rapid deep breathing at half-hour intervals. A feeling of sluggishness or sleepiness may be almost completely dispelled. I have never noticed any reaction as in the case of most stimulants and altogether it seems to me very satisfactory.

3. The effect on muscular fatigue is also striking. A difficult arm exercise with heavy weights which I could not repeat under ordinary circumstances more than twenty times, I found after four minutes of this preparatory breathing that I could do twenty-seven times, *i. e.*, about thirty per cent. more. This increase I found to exist at all stages of fatigue, as might be expected.

4. The pulse beat goes up very rapidly while the breathing is continued, in my own case from about 65 to 106 after four minutes' breathing.

Another curious effect which perhaps is worth mentioning is the apparent rapid lapse of time during the latter half of a hard breathing period. This change in the time-sense is very noticeable.

I might add, in conection with paragraph one, that a friend of mine has found a five-minute limit to the time during which he is able to hold his breath after the preliminary breathing.

I should not have ventured to describe phenomena which are so easily in the reach of every one, had I not found in people at large, and even among scientific men, a surprising ignorance as to their existence. I have seen some very amusing betting on how long it was possible to hold the breath, and have seen the cock-sure bettor laid low by not knowing of this possible resource of his adversary.

As a mental stimulant, and as a means to increase the time during which the system can do without respiration, violent breathing might find considerable useful application, and daring rescues from suffocation are common enough to make a knowledge of this possible threefold endurance without air of no little value.

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November 3, 1909

ESPERANTO

MR. J. D. HAILMAN'S interesting letter on the use of Esperanto by scientific men[1] is, I venture to think, somewhat misleading. He says (p. 561):

> This solution is the world-wide adoption of an *international* language—a second language which all will learn in addition to their natural tongue. . . .

The chemist, in order to be moderately well equipped, requires a good reading knowledge of English, French and German. Suppose we take a somewhat extreme case and assume that after January 1, 1910, under penalty of instant death, all chemical communications must be made in Esperanto, what would be the effect? Apart from the possible creation of a few desirable vacancies, the only result of such a law would be that chemists would have to know at least *four* or *five* languages, including Esperanto, instead of *three* or *four,* as at present. The reason for this is, of course, that the greater portion of the facts and theories which constitute chemistry has been contributed, hitherto, in English, French or German and, in many cases, it is absolutely necessary to have an author's original words.

The same conditions doubtless apply, *mutatis mutandis,* to other branches of knowledge.

I have no desire to obtrude an opinion regarding the merits and defects of Esperanto, nor to say anything as to the desirability or otherwise of an international language. I believe, however, that it is timely to point out that the adoption of Esperanto will involve an increase to the weight of languages which the scientific worker has to carry and that it will not be an alleviation of his burden. It is only fair to call upon the enthusiastic propagandists of Esperanto to state this fact clearly during their missionary labors.

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October 28, 1909

SCIENTIFIC BOOKS

Descendenz und Pathologie. Vergleichend-biologische Studien und Gedanken. By

[1] SCIENCE, October 22, 1909.

D. von Hansemann. Pp. 488; no illustrations. Berlin, A. Hirschwald. 1909.

There is considerable room for doubt whether the title of this fascinating volume was well chosen and whether a more correct title would not be "Evolution and a Pathologist" instead of "Evolution and Pathology." But, while there is little pathology, as such, the subject matter is presented by a master mind whose training has been in the field of abnormalities, and many a well-worn biological theme is clearly illustrated by facts from his own domain of science. In his introduction von Hansemann states that his book is for those who are familiar with the principles of evolution, but who have no far-reaching knowledge of pathology; and for those pathologists who have been so absorbed in pursuing their own goddess that they lack insight into the subject-matter of modern evolution. It would be expected, therefore, and the expectation is fully realized, that the essential points in the philosophy of evolution would be presented in the clear light of a well-trained mind and by one who views them somewhat objectively.

A vigorous supporter of Darwin, von Hansemann pays his respects to neo-vitalists by calling their philosophy pure speculation, and as such really less scientific in spirit than that of the old nature philosophers (p. 8), and throughout the book he returns again and again to the dicta of Darwin and of Weismann. The chapters on Preformation, Species and Varieties, Variability, Conditions of Constancy, Altruism, Design (Zweckmässigkeit) and Orthogenesis, Lamarckism, Functional Adaptation, Epidemics and Physiological Death, are devoted mainly to arguments in favor of the origin of variations. While much of this matter is old and many of the arguments somewhat hackneyed to a biologist, there is, nevertheless, a constant novelty in the ever-present point of view of the pathologist and a not inconsiderable originality in the interpretation of facts. Here, especially, are to be noted his views on variability, on altruism, on regeneration and transplantation, and on epidemics.

