tion. (In some strains, the stimulation is more limited than in others.) It augments the potency of the follicle-stimulating hormone (FSH) judged either by increase in follicular development or in uterine weights. It is to be emphasized that one half unit or 0.0025 mg of the substance, when combined with 2 RU of FSH, doubles the uterine weight in immature hypophysectomized rats. Shedlovsky *et al.* do not report tests essential for establishing the freedom of their material from contamination with other hormones of the anterior hypophysis. The substance herein reported is free of follicle-stimulating effects when given in 600-fold the MED for repair of the interstitial tissue; no thyrotrophic hormone was detected at the 0.50 mgm level in the one-day-old chick thyroid weight test; no growth-promoting activity or adrenocorticotrophic effect was detected in hypophysectomized rats when injected at a total dose of 8 mg in 10 days; the local crop test for lactogenic hormone was negative at 0.68 mgm.

2. *Chemical characteristics.* The protein contained 14.2 per cent. of nitrogen with approximately 4.5 per cent. of tyrosine and 1 per cent. of tryptophane. The carbohydrate content remained constant on repeated ammonium sulfate fractionation; analysis showed 4.45 per cent. mannose and 5.86 per cent. glucosamine.

3. *Physical study* (cataphoresis) has indicated the homogeneity of the protein. The schlieren picture obtained in the Tiselius apparatus showed only one boundary by scanning the whole field after electrolysis for 90 minutes. The mobility of the protein was found to be -6.36×10^{-5} in phosphate buffer of pH 7.53 and ionic strength 0.05 at 1.5° C. Electrophoresis experiments showed the isoelectric point to lie between pH 4.6 – 4.8. It is to be noted that in contrast with our results, Shedlovsky *et al.* obtained a mobility of 0.66×10^{-5} at pH = 7.86 and an isoelectric point of pH 7.45. It may therefore be said that although proteins with similar biological properties have been isolated by two laboratories, the results from electrophoretic study are so different as to forbid identification of the substances in question.

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THE BLACKENING OF COOKED POTATOES

THE blackening of cooked potatoes is a different process from the darkening that occurs when raw peeled potatoes are exposed to air; the latter darkening is known to be due to melanin. Although both darkening processes are oxidations, the synthesis of melanin involves an enzyme whereas the other type does not require one. Potatoes which did not darken when kept in an atmosphere of nitrogen during boiling and cooling blackened when removed to the air.

Certain properties, including the ultraviolet absorption spectra of the pigments from the darkened raw and cooked potatoes, were compared. Those of the blackened cooked portions differed markedly from the melanin and, moreover, showed properties similar to flavones.

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SCIENTIFIC BOOKS

CATASTROPHISM VERSUS EVOLUTIONISM

The Material Basis of Evolution. By RICHARD GOLDSCHMIDT. 436 pp. New Haven: Yale University Press. 1940. Price $5.00.

THIS book contains the only basically new theory of organic transformation propounded during the current century. For notwithstanding the colossal literature concerning organic evolution which has accumulated since the publication of Darwin's "Origin of Species," only three main types of theories can be distinguished. One type is based on Lamarck's assumption of direct adaptation by inheritance of results of use or disuse of parts. Other theories are built on Darwin's principle of natural selection of the fittest variants produced by interactions of the organism's inherited structure with the external as well as internal environments. Theories of the third group assume autogenesis, that is, unfolding of the potentialities hidden in the organism, impelled by an urge toward development in a certain direction. According to all these theories organic transformation takes place by evolution, that is, gradually by accretion of more or less small changes. According to Goldschmidt, however, it occurs by cataclysmic upheavals rather than by summation of individually small steps.

