down and overflowing their banks. The damage done by severe and sudden floods to roads, bridges, agricultural crops and stock, including human habitations, is well-nigh incalculable. Nor does the matter end there: millions of tons of valuable soil are washed away in these turbulent floods, and deposited as barriers in the river beds or in the sea at the river bar. Harbors and docks at the outlet of our main rivers become silted up with mud and debris: this in turn—apart from the loss of soil—involves costly dredging operations to keep the navigation channels clear.

Where forest exists in the upland districts or collecting ground of the water, rivers are more uniform in their flow, year in year out, and carry much less silt and debris. The crowns of the trees break the force of the falling rain; the humus layer on the forest floor has an enormous water-absorbing capacity, and when saturated it allows the water to percolate slowly into the deeper loosened layers of mineral soil, from which in turn it gradually finds its way into springs and watercourses. Further, the influence of the forest is such that the melting of snow is more gradual and water is slowly absorbed and held, thus again avoiding floods. The forest regulates the off-flow of water after heavy rains or melting snow. This water is fed into springs and watercourses more gradually throughout the year, thus preventing floods at one season and equally serious drought at another. As regards the influence of the forest in lessening the destructive effects of cloudbursts, we have it on the authority of Fernow that: "The forest litter, the moss-covered leaf-strewn ground, is capable of absorbing water at the rate of 40,000,000 to 50,000,000 cubic feet per square mile in 10 minutes, water whose progress is delayed by some 12–15 hours after the first effects of a heavy freshet have passed." I do not claim that afforestation or forest conservation in the high ground and valley slopes will entirely prevent floods and drought, but what the forester is doing or leaves undone in the remote hinterland will go a long way to check or ameliorate the evil effects of both. I have referred to these facts because the biological influence of the forest is so important and wide-spread in regard to drainage and water supplies.

As a form of vegetation which rises high above the surface of the ground, the value of the forest in breaking and tempering the effects of the cold winds has long been recognized and appreciated by the agriculturist. An adjacent sheltering strip or even clump of trees exercises a marked influence on farm crops and pasture lands; stock also thrive better in the shelter afforded. The trees afford shelter and at the same time exercise a very marked influence on the rate of evaporation of moisture from the surrounding area; this influence, in lessening the surface velocity of the wind and rendering it more moist, may be noted up to between 300 and 400 feet from the trees, but the distance varies with the height of the trees. In spring the pasture is earlier and more abundant, while in the autumn it remains longer green. The question of a reasonable balance between forest and grazing land is one of considerable biological and economic importance.

In the time available it is obviously only possible to refer to a few aspects of forest biology. I would have liked to say more about the importance of plant geography, but probably enough has been said to indicate how important this branch of botany is to forestry. Plant physiology and ecology are also of the highest service in the applied science of forestry. Plant anatomy is likewise of great value in wood technology, timber identification, seasoning, testing and preservation, which are all very materially helped by a knowledge of wood anatomy. It is needless to say that without help of the botanical systematist the forester would frequently find himself in serious difficulties, while the mycologist is equally indispensable.

Many biological problems of first-class importance in silviculture have still to be tackled, and it is to botany that the forester must look for their ultimate successful solution.

SCIENTIFIC EVENTS

THE TRAINING OF PHYSICIANS IN SOVIET RUSSIA

IN a special cable to *The New York Times* Walter Duranty, correspondent from Moscow, describes the training of physicians as an important feature of the Second Five-year Plan of the USSR. Mr. Duranty writes:

> The plan provides for a great increase in the number of medical students. In 1928, at the beginning of the First Five-Year Plan, the total number of students was 26,000. On January 1 of this year it was 48,000. The plan provides for the admission of 15,000 additional students this year—beginning this month—24,000 more next year, 30,000 in 1936 and 33,000 in 1937.
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> Whereas 5,400,000,000 rubles was spent on the hygienic needs of the Soviet Union—which include rest homes and physical culture as well as hospitals, medical schools and the like—the Second Five-Year Plan's hygienic budget amounts to 19,600,000,000 rubles. The number of hospitals in the cities will be increased by 44 per cent. and in the rural districts by 98 per cent.
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> The Bolsheviki assert there is no branch of the na-

tional life where a central socialized government has such a value as in organizing public health. They admit Russia's backwardness in this respect, but they believe that with the help of the state's resources medicine can be developed rapidly to a degree that no individualist system will be able to equal.

