

These facts show that the ordinary progression from youth to age can be reversed under certain conditions by some of the somatic cells. Immortality and rejuvenation are not a prerogative of the germ cells only. Somatic cells can, in many cases, take on the functions of germ cells by giving up their special function and reverting to a younger type. This fact has been notorious among the green plants, but it is also evident among the animals, even among the vertebrates. Any remnant of the germ plasm theory, however attenuated, is directly contradicted by these facts. One seems to be driven to take up some sort of position akin to Prof. C. M. Child's, who considers growth, senescence, and rejuvenescence in terms of the metabolic activity of the cells and not in terms of their visible structure or of hypothetical invisible components. One of the defects of Prof. Robertson's book is that he never once mentions Child's theory though referring several times to Child's experiments. In politics it may be often advisable to treat opponents with silent contempt, but men of science are expected to demonstrate the falsity of other theories before establishing their own.

Unworkable as Prof. Robertson's theory is in its present state, it has the merit of emphasising certain important facts which have got to be explained somehow or other. Apart from germ plasm complications, which are really extraneous to the main part of his views, the definiteness of the theory that makes it possible to subject it to experimental test is a great merit.

There is one final point of criticism that is perhaps worth making, though it concerns something outside the author's main line of argument. In the final chapter, in which general questions of evolution are discussed, the statement that variation always takes place by loss of characters reappears once again. It is quite true that under domestication the vast majority of heritable variations that have been observed, both in animals and plants, consist of the loss of a Mendelian factor. But it is also true that the conditions of domestication are physiologically peculiar and that the observed variations do not resemble the type of difference that normally distinguishes wild species from one another. Finally, there are a few cases among domestic animals that cannot be attributed to any cause other than the gain of a Mendelian factor: the most familiar of these are the White Leghorn plumage, and the Rose and Pea Comb among fowls. These are all dominant to the wild type, which in this species can be identified. That variation by gain of Mendelian factors occurs but rarely is no reason for denying its existence.

A. D. R.

### Rockets to reach Planetary Space.

*Die Rakete zu den Planetenräumen.* Von Hermann Oberth. Pp. 92+2 Tafeln. (München und Berlin: R. Oldenbourg, 1923.) 1s. 6d.

THE prospect of propelling a body from our earth to one of the heavenly bodies, notably the moon, has excited certain types of individuals for some time, and many romances have been built up round the idea. Scientific attention has been given to the matter in recent years, and in particular Prof. Goddard, of Clark University, in the United States, has examined the question theoretically and experimentally. His plan is to send a rocket to the moon, more or less as suggested by Jules Verne, with the important difference that the rocket is not to be left to the mercies of air resistance and gravitational forces, but is to be propelled continuously by means of firing successive charges of smokeless nitrocellulose. Herr Oberth claims to have obtained the results given in the present volume quite independently of Prof. Goddard. He says that he commenced working at the problem in 1907, and that the main ideas were evolved in 1909: the calculations and proposals of this book were made during the years 1920-22.

Herr Oberth is more ambitious than Prof. Goddard: his object is to obtain sufficient financial support to be able to send off a rocket large enough to hold human beings. For fuel he suggests liquid hydrogen and a mixture of water and alcohol, the liberated gases escaping through small holes at the back of the rocket, and thus forcing the rocket forwards. He calculates that an initial speed of 11 km./sec. would suffice for getting out of the earth's field of gravitation. The calculations are simplified by introducing the assumption that while the rocket is still in the earth's atmosphere, the fuel is used at such a rate as to give at each instant what is practically the "limiting velocity" at the instant.

The author discusses the theoretical as well as the chemical, physical, and even physiological aspects of such a venture. He examines the economic possibilities, but he does not appear to be very sanguine about his scheme being carried out. He estimates that a rocket for two persons would weigh 400 tons, would need 25 tons of alcohol and 4 tons of liquid hydrogen, and would require an initial outlay of 50,000*l.* on the basis of pre-War prices.

A voyage to the moon would be an attractive trip to many adventurous spirits; and in these days of unprecedented achievements one cannot venture to suggest that even Herr Oberth's ambitious scheme may not be realised before the human race is extinct.

S. B.