronted by the difficulty of explaining how a night express ever reaches its destination in safety—since its safety

[1] SCIENCE, N. S., XXV., May 10, 1907, p. 746.

would depend upon the engineer's ability to distinguish between indistinguishable signals. As a matter of fact, the reverse of Professor Stratton's statement is true. Instead of being totally, or even partially, color-blind, "the normal eye, grown accustomed to darkness," is much more sensitive to color than is the retina in daylight vision. Indeed, the increased color-sensitivity of the dark-adapted retina is so striking and so well-known that it has in several instances been made the object of special investigation. And the investigators who have made quantitative determinations of this hyperesthesia to color agree that it amounts to, at least, *two hundredfold.*

Professor Stratton believes that another reason for the misinterpretation of colored signals is to be found in the fact that one "is incapable of seeing correctly the color of objects caught out of the corner of the eye." He represents the engineer as being so occupied with his engine and his time-piece, that he does not even see his signals until he is upon them. "The color of a signal must be caught in its flight to one side" while the engine rushes past in mad career. It seems unnecessary to discuss the question as to whether or not Professor Stratton's dramatic description represents the actual procedure adopted by the engineer in the reading of his signals; but it may be remarked that if engineers really do attempt to interpret signals under the conditions described by the author, the semaphore device which he advocates would prove to be even more defective than the despised system of colored lights. For while it is true that the outlying regions of the retinal surface are relatively insensitive to color, it is also true that these peripheral regions are even less capable of discriminating between spatial forms.

The author errs again in his discussion of the status of "color weakness." It is popularly supposed that there exists a group of individuals who are "weak in their color sense, but by no means color-blind." Professor Stratton promulgates this erroneous conception, notwithstanding the fact that in an examination of several thousand cases of "color weakness" Professor Nagel, of Berlin, found not a single instance of the defect that did not turn out, on closer investigation, to be a familiar case of color-blindness.

Professor Stratton omits to mention that the illuminated semaphore which he recommends is an antiquated expedient. It represents an earlier stage in the evolution of the present system of signaling; it was introduced into the railway service many years ago, but, for reasons which need not be discussed here, it never came into general use. Its failure and ultimate supplanting by colored lights are now a matter of history.

J. W. Baird

University of Illinois

The Definition of Respiration

To the Editor of Science: In the article "On the Teaching of the Subject of Respiration" in Science for April 19 it is stated that "the confusion of words is inconvenient enough, but there is back of it a confusion of ideas which is more serious and by which the teaching of the subject is more or less impaired." That this is true there is abundant evidence, while a very superficial glance over the recent literature of the subject shows where the trouble lies. If only one authority were consulted little difficulty would result, for the differences are concerned with words rather than with ideas; each book is clear enough if taken by itself; yet the number of definitions of respiration that are available to the student can lead to nothing but confusion. A few brief quotations will illustrate this. Barnes[1] speaks of "another false conception. . . . One often finds respiration described as a gaseous exchange—the taking up of oxygen and giving off of carbon dioxid—a trade between the atmosphere and the body." More recently Loeb[2] has stated, "By respiration we mean the taking up of oxygen and the giving off of CO_2. We shall see later that the latter process can exist independently of the taking up of oxy-

[1] "The Theory of Respiration," Science, February 17, 1905.

[2] "The Dynamics of Living Matter," 1906.