Two such eminent public health authorities as John A. Kingsbury, of the Milbank Memorial Fund of New York, and Sir Arthur Newsholme, who was long the chief public health officer of Great Britain, told the writer after they had taken trips through Russia two years ago that the foundations for a public health service were being laid on a scale that no other country had yet contemplated.

Medical students in the Soviet Union by the end of the Second Five-Year Plan will number more than 100,000. Their five years' training expenses, including food and lodging, will be wholly paid for by the state. But there will be no more hurried granting of medical degrees, which produced "qualified physicians" after a two-and-a-half years' correspondence course.

Even that was better than it sounds. True, the said physicians had no higher real qualifications than the average American trained nurse, but the dearth of any kind of medical knowledge was so great here that even a half-qualified doctor was better than nothing. There are still villages in European Russia where the village priest and sorcerer vie in treating the sick.

Henceforth there will be an obligatory five-year training period, with entrance examinations to test the candidates' fitness and half-yearly examinations by a special state board, wholly independent of the hospital or school where the students are being trained, to insure that they are making progress.

The training program provides that 75 per cent. of the students shall become what one might call general practitioners, while the remainder, selected by examination, will be educated as specialists.

Medicine will probably predominate over surgery because the Russian Health Commissariat, which controls the medical profession, has been "sold" on the idea of preventive rather than curative treatment. In this connection the program provides a great extension of children's doctors, and it is interesting to note that 74 per cent. of the present-day medical students are women.

The new program further requires that doctors in villages or small towns must take a course not less than once every three years in an urban medical school or hospital to keep themselves up to date. For this their traveling and living expenses are paid, plus the full salary they have been receiving in their own post.

As this indicates, it is the intention of the authorities to eliminate private practise as far as possible. Their idea is that doctors should become salaried officials of the Health Commissariat, as is already generally the case in Moscow.

But even here, and to a considerable extent in other cities, private practise continues, and some physicians earn a great deal of money, but it is expected that this will be superseded before the end of the Second Five-Year Plan by a system in which every citizen through his "social insurance" will receive free medical treatment.

RUBBER PLANT EXPERIMENTS

EXPERIMENTS by the U. S. Department of Agriculture, covering practically every important plant used for commercial production of rubber throughout the world, have singled out as the most promising sources for domestic rubber: goldenrod; guayule, a shrub which grows well in the Southwest; and Hevea, the rubber tree of the tropics. Of these, goldenrod is regarded as the most likely to develop commercially. The recent transfer to the department of the Edison collection of goldenrod selections has given new impetus to the research program.

Rubber of good quality has been made from goldenrod, but the details of extraction and manufacture have not been developed sufficiently to produce rubber on a commercial scale. With present knowledge it would not be possible to make rubber from goldenrod at prevailing prices of about 15 cents a pound. However, the experiments now in progress lay the foundation for domestic rubber production in case of an emergency.

Guayule is a shrub native to Mexico and southern Texas which resembles sage brush and which can be harvested with machinery. Several thousand acres have been planted to guayule in California by a company interested in its development. For maximum yields, guayule is harvested only every fourth year, thus it would be necessary for farmers to have some assurance of a stabilized price before this crop could be grown on a large scale. Because the whole plant is harvested it is necessary to have a large area and a succession of plantings to insure a continuous harvest. It is a long-time, large-scale rotation.

Other sources of rubber which could be developed in this country if the price were high enough to warrant it include the Hevea, the rubber tree of the tropics. The department now has 30,000 of these trees growing in Florida, some of them from seed produced there. There is said to be reason to believe that the yield will equal that of the East Indies.

Rubber made from guayule and goldenrod in this country so far has not been so good as the imported product. In the opinion of L. G. Polhamus, who for several years has been engaged in a study of rubber plants for the Department of Agriculture, with continued improvement in methods of extraction, it is possible that domestic rubber from these plants might be made to approximate that from the East Indies.

So far, *Solidago leavenworthii,* one of the Edison selections, has the highest rubber content of any of the goldenrods analyzed. Specimens have produced more than 12 per cent. rubber. Another species, *S. fistulosa,* has analyzed as high as 9 per cent. rubber. A third species which yields from 4 to 6 per cent. rubber is considered promising because of its greater leaf production. The goldenrod experiments have not,