Lamarckianism has become obsolete owing to its basic assumption having fallen short of experimental verification. Autogenesis has always been in conflict with the principle of causality in vogue in the materialistically-minded modern science. Darwinism underwent great changes because of the forward strides of genetics, but the unbroken continuity of ideas between the "neo-Darwinism" and Darwin's original theory is evident. The appearance of Goldschmidt's book connotes an at least temporary end of the undivided reign of neo-Darwinian theories. For Goldschmidt not only relegates natural selection to a place

of relative unimportance, but in effect rejects evolution beyond the narrow confines in which it has been admitted to exist by Linnaeus and many creationists. His theory belongs to the realm of catastrophism, not to that of evolutionism; his break with the Darwinian tradition is almost complete, and his ideas are related to those of G. St. Hilaire rather than to those of any modern evolutionist. Only deVries has occasionally expressed himself in a language similar to Goldschmidt's, but this similarity proves to be a spurious one. Genetics has been considered the foundation of neo-Darwinism. Throughout his book Goldschmidt stresses the fact that his views are a result of his life-long work in genetics, but it must not be forgotten that he has a splendid command of other biological disciplines as well. Goldschmidt's interpretation of genetic data is different from the rather generally accepted one.

Only the salient points of Goldschmidt's brilliantly developed and masterfully presented theory can be summarized here. Goldschmidt asserts a fundamental dualism of the processes of organic transformation by distinguishing microevolutionary and macroevolutionary changes. 'Microevolution by accumulation of micromutations—we may also say neo-Darwinian evolution—is a process which leads to diversification strictly within a species, usually, if not exclusively, for the sake of adaptation of the species to specific conditions within the area which it is able to occupy." This process has nothing to do with the origin of new species: 'the subspecies are diversifications within the species, but there is no reason to regard them as incipient species." On the other hand, "the change from species to species is not a change involving more and more atomistic changes, but a complete change of the primary pattern or reaction system into a new one. . . . One might call this different type of genetic change a systemic mutation. . . ." The effectiveness of systemic mutations is tremendous: "Macroevolution may proceed by large and sudden steps which accomplish at once what small accumulations can not perfect in eons, and this on the specific as well as on any higher level." "Species and the higher categories originate in single macroevolutionary steps as completely new genetic systems." The origin of mimetic resemblances, of mutual adaptations of flowers and insects, the transformation of *Sinanthropus* into *Homo sapiens* might have taken place thus suddenly. The bon mot of Schindewolf that "the first bird hatched from a reptilian egg" is quoted approvingly, although it is not clear to the reviewer whether Goldschmidt intends this to be taken literally. The role of natural selection in macroevolution "becomes reduced to the simple alternative: immediate acceptance or rejection."

Although, in the reviewer's opinion, Goldschmidt's theory is invalid, it must be admitted that Goldschmidt has marshalled an impressive array of evidence in its favor. If races are not incipient species, if species arise by changes akin to explosions, the living world must be divisible into discrete species compartments. The lack of universality of such rigid subdivisions is what has ever since Darwin been one of the main arguments in favor of evolution. The first 183 pages of Goldschmidt's book are devoted to disproving this argument. The alleged transitional cases between races and species are scorchingly criticized and shown, according to the author, to be spurious. He admits that there are transitions between some of the "species" of the taxonomists, but these are not deemed to be real species. Goldschmidt has no crusading zeal to induce taxonomists to abandon their errors, but he insists that to an evolutionist "Where species can be distinguished with certainty . . . they are different and are separated by a gap, if not by an abyss." However, no definition of what a real species should be is given, so that one is left wondering how to detect them in practice.

Pages 184–250 contain the climax of Goldschmidt's theory: the statement of the case for systemic mutations. "A systemic mutation (or a series of such), then, consists of a change of intrachromosomal pattern," and involves "only the arrangement of the serial chemical constituents of the chromosomes into a new, spatially different order. . . ." An excellent review of the data showing that species differ in the linear sequence of materials (gene arrangement) in the chromosomes is given, and the conclusion is reached that the source of macroevolutionary changes is herein detected. A thorny question obtrudes, however, in the reviewer's mind. According to Goldschmidt, genes do not exist, and what has been known as gene mutation (the microevolutionary one!) is based on very small pattern changes in the chromosomes. What, then, is the fundamental difference between the ordinary mutations and systemic mutations?

