I have refrained from doing so, because I knew of the matter only at second hand, and as I made no notes at the time, I can not quote exactly, but only in substance. I had recently a conversation with Professor A. H. Tuttle, for many years at the University of Virginia, and our discussion led to mention of the position of Louis Agassiz upon evolution. Professor Tuttle in his early years went to Harvard to study with the late Jeffries Wyman, and, one day, as he was talking with the doctor, Tuttle mentioned Agassiz' opposition to the theory. He has kindly written out his recollections of what Wyman said and which he has permitted me to quote.

The following is a statement, as accurately as I can, after repeated and careful effort, recall it, of the incident of which I told you. The words of Agassiz surprised me so much that they were especially impressed on my memory, and I am sure that they are here given substantially as I received them. Of the accuracy with which they were quoted by Wyman no one who ever knew him could have any question.

It was my good fortune to be (1870–72) a student in the laboratory of Jeffries Wyman. He was not only a colleague of Agassiz, but also his neighbor and one of his most intimate friends. In those days "Darwinism" was a very live subject. I had read every thing that Agassiz had published which bore upon it. One day I asked a question about his violent opposition to it of Professor Wyman.

In reply he told me that at first they had discussed the subject quite freely; at the last time it was mentioned, after his statement of some considerations based upon his own personal work then in hand, Professor Agassiz exclaimed:

"Wyman, if I were a comparative anatomist, as you are, I should probably think as you do. But I can not accept this new doctrine consistently with the views that I have already put forth [referring, of course to his "Essay on classification"] and I do not intend to!"

"After that," added Professor Wyman, "of course neither of us said anything more about it to the other."

In one of my many talks with the late Professor A. S. Packard, who studied for several years with Agassiz and who always remained intimate with him, he told me that Professor Agassiz, in the last year of his life, said (I quote only the substance, not the exact words): "The greatest mistake of my scientific life has been in fighting the theory of evolution. I saw that it was coming for years and my 'Essay on classification' was written largely to forestall it. I believed it all wrong, but now I see that it will prevail."

This, of course, is merely my recollection of a conversation some forty years ago, but it made such an impression on me that I am confident that I have the substance correctly.

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NEW ORLEANS AND YELLOW FEVER

I NOTICE on page 14 of the November 14 issue of SCIENCE, the last statement began, "About a month ago a case of yellow fever was reported in New Orleans without causing a ripple of interest in the medical profession."

While I fully endorse the sentiment expressed in the entire article, which I know is written in accord with the modern conception of preventive medicine, nevertheless, I thought it advisable to call your attention to the fact that this case of yellow fever was not reported in New Orleans. The patient, a Mexican, passed through New Orleans from Mexico and stopped for about two days. We were advised of the diagnosis of yellow fever eight days after he had left the city and had died in Houston, Texas. Without going into details, I am reliably informed that the U. S. Public Health Service has since considered the diagnosis of yellow fever erroneous.

New Orleans has not had a local case of yellow fever since 1905; a few isolated cases since that time have all been cases coming up through quarantine.

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SCIENTIFIC BOOKS

Helmholtz's Treatise on Physiological Optics, translated from the third German edition. Edited by JAMES P. C. SOUTHALL, professor of physics in Columbia University. Published by the Optical Society of America. 1924. Volume I. The Anatomy and Dioptrics of the Eye. (pp. xxiv + 482).

THIS is the first volume of the English translation of Helmholtz's great and original work on physiological optics. It is not merely a reproduction of Helmholtz's own epoch-making treatise on this subject, but it is a translation of the famous third edition published in Germany between 1909 and 1911 long after Helmholtz's death, under the auspices of the late Professor W. Nagel, in collaboration with Professor A. Gullstrand and Professor J. v. Kries. This edition, brought up to date at that time and enriched by the contributions of these new editors, was expanded into a work published in three large volumes, which comprised perhaps more than double the contents of the original. The English edition also contains some additional new material written by Professor Gullstrand and Professor v. Kries, an article by Dr. Christine Ladd-Franklin and various notes and compilations made by the editor and his collaborators. Thus, for example, the first volume on "The Anatomy and Dioptrics of the Eye," which is the special vol-

ume here under discussion, contains an entirely new chapter on ophthalmoscopy by Professor Gullstrand, which was not in the third German edition at all. Professor Gullstrand himself has designed an ophthalmoscope which is a marvel of optical perfection and many other notable ophthalmic instruments besides. Doubtless, many persons are accustomed to think of anatomy as practically a closed subject, so far at least as the human body is concerned; but a reader who will glance at the partial list of more recent bibliography on the anatomy of the eye, compiled by Dr. Davenport Hooker for the English edition, which comprises more than seven pages of fine print in this first volume, will have ample evidence to the contrary.

