

a clear idea of the composition of forces, at a time when the fundamental principles of dynamics were unknown.

The writings of the German philosopher Nicolaus de Cusa seem to have made a profound impression on Leonardo, and M. Duhem shows how suggestive they were to him in his studies on the motion of bodies. Leonardo discussed the motion of an arrow shot vertically upwards from the earth, assuming the latter to rotate in twenty-four hours, not because he wanted to prove or disprove the rotation of the earth, but merely as a problem of dynamics. Here, as well as in his general investigation of the motion of a projectile, he found it hard to free himself from old ideas; he believed, for instance, that a cannon ball at first moves in a straight line while influenced by a "violent force," next in a curved path while that force and gravity are struggling for supremacy, until it finally drops to the earth in a straight line. Though he cannot be considered a precursor of Copernicus (he says repeatedly that the earth is at the centre of the universe), he reasons as freely as Cusa about the nature of the stars, and rejects the Aristotelean distinction between the terrestrial elements and celestial matter. He believed the moon to be composed of the four elements which it supports in space in itself and by itself, as the earth does with its component parts. This is much the same as the statement of Copernicus that gravity is a natural tendency of all particles to join themselves into a whole in the form of a sphere, a tendency which is innate in the sun, moon, and planets.

The fourth essay deals with speculations on the origin of fossils. Leonardo did not consider them to be "plays of nature," or to have been carried to the tops of mountains by a deluge, but recognised that they are the remains of animals which actually lived on the spot where the fossils are found.

#### PARA RUBBER.

*Hevea brasiliensis*, or *Para Rubber*. Its Botany, Cultivation, Chemistry, and Diseases. By Herbert Wright. Third edition. Pp. xviii+204. (Colombo: A. M. and J. Ferguson; London: MacLaren and Sons, 1908.) Price 10s. net.

A REVIEW of Mr. Herbert Wright's valuable work on Para rubber appeared in NATURE about two years ago. The present edition (third) has been considerably enlarged, and in Mr. Wright's words "has been compiled in consequence of the many advances which have been recently made in methods of cultivation and tapping, coagulating and curing." The text has been increased from 177 pages to 304 pages, and the really well reproduced and instructive illustrations from 86 to 272. Many of the chapters have been re-written and expanded, especially the one on uses of rubber. There is now a separate chapter on the botany of the Para tree, *Hevea brasiliensis*, and one on the effect of tapping on the trees.

Chapter iv. contains a great deal of useful and  
NO. 2070, VOL. 81]

up-to-date information on planting operations and on catch crops. The advantages and disadvantages of close planting are fully considered. The most general distance now employed is from 15 feet to 20 feet. The main justification for close planting is the increased tapping area which is available in the first few years, but there is a note of warning in the following passage:—

"No one who has seen the uncultivated thirty-year-old trees at Henaratgoda can doubt that such specimens require at the very least a distance of thirty to forty feet if they are to be allowed to continue in their growth and maintain a healthy constitution."

Catch crops, says Mr. Wright, are all very exhausting, and their profitable cultivation is limited to about the first four years.

Considerable space is devoted to a description of the various methods of tapping and tapping implements, but, apparently, the systems employed are far from perfect, as the following passage implies:—

"The adoption of better systems of tapping which obviate the necessity of paring away the tissues wherein the milk accumulates, and drawing supplies of latex by merely cutting and not excising the laticiferous tissues is bound to result in an increased yield since the life of the tapping area is so much prolonged."

At present the average yield per tree per year for the Malay States would appear to be about 2 lb. Most of the trees, however, are still young. The cost of production is about 1s. 6d. per lb. Various methods of coagulating and treating latex are described: the use of centrifugal machines is more or less experimental; "the principle . . . of causing a separation of the caoutchouc globules by mechanical means is one which cannot be too strongly impressed on the experimentalist."

There is very little doubt, from Mr. Wright's remarks and his inquiries amongst manufacturers, that plantation Para is inferior in quality to fine hard (wild) Para. A wise manufacturer would not dare to buy 50 tons of cultivated rubber and store for six months, for fear of grave deterioration in quality, but he would buy thousands of tons of up-river fine Para with a full knowledge that it would grow better in storage. Mr. Wright appears to have very little faith in the so-called "synthetic rubber."

Natural rubber consists chemically of very complicated compounds. The "resins" and "proteins" are in themselves highly complex bodies, the components of which are but little understood.

"How can it then be possible, since we do not fully understand the chemical composition of the various components of natural rubber, to have synthetic rubber already on the market?"

Mr. Wright's book is perhaps the most comprehensive and up-to-date work on Para rubber published in this country, and has proved of great utility to practical men in the various branches of the rubber industry.

L. C. B.