Next (pp. 250–395), follows the chapter on "Evolution and the potentialities of development," in which Goldschmidt seeks to prove that the normal embryogeny contains potentialities which, when evoked by a genetic change, may lead to a complete reorganization of the end product. Here Goldschmidt is really at his best: pertinent facts from experimental embryology, comparative anatomy and physiology, unknown to or ignored by many geneticists, are organized into a logical and convincing system. It is difficult not to agree with Goldschmidt's conclusion that "The physiological balanced system of development is such that in many cases a single upset leads automatically to a whole series of consecutive changes of development. . . . If the result is not, as it fre-

quently is, a monstrosity incapable of completing development and surviving, a completely new anatomical construction may emerge in one step from such a change." Whether or not the production of such "hopeful monsters" may reasonably be considered the main channel of organic transformation is, however, an entirely different matter, as Goldschmidt himself admits (p. 251).

It is impossible to attempt here a critique of Goldschmidt's theory, for this would require a book approximately of the same size as his own. Certain lines which such a criticism might take are adumbrated above. In his concluding chapter (pp. 396–399), Goldschmidt indicates that one of the advantages of his views over neo-Darwinism is the simplicity of the former. It is indeed simpler to assume that major groups of organisms arose ready-made by catastrophic systemic mutations than to visualize the complex interplay of the numerous agents which could bring similar results on the neo-Darwinian scheme. But in the reviewer's opinion the simplicity of Goldschmidt's theory is that of a belief in miracles. It must, nevertheless, be recognized that Goldschmidt's keenly critical analysis has emphasized the weaknesses and deficiencies of the neo-Darwinian conception of evolution, which are numerous, as even partisans ought to have the courage to admit. It would seem that this fact alone obliges any one interested in the modern evolutionary thought to read Goldschmidt's book.

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REPORTS

THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY AND THE NATIONAL DEFENSE PROGRAM[1]

PROTECTION of the Western Hemisphere and especially of the North American continent against any possible invasion by force is the firm determination of all true Americans. Equally important, and more difficult, is defense of the freedom of spirit and action which our forefathers won for us by generations of struggle and which is stealthily threatened alike by subversive influences from without and vicious ambitions from within. Both tend to undermine our strength by sowing doubt and discord. Sometimes these influences operate insidiously in the guise of high idealism, as in the cause of peace or of human rights; sometimes they operate openly to incite violence and class hatred.

Research work on national defense problems is being conducted in many of the departments of the institute. Most of this is through contracts with the War and Navy Departments, the National Advisory Committee for Aeronatuics, the National Defense Research Committee, the National Academy of Sciences and with private companies engaged in development of equipment for military purposes.

Members of the institute's staff are serving in a variety of national defense agencies, some having been granted leaves of absence and others having been relieved of a portion of their institute duties to make this possible. Dr. Robert G. Caldwell, dean of humanities, is serving as chairman of the Division of Cultural Relations Among the American Republics, a post he has taken at the request of President Roosevelt. Professor Ralph D. Bennett, of the department of electrical engineering; Professor Francis Bitter, of the department of metallurgy, and Doyle Northrup, of the department of physics, are on leave of absence to carry on an important research program for the Navy Department, while Professor C. M. Van Atta and R. D. Campbell resigned from the physics staff to work on this project.

Professor Jerome C. Hunsaker, head of the departments of mechanical engineering and aeronautical engineering, is a member of the National Advisory Committee for Aeronautics, and is participating in the aeronautical research programs conducted for the Army and Navy by that committee. Through membership in many other boards and committees in Washington he is also aiding the defense program. Professor Walter G. Whitman, head of the department of chemical engineering, is chairman of a subcommittee of the National Advisory Committee for Aeronautics. Professor E. S. Taylor, of the department of aeronautical engineering, has been the chief assistant to George J. Mead, a graduate of the institute, who is in charge of airplane engine production under Mr. Knudsen, head of the National Defense Committee.

Professor John E. Burchard, director of the Bemis Foundation of Technology, is in active charge of a group of scientists and engineers charged with the development of special types of shelters.

Professor Douglass V. Brown is head of the Division of Economics and Statistics for the Stettinius Committee, and his colleague, Professor Douglas M. McGregor, has been called from time to time to undertake special assignments for the Bureau of Labor Statistics.

The National Defense Research Committee, under the chairmanship of our colleague, Dr. Vannevar

[1] From the annual report of President Karl T. Compton to the Corporation of the Massachusetts Institute of Technology.