established in Russell Square in 1905. Here laboratories were constructed for chemical, bacteriological and other research work. The courses of instruction given in these laboratories are recognized as qualifying medical practitioners for admission to the examinations for degrees and diplomas in public health of all the universities and medical corporations in the kingdom.

INDICATIONS of extensive commercial research in Soviet Russia are shown, as reported in the *U. S. Daily*, in large exports from the United States of various types of scientific, laboratory and professional instruments and apparatus in 1929. Soviet Russia became the second most important market for this class of materials last year, being exceeded only by Canada, which is the leading purchaser of American scientific appliances. The shipments to Russia amounted to $400,816, and accounted for a large part of the 23 per cent. gain in the year's exports of these commodities. The total shipments in this group, which is classified as "other scientific, laboratory and professional instruments and apparatus," aggregated $4,344,640 during the year. The materials include scientific instruments for testing physical strength, materials and forces; chemical and physical apparatus, aeronautical, astronomical and bacteriological instruments; graphic recording, military and naval, meteorological appliances; microscopes, laboratory scales, thermometers, barometers, hygrometers, magnets, etc. The exports of these materials showed a gain also during the month of January, when shipments amounted to $344,763, an increase of 13 per cent. over the corresponding month of 1929.

DISCUSSION

A SACRIFICE TO PELE

DOWN along the thinner borders of the lava overflows from Kilauea, which four years ago surged out into the fern forests and cut off some acres of them, where Pele's glowing strands had floated round, I noted last October that many of the tree fern stumps, somewhat pocketed in the light and fluffy lavas from one to three feet thick, seemed again to come to life. Could that be? I asked, and was told it was apparently so.

Then I looked over about an acre of the former fern forest, noting many of the stumps which seemed to send up the gnarled, irregular shoots, rather large for the time in which they had appeared, if grown from spores and prothalli. No soil seemed to have gathered over these shoots; their roots were imbedded deeply in the chaffy tops and remnants of the old stumps. No other plants or ferns of any kind whatever were to be noted round about, although the rough, deeply furrowed lavas should have favored soil forming and the growth of prothalli. Without previous and continued observation of the stumps from the time of the flows and without the digging up of the stumps from beneath the lavas, it seemed necessary to consider the amazing explanation of survival. Not knowing the forms of the fern forest very well, I can't say which of the several species was concerned, or how.

Could a surging, fiery spray of thinning waves of basaltic lava of extreme liquidity, flowing rapidly about the fern trunks with their heavy mat of wet, insulating chaff, perhaps with accompanying torrential rain, cool quickly enough to leave strands of the fern stumps still alive? And then, with initial rootlet cell growth, could a stalk cell form, and life begin anew? This much is certain: the liquid lava temperatures, usually recorded as from 800° to 1,200°, would be nowhere near so high about the fern stumps while the free tops of the forest were cut down. There would also form about the chaffy outer mass a jacket of steam which would hold the lava away from the stems as water from below made its escape. The trunks themselves and the fern forest floor would be further protected by a dust and ash coating precedent to the flow. The lava is very vesicular.

Recently the subject of reforestation following devastating eruptions, especially at Krakatau and at Katmai, has claimed some further attention. It has been found that the destruction of the original flora is not so extreme as earlier supposed. Certainly, ferns do come up from beneath the ash when it is washed away by the rains.

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BRANCHING HABITS OF THE HEVEA RUBBER TREE

MANY tropical trees have specialized habits of branching, which may be viewed as adaptations to forest conditions. Darwin and many other writers have recognized that forest vegetation in the tropics must meet an intensive competition for space and light. Chances of survival are greater for seedlings or saplings that can outgrow the surrounding vegetation and reach the sunshine. The seedlings of Hevea are specially adapted to undergrowth conditions in tropical forests.

