this communication, I hope, after they have verified the reference, that they will refrain from making unjust charges against Dr. Dubois.

It is not for the anti-evolutionists, however, that I make this contribution, but rather for the information of those who, in these days when state legislatures are attempting to settle scientific questions by majority vote, are called on themselves to be energetic champions of the truth.

And, speaking of state legislatures, while I have not seen the text of the anti-evolution law enacted by the law-makers of the state of Tennessee, and which is impending in other states of the Union, I presume that they have had the foresight to make it illegal for human skeletons, in museums and schools which are supported by public funds, to wear their coccygeal bones.

EDWIN LINTON

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FAUNA HAWAIIENSIS

BERNICE P. BISHOP MUSEUM, Honolulu, has on hand a number of incomplete sets of Fauna Hawaiiensis. The following numbers will be sent to libraries or individual scientists on receipt of twenty-five cents in stamps to cover the cost of postage on each volume: Volume I, Nos. 4, 5, 6; Volume II, No. 6; Volume III, Nos. 3, 4, 5, 6. Bishop Museum Memoir, Volume VII, No. 2 (Monographic study of the tribe Lobeloideae, by Joseph F. Rock, 395 pages, 217 plates) may also be obtained for the cost of mailing, forty-five cents.

HERBERT E. GREGORY

BERNICE P. BISHOP MUSEUM

QUOTATIONS

THE ANTI-EVOLUTION TRIAL IN TENNESSEE

THE mortification which most educated Americans feel about the Dayton trial has at least one offset. This challenging of the truths discovered by scientific inquiry yields at any rate this advantage, that it gives scientific men a better opportunity than they ever had to bring their teaching home to millions. They can unfold the evidence for what they believe, and can get a wider and more interesting hearing for it. Elsewhere in the *Times*, for example, Dr. Henry Fairfield Osborn states, summarily but effectively, the anatomical and geological proofs of the descent—or ascent—of man. This will undoubtedly be read with an attention that could not have been elicited from the general public had not Mr. Bryan made his ignorant and intolerant assaults upon those who accept evolution as the method of creation.

He has, in reality, given to scientists and teachers a splendid chance. They will now have a larger and more alert popular audience than they have ever known. Such an opportunity for popularizing, in the best sense, scientific truths can rarely have presented itself. Let it be improved by men ready to give the reasons for the faith that is in them. They can explain in a way intelligible to the ordinary mind the process of engrafting the theory of evolution upon all modern thought. They can show how it is to-day the presupposition of inquiring minds in all departments of knowledge. It is taken for granted in every laboratory. It is a part of the baggage which every explorer carries with him into unknown lands. It is the indispensable tool of the modern investigator and the modern philosopher alike. It is the great working hypothesis of science everywhere. Educated men think unconsciously in terms of evolution. The idea of it and applications of it are woven into the intellectual life of the whole world to-day.

All this can be set forth, with the evidence for it and the human benefits to be derived from it, and then the ignorant defiance from Tennessee can be met by the poet's indignant assertion that it is "shame to stand in God's creation and doubt truth's sufficiency." —N. Y. *Times*.

SCIENTIFIC BOOKS

The Cell in Development and Heredity. By EDMUND B. WILSON, professor of zoologoy in Columbia University. Third Edition, Revised and Enlarged. The Macmillan Co., 1925.

THE grateful and enthusiastic student of cytology can paraphrase Emerson's exclamation concerning Plato by saying of this book: "In Wilson are all things (concerning cells) whether written or thought." The former editions of this work have been recognized for a generation throughout the world as the most valuable and important books on this important subject, and the present volume, coming a quarter of a century after the last previous edition, represents the enormous advances in our knowledge of cytology which have been made during this period—a development that has probably not been surpassed by any other science during the same time.

