which are of great interest and value. Many movements in nature proceed at a rate such that we cannot successfully follow them with the eye and brain. The slow movements of a leucocyte, the gradual unfolding of a flower-bud or upward growth of a plant advance so leisurely that we cannot readily follow the change—it is only by observing them from time to time that we can appreciate that alteration is occurring. A succession of photographs, however, taken at considerable intervals, and passed rapidly in review before us, shows us as occurring in a few minutes the whole process which may take hours or days in reality, and we are better able to appreciate the nature of the phenomena because the sequence becomes more obvious. Conversely, many motions occur too fast for us to analyse them. The fact that our retina can clearly distinguish only impressions which reach it at a comparatively slow rate makes it impossible for our unaided eye to follow the sequence of many natural phenomena. By reproducing at a slower pace the changes which do occur, the kinematograph can assist us to attain a clearer perception of the nature of the alteration which is taking place, or, even if we are amœboid movements of a leucocyte or a spirillum wriggling its way between the corpuscles or the heart itself beating before their eyes. Yet these are things which it concerns them to understand, and no amount of imagination can supply the clearness and comprehension which actual seeing can give. The kinematograph might well become a most efficient aid to the teaching of very many biological, and especially medical, subjects.

The accompanying illustrations have been reproduced from kinematograph films kindly supplied for the purpose by Messrs. Pathé Frères.

THE RUBBER-PRODUCING PLANT OF THE MEXICAN DESERTS.[1]

AMONGST the botanical collections formed in 1852 by Dr. J. M. Bigelow, whilst attached to the Mexican Boundary Survey, were specimens of a shrub known to the Mexicans as "guayule," afterwards described by Prof. Asa Gray as *Parthenium argentatum*. No mention, however, was made of its

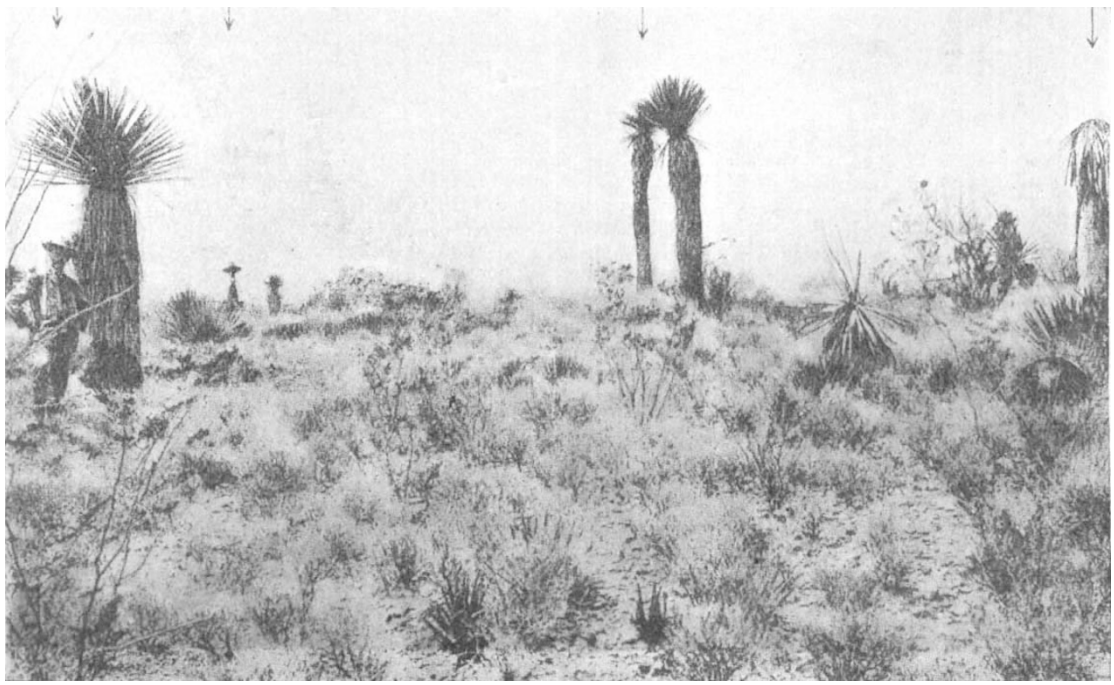

FIG. 1.—Foot-slope of Sierra Zuluaga.

still unable to grasp the successive phases, a study of the film itself will enable us to follow the sequence and analyse the motion with a greater detail and a greater accuracy than any number of examinations of the natural phenomenon can possibly supply. The kinematograph therefore can give us a positive addition to the sum of our knowledge, as well as diffuse through wider circles knowledge already gained.

This latter, while perhaps the most obvious, is not the least of the functions which such moving pictures can fulfil. There are thousands of people in this country who are intimately acquainted with the cellular constituents of the blood, and their various shapes and functions, thousands who have seen the ordinary bacterial preparations or are familiar with the heart-beat and its action on the pulse, but of these thousands not one-tenth have actually seen the

rubber-bearing qualities. It was not until 1876 that public attention was directed to guayule rubber by an exhibit sent to the Centennial Exposition at Philadelphia in that year. The country peon had, it appeared, for long been in the habit of making playing balls and other articles by the "communal mastication" of the bark of this shrub, and it was by that means sufficient was obtained for the above-mentioned exhibit. Investigation showed that the plant was capable of producing in the neighbourhood of ten per cent. of its weight of dry rubber, and that it grew in vast abundance in the desert country of northern Mexico.

