

classified by Garrett⁴. Detailed results will be published elsewhere. Studies are in progress regarding the relationship between the host plant, the parasite and the general soil microflora under varying conditions of soil texture, soil moisture, soil reaction, available soil nutrients and the influence of cover crops, with the view of evolving methods for the control of wilt.

Seedlings of shisham are immune to the attack of *Fusarium solani*, saplings are resistant, while the adults (after the trees bloom and bear fruit) are susceptible, when growing in close proximity in the tarai land where shisham grows naturally. In the pure plantations in the taungyas of Uttar Pradesh also there is no wilt of seedlings. The fungus is present throughout the soil in this region and has been described as a soil inhabitant. It also causes systemic infection on the stems of siris (*Albizia procera*) by the air-borne spores⁵. The problem of the lowering of the resistance of the host at the transition from the juvenile to the adult stage is now under investigation. Control depends on the factors which predispose the trees to the attack of the pathogen at this stage.

I am grateful to Mr. C. R. Ranganathan, president of the Institute, for suggesting the problem and offering helpful criticism in the work. Thanks are due to Dr. K. Bagchee, mycologist, for his advice and interest in the work, and to Dr. W. L. Gordon, plant pathologist, University of Manitoba, Manitoba, Canada, for identifying the cultures of *Fusarium solani* sent to him.

B. K. BAKSHI

Mycology Branch,
Forest Research Institute,
Dehra Dun, India.

¹ Ridgway, R., "Color Standards and Color Nomenclature" (Washington, 1912).

² Bagchee, K., *Ind. For.*, **71**, 20 (1945).

³ Waksman, S. A., "Principles of Soil Microbiology" (London, 1927).

⁴ Garrett, S. D., *Biol. Rev.*, **25**, 220 (1950).

⁵ *Ind. For.*, **80**, 246 (1954).

"The Case for Natural Selection"

ON my return from eight months travelling, my attention was directed to the review of my book "Evolution in Action" by Sir James Gray (*Nature*, **173**, 227; 1954). I feel I must comment on some of his statements, since they are of major concern to general biological theory.

At the outset he writes: "Darwinian orthodoxy demands implicit faith in the efficacy of natural selection operating on chance mutations. Subscribe to this and all doubts and hesitations disappear; question it and be forever lost". After saying that I state "the case for orthodoxy", he continues: "A few readers, perhaps rather pagan in their outlook, may think it a little strange that, if the case is quite so strong as they are asked to believe, it should still be necessary to argue the merits of natural selection with almost evangelistic fervour". Later, he states, "No amount of argument, or clever epigram, can disguise the inherent improbability of orthodox theory; . . . there will always be a few [biologists] who feel in their bones a sneaking sympathy with Samuel Butler's scepticism".

These allegations from one of our leading biologists demand an answer. First, I repudiate (and I am sure that other biologists will agree) the idea that there is any such thing as a "Darwinian orthodoxy"

which "demands implicit faith in natural selection"—or in anything else. I venture to remind Sir James Gray of Sir Ronald Fisher's "Genetical Theory of Natural Selection". In that remarkable book, Fisher demonstrated conclusively: (1) that gradual evolutionary change, as postulated by Darwin and later established by the palaeontologists, could have been brought about by selection acting on small mutations, on the basis of a particulate (Mendelian) mechanism of inheritance; but could not have been brought about on the basis of a mechanism of blending inheritance; (2) that, given the observed facts concerning heritable variations and their origin, neither orthogenesis (in the sense of inherently determined and directional variation) nor Lamarckism in any of its forms could have played any but the most trivial part in effecting evolutionary change; (3) that selection, acting upon small mutations and their recombinations, is capable of producing an extremely high degree of *apparent* improbability; and (4) that natural selection does not have to await the precise mutations needed to produce desirable adaptation, but operates on the stored variance made possible by the particulate mechanism of heredity, eliciting from it the required recombinations. (Gray's statement about selection "operating on chance mutations" obscures this essential point, and neglects the fact that the *effects* of genes are gradually adjusted by selection operating on the gene-complex.)

These are not dogmatic statements, but scientific conclusions; and the resultant neo-Darwinian or selectionist theory of evolution is no more an 'orthodoxy' than is the atomic theory of matter or the Mendelian theory of inheritance. Evolutionary biologists support it, not because they would be "forever lost" and excluded from an orthodox fold if they questioned it, but because it—and so far, it alone—is able to account for the facts.

Finally, the reason why it is still necessary, especially in a semi-popular book, to argue the case for natural selection so vigorously is that, unfortunately, a certain number of prominent biologists still publicly evince "a sneaking sympathy", to use Gray's own words, with Samuel Butler, or other vitalists or Lamarckians.

JULIAN HUXLEY

Athenæum Club,
London, S.W.1.

THAT my review of Dr. Huxley's book should be regarded as a matter of "major concern to general biological theory" is a sobering thought. It just shows how careful one must be in approaching the preserves of evolutionary genetics.

I can only say that none of the works to which Prof. Huxley refers, or appears to have in mind, gives me reason to believe that a 'conclusive demonstration' of the fact that certain things *can* happen is necessarily proof that they *have* happened. A demonstration that Dr. Huxley might conceivably make a mistake is no proof that he has, in fact, done so. Nor does a feeling of disappointment in natural selection as a working hypothesis during the past hundred years prove that biologists—prominent or otherwise—are either vitalists or Lamarckian fellow-travellers.

J. GRAY

Department of Zoology,
University, Cambridge.