Students of cytology have known for a long time that Professor Wilson was preparing a new book and they have been waiting anxiously for its appearance. The present volume more than justifies all expectations. It is, in fact, an entirely new book; the arrangement of materials, the topics treated, even much of the terminology is different from that in the old edition, and the book has grown from nine chapters and 483 pages, in the second edition, to fourteen

chapters and 1,232 pages in the present one.[1] Even this statement does not fairly represent the relative size of these two editions, for the former edition was printed in eleven point type, while the present one is in ten point, and the figures, on the whole, have been reduced about one third in size as compared with the previous edition. (The number of figures has grown from 194 to 529, and many of the figures of the old edition have been entirely redrawn). This reduction in size of type and figures is the one and only respect in which the new edition compares unfavorably with the old, but this reduction, as well as the much thinner paper used, was necessary in order to bring the work into a single volume, which, in spite of its more than 1,200 pages, is less than two inches thick.

The year 1900, in which the second edition of "The Cell" was published, marks an epoch in the history of biology, for in that year Mendel's law of heredity was rediscovered; only two years later Wilson and his pupils had established the fact that the basis of Mendelian segregation lies in the separation and distribution of maternal and paternal chromosomes in the maturation of the germ cells. Although there was abundant evidence before 1900 that chromosomes were the bearers of inheritance factors, this evidence was general rather than specific, but with the discovery of the cellular basis of Mendelism, this evidence became not only specific but for the first time cytology became a leader rather than a follower in the study of genetics. Again in 1902 to 1905 Wilson and his pupils demonstrated that sex in certain insects is determined by the distribution of particular chromosomes to the germ cells, thus solving one of the oldest and most perplexing problems in the whole realm of biology. Finally, on the basis of this work, Morgan and his associates, working in close relations with Wilson, discovered not only the details of the "architecture of the germ plasm" but also some of the most important features of the cellular mechanism of heredity, variation and evolution. These discoveries represent the high points in the progress of biology during the present century, and of all of them Wilson could truthfully say, though his well-known modesty would forbid, "All of which I saw and much of which I was." This book has been written out of this experience; it represents not only the mature point of view of the world's leading student and teacher of cytology, but it is to a large extent the work of its leading investigator in this field.

It would be impossible in the space appropriate to a book review to deal at all thoroughly with the contents of a book of this size and character; the most that can be done is to point out some of the more general features and conclusions. In the preface Professor Wilson says that the book has been written from the standpoint of a zoological student of cytology and embryology; consequently emphasis is placed on the zoological and embryological phases of cytology rather than upon the botanical, histological, pathological, biophysical or biochemical aspects, though all of these are dealt with in more or less detail. The author says also that, while holding in view the needs of technical students and teachers of the subject, he has tried not wholly to lose sight of the interests of more general readers. But the subject of cytology is such a *terra incognita* even to scholars in other fields that it is doubtful whether clear ideas can be conveyed to those who have never seen cells under a microscope, and the terminology is so strange and forbidding that the general reader would need to be a capable and serious student to undertake to read such a book as this—despite its beautiful style and the excellent glossary of more than twenty-four pages of distinctively cytological terms. But for students and teachers of cytology the book is indispensable; it is a handbook, encyclopedia and guide to practically all important work that has ever been done on cells. For years to come it will be the Bible of cytology, for in all probability there can never again be a single *inclusive* volume on this branch of science. The book is well documented by footnote references on almost every page, by two or three pages of special references at the end of each of the fourteen chapters and by fifty-eight pages of closely printed general references at the end of the volume. There is an excellent author's index of twelve pages and a subject index of sixteen pages which make it relatively easy to find any reference, topic or illustration in the book.

In a book of such extent as this is, there are naturally many minor features which could be criticized and a number of errors, typographical or otherwise. Most of these are easily detected and would be of more interest to a printer than to a biologist. However, there are a few errors of a more serious character. Wilson himself has called attention to an error at page 758 with respect to the sex chromosomes of a sea urchin, as determined by Tennent, Baltzer and others (SCIENCE, February 13, 1925). The most serious error that I have noted is on page 743 where it is stated that R. Hertwig found that "over-ripe eggs of frogs produce a large excess of females as

[1] The titles of the new chapters are: Chapter 3, "Reproduction and the life cycle"; Chapter 7, "Reproduction and sexuality in lower organisms"; Chapter 10, "Chromosomes and sex"; Chapter 11, "Morphological problems of the chromosomes"; Chapter 12, "Heredity and the chromosomes."

compared with those of the same female when fertilized immediately." A footnote from this passage gives the numbers of males and females from over-ripe eggs in one experiment as 13 males and 673 females; a reference to Hertwig's paper shows that the condition is exactly the reverse of that quoted, namely, over-ripe eggs give rise to this large excess of *males*.

