siderations. Only in this way is it possible to bring in the new ideas and the new light which alone make research successful.

The reception of the scheme by the younger scientific workers has been very satisfactory, and the responsible authorities of the institutes have been in the gratifying position of finding excellent candidates for their posts. At no time in the last twenty years have the research institutes been better staffed than now.

Provision has also been made for the creation of a link between the university and the research service. The Ministry of Agriculture awards scholarships of the value of 200*l.* per annum to men and women, possessing an honours degree or equivalent qualification, who are desirous of entering the service. The successful candidates are attached to whichever institutes they may prefer, and have their opportunity in the event of a vacancy occurring. They will, however, usually find other scholarship holders at the institutes—1851 Exhibitioners, various university scholars, and other post-graduate workers also waiting for posts—and they can hope for appointments only if they happen to be the best of the available candidates.

Thus the scheme provides for selection from the universities of the most promising young men and women for research work; it allows of a probationary period in which each candidate can show his or her fitness for the work; it affords permanent posts for those finally chosen; it gives increments of salary commensurate with the value imparted by experience; and for the highly gifted worker it affords prospects of promotion to posts which, considering their freedom from routine duties and from worries, must be regarded as distinctly good. The scheme is economical and effective; it works with the minimum of friction and without interference with the individual research worker; and it may confidently be recommended as a model to other Government Departments which are concerned with the promotion of scientific research.

Philosophy of Relativity.

The General Principle of Relativity: In its Philosophical and Historical Aspect. By Prof. H. Wildon Carr. Pp. x+165. (London: Macmillan and Co., Ltd., 1920.) Price 7*s.* 6*d.* net.

PROF. WILDON CARR has produced in this little volume a really valuable book. There was an hiatus in the current expositions of the
NO. 2666, VOL. 106]

principle of relativity. Its significance and importance had been clearly set forth in their bearing on mathematical physics. But the doctrine had not been connected with its position in the history of general philosophical thought. This Prof. Carr has now done, and with great knowledge of philosophy.

After explaining the old difficulties, he shows how Descartes and Leibniz had partially recognised their origin. The exposition of the discussions by each of these thinkers is lucid and informing. In particular, there is an admirable explanation of the Leibnizian theory of monads, and of how Leibniz was driven to its adoption. Both philosophers were mathematicians of great eminence. They saw that the explanation of matter must come after that of movement, and could not precede it. Extension was not "stuff." The explanation of gravitation given by Newton follows. The book goes on to deal with the difficulties that led to Einstein's revision of the whole of the Newtonian hypothesis of space and time as absolutely existing frameworks. The special principle of relativity is then explained, and it is shown that the general, or later, Einstein principle is simply a full statement of what is implied in its earlier form. The first dealt with a definite phenomenon—the velocity of light. The second extends the explanation to the laws of Nature generally. There is no longer a particular finite velocity taken to be a constant and limiting one. As soon as we extend the special case of relativity to non-uniform and rotational systems of motion, the doctrine of equivalence between the experience of the observer taken to be at rest, and the experience of the observer in another system relatively to which the observer taken to be at rest is regarded as being in motion, becomes apparent. The explanation of the possibly non-Euclidean character of space systems, and of the necessity of correlating observations by adequate formulæ of transformation, becomes clear. The idea of pure objectivity disappears. Mind appears as relating the centre of a universe which is no longer infinite in the sense given to the word as applied to Newtonian space. For the observer is not a fixed point existing at a fixed instant. "Space and time are not containers, nor are they contents; they are variants. They change as my system of reference changes."

One of the difficulties experienced in reading even Einstein himself is the lack of a thorough-going connection of his principle with the new character really given by it to space and time. They are discussed as though they remained changed, not in kind, but in degree' only, and

based on what is original and still present, transformed in shape and measurement only. But more than this is implied in Minskowski's famous discourse at Cologne in 1908, which Einstein seems to adopt. The former deposed the intuitional space and time of our supposed direct experience to the status of mere shadows. The reality was to be sought in "the world-line," in a *continuum* the factors in which were not space and time, but deeper lying and inseparable phases of reality, to which space and time present only imperfect analogies. Some of the language of modern mathematical writers is obscured by the employment of words suggesting that we have only to correct imperfections in the description of our space and time as actual facts. Minskowski, on the other hand, seems to point to the reality being something radically different from the space and time of our discourse in science even of the most modern type. "Die dreidimensionale Geometrie wird ein Kapitel der vierdimensionalen Physik. Sie erkennen, weshalb ich am Eingange saghte, Raum und Zeit sollen zu Schatten herabsinken und nur eine Welt an sich bestehen." There is one English mathematical writer who has seized on the full meaning of this interpretation and carried it out to its logical conclusions in his "Concept of Nature." I refer to Prof. Whitehead.

The metaphysical foundations of this further view of Einstein's doctrine are made apparent in Prof. Carr's book. That is what makes it important for scientific readers, as well as for the general public, who will gather from it what the principle of relativity means. Like all books on this subject, it requires careful reading and unbroken attention, but the time these necessitate, even for this short book, will, I think, be found to have been thoroughly well spent.

HALDANE.

The Human Hand.

The Principles of Anatomy as Seen in the Hand.

By Prof. Frederic Wood Jones. Pp. viii+325+2 plates. (London: J. and A. Churchill, 1920.) Price 15s.

IN this work Prof. Wood Jones has made a notable contribution not only to the literature of human anatomy, but also to that of philosophical biology. The book is the result of an intensive study of a single part of our anatomy undertaken in the belief that if we understand it thoroughly and correctly we shall understand much more—shall, in fact, know the principles upon which the whole of our anatomy is formed. In selecting the hand for his purpose the author

has chosen wisely, for it is, we think, without doubt the part which is most characteristic of us—that which has played the chief rôle in our development. Prof. Wood Jones's method is to take the various tissues forming the hand—viz. the skin, nails, fasciæ, bones, muscles, vessels, and nerves—separately, describing them in considerable detail from both the morphological and the practical points of view. As we can readily imagine, he is not able to confine himself strictly to the hand, any more than was Sir Charles Bell in his century-old book on the same subject. (We might say in passing that the comparison between the two books, which are further alike in that they are largely illustrated by the authors themselves, is extremely interesting and illuminating, as showing the great advance in our knowledge and the great change which has come over our conception of man's place in Nature during the last hundred years.)

From internal evidence alone the book appears to have been begun as a morphological study, and to have been given its practical bias in consequence of experience with patients suffering from nerve lesions acquired in the war. The fact—if fact it be that this was the order of its evolution—will go far, we think, to explain the peculiar value and interest of the book. It is seldom that anatomy is treated from both the morphological and the practical points of view; here, however, we have a book in which this is not merely observed, but impartially observed, with a result which, we believe, completely justifies those who look upon morphology as the guiding spirit of anatomical research, and upon anatomy itself as the only solid basis on which scientific medicine and surgery can be founded. An admirable example of the close connection which exists between morphology, anatomy, medicine, and surgery is, we think, to be found in the chapter on the skin creases or flexure lines, subjects which, we agree with the author, have not been given the consideration they deserve by either the physician or the surgeon.

In the chapter on the osteology of the hand the form of the primitive vertebrate hand is discussed at some length, and the conclusion reached that the primitive hand was not only pentadactylous, but also characterised by a smaller number of phalanges in the preaxial digit. The discrepancy in the number of phalanges in this digit compared with those in the other digits may, of course, be due to a decrease in the preaxial or to an increase in the other digits. Despite the fact that, as is pointed out and emphasised, no animal living or extinct has more than two phalanges in the preaxial digit, whereas the number of phalanges in