The key-note of his view on variations is sounded in the sentence "die ganze Fragestellung in Bezug auf die Entstehung der Variabilität eine unrichtige ist" (p. 150), and he takes the original ground that variability is one of the fundamental properties of living protoplasm and seeking for its origin, therefore, is lost effort. If a constant tendency to vary is a fundamental property of protoplasm, then the problem of the origin of species becomes more simple by the effort to ascertain what it is that gives or causes constancy of type. The chapter devoted to this phase of his subject (Bedingungen der Konstanz) is the most interesting one in the book and is worked out with the greatest argumentative ingenuity and with a wealth of illustrations and citations. Concerning variability he says:

> Natürlich stelle ich mir diese innere Ursache nicht als irgend etwas Mystisches vor, das ausserhalb der mechanischen Erklärungsmöglichkeit liegt, sondern als eine der lebenden Materie inhärente physikalische Eigenschaft, die aus der besonderen Form der Vereinigung ihrer Atome und Moleküle erklärt werden muss und deswegen zur Definition der lebenden Substanz gehört (p. 152).

As a ball upon an inclined plane is prevented from rolling by some external hindrance, so species, having an inherent and continual tendency to vary, are prevented from changing by reason of external conditions. Adaptation means the establishing of an equilibrium between the internal forces and such external conditions. The statement of his principle is followed by a discussion of the many ways whereby constancy of type might be brought about, environmental and climatic changes, inheritance and other phenomena usually credited with bringing about variations, are here regarded as effective agents in checking the inherent tendency to vary, while in the highest types of living things, which presumably have passed through a long phylogenetic history of variations, this fundamental property has become weakened or partially lost, so that in such highest forms we find the greatest fixity of types.

The phenomena of regeneration, also, are

traced back to a fundamental property of protoplasm, and, like the capacity to vary, this property becomes more and more limited with advanced differentiation until, in the highest types of animals, the power of regeneration is much more reduced than in lower forms. This power, he thinks, still remains in the germ plasm which in higher animals becomes more and more localized in specific organs while in plants and in lower animals it is still present in part, at least, in all somatic cells, making them what Driesch calls "equipotential." Not only in different animal types does this somatic and germinal distinction exist, but among the different cells of the same individual as well, the difference being measured by their relative power to regenerate, from which it follows that "the regenerative power of a cell-type is a criterion of its differentiation" (p. 44).

The expression "struggle for existence," as used in current theories, he regards as an erroneous phrase for the description of natural phenomena. The conditions throughout all nature, he thinks, indicate a "compromise" of individuals bound by the fundamental law of altruism which is as strikingly operative between varieties, species and races as it is between the various organs, tissues and cells of the individual.

Manche Lebewesen stehen in so enger altruistischer Beziehung zueinander, dass sie bei künstlicher Aufhebung derselben zu Grunde gehen. Bei anderen ist dieser Verhältnis ein viel locheres, ja viele Arten stehen so weit auseinander, dass die altruistischen Beziehungen zwischen ihnen garnicht mehr erkannt werden können. Man kann mit Sicherheit behaupten, dass überall, wo diese Beziehungen enge sind, eine Abhängigkeit in der phylogenetischen Entwicklung bestanden hat. Ganz besonders deutlich tritt das bei Anpassung von Instinkten zweier Tiere in die Erscheinung, z. B. bei der Symbiose des Einsiedlerkrebses und der Aktinie, und man ersieht daraus, dass diese längst anerkannte und auch schon von Darwin hervorgehobene Tatsache sich aus den Erscheinungen des Altruismus ausreichend erklärt (p. 225).

Bearing the title it does, one naturally looks under the heading "Epidemics" for something more akin to pathology than the other chapters present. But a zoologist would have little use for the medical information to be gathered here. The term "epidemic" is used in its broadest sense and not at all with the usual significance. In using it biologically, he differs widely from Osborn and others who have made use of the term in a pathological sense and in connection with disease as one of the factors in the extinction of animals of the past and present. Von Hansemann uses the term to indicate an abnormal or unusual increase of numbers of a race or species of animals; he would not speak of an epidemic of typhoid fever but would describe such a wide-spread illness as due to an epidemic of *Bacillus typhosus*. Great collections of fossils of one type in one geologic bed similarly would be "epidemics." The reason for such epidemics might be unusual abundance of food or unusual absence of adverse environmental conditions, such as absence of enemies or, in a pathological sense, absence of protective agents on the part of the host. Such epidemics, he argues (p. 459), would be another means of increasing varieties and species through variation, since increase in numbers means proportional increase in the number of variants.

The limits of a review do not permit of an enumeration of the hundreds of other interesting points that are brought out with delightful clearness and fairness of presentation. Many of his conclusions are, indeed, open to question, especially such as result from a too superficial view of the problem concerned, but these are due more to ignorance of the great mass of facts involved than to faulty logic. Taken as a whole the book is full of valuable suggestions and is an undoubted contribution to the philosophy of evolution, and as such will be gratefully received.

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Cave Vertebrates of America—A Study of Degenerative Evolution. By CARL H. EIGENMANN, Professor of Zoology, Indiana University. 241 pages, 31 full-page plates and 72 text figures. Carnegie Institution of Washington. June, 1909.