Apart from Helmholtz's own masterful treatment of the complex problems connected with the dioptrics of the eye (including such subjects as ophthalmometry, corneal astigmatism, chromatic and spherical aberrations, mechanism of accommodation, ophthalmoscopy, etc., in all of which he was the great pioneer), undoubtedly the main value of this volume is to be found in Gullstrand's discussion of these matters from the standpoint of his modern theories of optical imagery. Here he is the acknowledged authority at the present time. The only detailed account of his researches and determinations of the schematic eye which have ever been published in English appears in these pages; together with his articles on refraction, mechanism of accommodation, spherical aberrations, etc. For this reason, if for no other, this particular volume should be of literally incalculable value to scientific ophthalmologists both in this country and in England, and indeed to oculists and optometrists generally.

The Optical Society of America certainly deserves much credit for bringing out this translation of the definitive edition of the "Handbuch der physiologische Optik." The English scientific world should be grateful especially to Mr. Adolph Lomb, because, as the editor states in his preface, without his "continual advice and encouragement" the great undertaking could never have been brought to successful completion.

The second volume, on "The Sensations of Vision," which is now ready also, contains 480 pages. The third volume, on "The Perceptions of Vision," which is still in preparation, will be about double the size of either of the other two.

The book is not on sale at the regular booksellers. Orders should be sent to Professor F. K. Richtmyer, secretary of the Optical Society, Cornell University, Ithaca, N. Y., or to the Columbia University Bookstore, 2960 Broadway, New York City.

S.

SPECIAL ARTICLES

THE ELECTRICAL CHARGES OF LIVING CELLS

IN a recent paper[1] evidence was presented to show that the particles in the interior of living cells bear a positive charge, whereas the particles in the surface layer have a negative charge. The evidence depended in part on the observed fact that Ca and Mg ions tended to make the interior protoplasm more fluid, and that an excess of K, Na or NH_4 ions had the opposite effect. Bivalent ions are adsorbed more readily than monovalent ions, hence Ca and Mg ions furnish a greater positive charge to the colloidal materials (granules, oil-droplets or ultramicroscopic particles) in the interior of protoplasm. This would tend to produce coagulation if the normal charge were negative, but it would have the opposite effect if the normal charge were positive. The observed increase in fluidity when protoplasm is exposed to solutions in which the ratio of Ca or Mg ions is increased indicates a positive charge on the materials present in the interior of the cell. If this reasoning is correct, it is to be expected that trivalent cations should have an even more pronounced effect than bivalent cations like Ca and Mg.

It is hard to work with trivalent cations. Earlier experiments with aluminum chloride on sea-urchin eggs failed to yield results, for it was not found possible to separate the effect of the Al ion from the effect of the H ion always present in a solution of aluminum chloride in sea water. Neutralization of this acidity leads to a precipitation, until there is presumably no more Al ion left in solution. However, by adding small amounts of aluminum chloride to solutions of sodium chloride (in the absence of Ca), it was found possible to obtain solutions containing aluminum which were so near neutrality that the H ion could have no possible effect on the protoplasm. Under these conditions it was found that the aluminum, and presumably the Al ion, acts like the Ca ion, except that its action is at least a thousand times as strong. This is entirely in accord with expectation. Very dilute solutions of aluminum chloride (*e.g.*, m/25000) cause a pronounced liquefaction of the protoplasm in the interior of the cell. Ce ions act like Al ions, but they do not act in as great dilution.

With somewhat higher concentrations of Al or Ce ions, and even in some instances with Ca ions in the absence of all other cations, the adsorption of the cation at the surface of the cell is so great that the normal negative charge at the surface layer is apparently neutralized. As the surface membrane of the cell approaches an isoelectric condition, it be-

[1] Heilbrunn, 1923, *Amer. Jour. Physiol.*, LXIV, 481.