This discovery speedily changed the economic value

[1] "Guayule (*Parthenium argentatum*, Gray), a Rubber-plant of the Chihuahuan Desert." By Prof. F. E. Lloyd. Pp. viii+213+46 plates. (Washington: Carnegie Institution, 1911.) Publication No. 139.

of these deserts, and set in motion business operations involving millions of capital based upon the amount of raw material in sight. In 1902 chemical and mechanical extraction plants were set up, and guayule rubber, though an inferior article containing a high percentage of resinous substance, soon became a very important item in the imports of the United States. At the present day the outlay of American capital in Mexico alone is said to amount to 30,000,000 dollars.

A good deal has already been written dealing with guayule, but the monograph by Prof. F. E. Lloyd is a most welcome addition to special rubber literature. Its contents are the outcome, Prof. Lloyd states in his preface, of an investigation carried out by others and himself at the instigation of certain Mexican rubber companies towards the elucidation of the question of the profitable cultivation of guayule in the desert with a view to future maintenance of supplies.

In addition to the physiology of the plant under varied conditions, the main subjects dealt with are questions of climate and soil, seed germination, methods of reproduction, results of cropping, environment of the plant, its rate of growth, methods of extraction, the possibility of maintaining the supply by irrigation, and the effects of this upon the yield of rubber. In the course of the investigation attempts are made to throw light upon many interesting problems in connection with the physiology of desert vegetation.

Much attention has been given to the formation of resin and rubber, and the close connection between the two. There appears to be no tube-like laticiferous system as in other rubber-yielding plants, the rubber being formed apparently in the cells of the resin-canals, whilst the resin itself is found only in the canals and not in the cells.

The guayule shrub is a very slow grower, a fifteen-year-old plant being no more than 15 inches in height, and Prof. Lloyd estimates that existing supplies will be exhausted in a few years' time. Seed can be germinated and plants easily raised by giving a small amount of shade and subsurface irrigation. On p. 121 the author remarks that "the most fundamental economic question for which an answer will be sought in these pages is that relating to the production of rubber under irrigation." In searching for a reply one has to be content with the statement that "The less the water the thicker the bark (cortex) and *vice-versa*." Irrigated plants naturally grow more vigorously but produce wood at the expense of cortical tissues, and it is largely the latter from which the rubber is extracted.

The book is evidence of a vast amount of labour undertaken in the spirit of enthusiasm, but its utility for the general reader is curtailed by the want of condensation in dealing with experiments and tabular results, and the absence of definite statements or deductive conclusions. It is elaborately illustrated by photo-litho plates, containing a large number of photographs and line-drawings of the minute histological structure of the different parts of the plant, as well as by some fine photographs of desert surroundings.

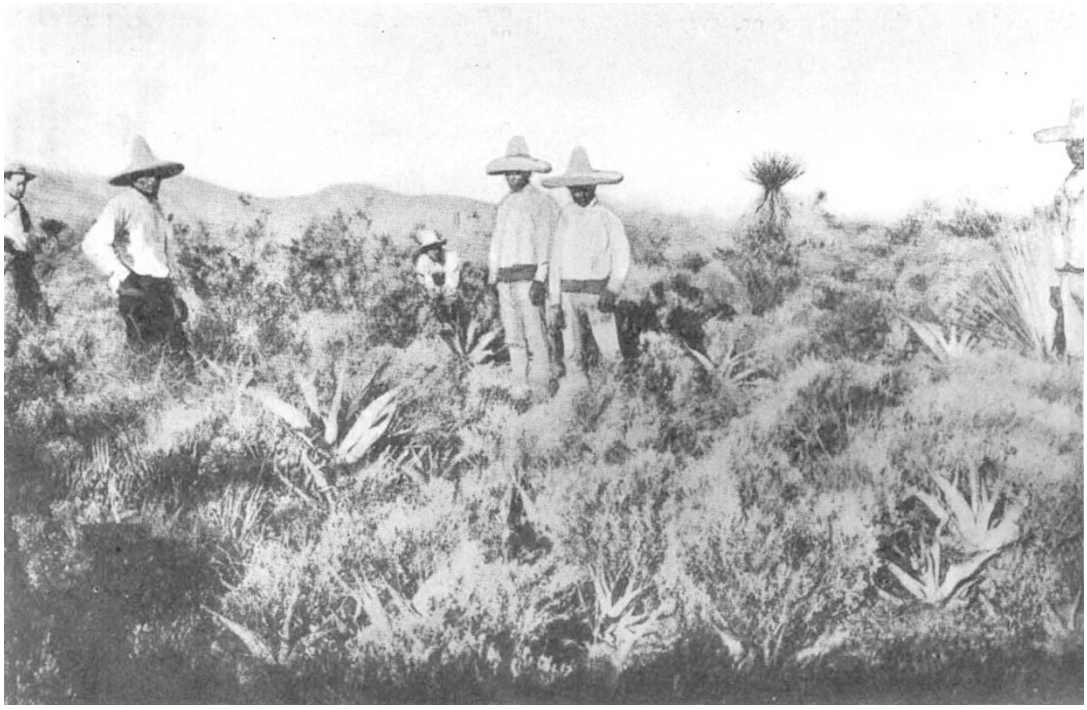

FIG. 2.—Guayule in a very dense growth.

THE AËRONAUTICAL BLUE-BOOK FOR 1910–11.[1]

THE specific questions which form the subject of the experiments and observations described in this report may be briefly described as follows :—

The deviation of air resistances from the law of proportionality to the square of the velocity and the effects of friction in this connection—discussed theoretically by Lord Rayleigh and experimentally by Messrs. Bairstow, Booth, Dr. Stanton, and Mr. Pannell.

[1] Technical Reports of the Advisory Committee for Aëronautics for the Year 1910–11 (with Appendices). Pp. 134. (Published by his Majesty's Stationery Office. London: Wyman and Sons; Edinburgh: Oliver and Boyd; Dublin: E. Ponsonby, Ltd., 1911). Price 6*s*.