In places there is a good deal of repetition which is probably unavoidable, owing to the method of treatment; for example, portions of the general history in the introduction are repeated in the special chapters. Several of the chapters show that they have grown by accretion rather than by intussusception, owing probably to the fact that new work had to be added to chapters already written. The terminology of cytology is relatively unfamiliar and complicated and it ought to be simplified as far as possible; it is unfortunate that in this standard work all superfluous synonyms were not suppressed and a single uniform system of terms adopted throughout the text. For example, about five hundred cytological terms are listed in the glossary, of which at least one hundred are synonyms and probably another hundred are of no real service. The invention of new names in cytology is akin to the introduction of new specific names in taxonomy; it is an easy road to immortality,—if they stand. In a great work such as this it is highly desirable that synonyms and superfluous terms should be defined and authority for them cited in the historical sections and in the glossary, as has been done in this case, but elsewhere they should be excluded from the text, for they serve only to complicate and confuse.

There is a peculiar charm in all Professor Wilson's writing, which is especially noticeable in the more general and theoretical portions of this book; this is in part due to excellent diction and style, but chiefly to an artistic quality that can best be described as stimulating to the scientific imagination. Of the many excellences of the book, perhaps the most notable are its breadth of view, judicial temper and eclectic spirit. The views of different authors are presented fairly and judged impartially, and where evidence is conflicting conclusions are stated with scientific caution. Even in matters where Professor Wilson's own investigations have been most unambiguous, as, for example, on the determination of sex, he does not attempt to force all cases into a single mould. His is not "a single-track mind," but rather one of many tracks not always parallel, but all of which lead to certain general termini. Furthermore, he nowhere leaves the impression that final solutions of any problem have been found; even the most satisfactory solutions are incomplete and tentative, and back of the known is an infinity of the unknown.

In my review of the second edition of "The Cell" I called attention to the fact that the book-mark on the cover of the first edition had been changed from a mitotic figure in the metaphase to one in the anaphase, and expressed the hope that we might see "still other editions, telophases and yet other cycles of development in the future." This is the telophase of Wilson's "Cell"; if there should ever be another edition it is safe to predict that it will have divided into two. Probably no singe book can ever again deal so comprehensively and judicially with the whole field of cytology. Few other workers are left who were in at the birth of this science and who can speak of its development with the knowledge that comes from intimate contact with persons and problems. It is a monumental work, one of the most complete and perfect that American science has produced in any field, and biologists throughout the world will unite in extending thanks and congratulations to its author on the successful completion of a great work which will always stand as a golden milestone on the highway of biological progress.

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

COMPENSATING THE UNEMPLOYED EYE IN MONOCULAR INSTRUMENTS

WHEN using a hand-lens, an ordinary single-tube microscope, or any other optical instrument made for one eye, three points at least may be considered with regard to balancing the two eyes: (1) The intensity and angle of the light passing through the two pupils may be made roughly equal, so that the two irises may not tend to be in conflict with regard to contraction or expansion; (2) an arrangement may be made to facilitate the axes of the two eyes converging to the same point, this point is best, in many or most cases, if situated at an indefinite distance; (3) the accommodation of the two eyes, which is more or less linked with their convergence, may be kept approximately the same.

The beginner with the microscope, as every one knows, has troubles because the unoccupied eye persists in seeing. If an opaque shade is placed in front of it, or if it is closed, matters are not better. The well-known rule is to keep the unemployed eye open, and to gradually learn to neglect everything it sees. More or less temporary diplopia often results. Also, in the course of years, the unemployed eye commonly sees less and less, and may in time