Instead of beginning to branch near the ground, as do the more spreading trees of temperate climates, the specialized tropical species send up at first a tall, slender stalk, with branches only at the top. The

Central American rubber tree (Castilla) forms temporary branches on the lower part of the trunk, different from the permanent branches that appear later. Coffee, cacao and cotton are other examples of plants that have specialized lateral branches, different in structure and function from the uprights. In such cases the branches are said to be of two forms, or dimorphic. Several systems of dimorphic branching are known, though botanical text-books usually treat only of monopodial and sympodial systems, which may or may not be connected with dimorphism. The branch specializations undoubtedly should receive greater attention from morphologists than has yet been given.[1]

In the development of the Hevea tree two distinct growth periods or phases may be recognized, as in the cacao (Theobroma) and the patashte (Tribroma). The juvenile phase covers the growth of the primary upright, while branching signalizes the adult phase. The upright is built of a long succession of internodes whose buds normally remain dormant, though able to replace a lost or damaged terminal bud. The upright develops by flushes or spurts of growth, with each of the growth-sections ending in a close-set cluster or whorl of leaves. Lower internodes of the growth-sections often are four or five inches long, and sometimes six to nine inches, while the internodes that produce the leaves in the terminal clusters are only a quarter or an eighth of an inch in length. The interrupted growth, suppressed buds and pronounced inequality of the internodes are specialized features.

The adult phase of Hevea usually begins with a terminal whorl of branches, though not so definitely specialized as in Theobroma and Tribroma, which have regular numbers of branches in the whorls, five and three respectively. Also in the Ceara rubber tree (*Manihot glaziovii*), a relative of Hevea, the branches are regularly in threes. In Hevea, whorls of three, six and twelve branches occur, as well as intermediate and larger numbers of branches. Even where the branches of Hevea are not definitely clustered, the main stalk loses its predominance. Adult Hevea trees are essentially candelabrum-like, seldom showing any tendency to retain a strong central axis.

The primary upright of Hevea usually attains ten to twelve feet, and often fifteen to twenty feet, before any branches are formed. Some of the trees fork at five or six feet from the ground, especially those that have been cut back or injured, while others form several whorls of abortive branches before the permanent branches develop. Under forest conditions, branches that do not have upright or ascending positions are not likely to be permanent, but are overshadowed and die. Border trees may develop rather large horizontal branches, but these become topheavy, twisted and diseased. The normal habit of the species is shown by the slender, few-branched forest trees, rather than by the more spreading open-grown trees.

Propagation of Hevea from cuttings was reported by several experimenters in the East Indies soon after the first introduction from Brazil, but efforts in recent years to root cuttings from mature trees are reported as complete failures. Readier rooting of cuttings by the first experimenters may be connected with the fact that the lower section of the trunk has the power of producing adventitious roots, and only seedlings were available in the early years. Rooting above the crown has been observed at Chapman Field, in southern Florida, in experiments where the level of the soil has been raised by top-dressing. The root swells in advance of the trunk, and may attain nearly twice the diameter, a few inches below the surface of the soil. The enlargement of the trunk at the base is an important feature as determining the extent of tapping surface accessible from the ground.

Propagation from buds of high-yielding trees has been practiced for several years in the East Indian rubber plantations, but the budded trees are reported to differ generally in having narrow cylindric trunks, not thickened at the base as in the normal trees. This behavior has been ascribed to incompatibility and great variation in the stocks, but may be a consequence of specialization of the branches. The ability to regenerate uprights may be lacking in the lateral branches of Hevea, as in those of Theobroma and Tribroma. The lateral branches of coffee and of the Central American rubber tree also fail to produce uprights, and are not of use for vegetative propagation, although sections of the uprights are readily rooted.

Thus the specialized habits of branching in Hevea may throw light on cultural problems which hitherto have remained obscure. The commercial cultivation of Hevea did not begin till 1896 and has been confined largely to the East Indies. Recently it has been learned that Hevea can grow in southern Florida and is more tolerant of cold than many other tropical types. A Hevea tree has survived for nearly thirty years in an open-air planting at Palm Beach, and is still vigorous and healthy, though of small size.

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[1] "Dimorphic Branches in Tropical Crop Plants: Cotton, Coffee, Cacao, the Central American Rubber Tree and the Banana," U. S. Department of Agriculture, B. P. I. Bulletin 198, 1911. "Branching and Flowering Habits of Cacao and Patashte," Contributions from the U. S. National Herbarium, Vol. 17, Part 8, 1916.