

CURRENT SCIENCE

Vol. XVI]

JULY 1947

[No. 7

| | PAGE | | PAGE |
|---|------|--|------|
| Research and Exploitation of Forest Products | 199 | Palæontology and the Measurement of Geological Time. BY B. SAHNI, SC.D., F.G.S., F.R.S. .. . | 203 |
| Editorial Notes— | | Indian Wool. BY B. K. VAIDYA AND P. N. BHATT .. . | 206 |
| Morality of Science | 201 | Solar Radiation and the Indian Monsoon. BY K. S. RAMAMURTI .. . | 213 |
| Factory Training for Indian Students Overseas | 201 | Letters to the Editor | 216 |
| Laboratory Technicians | 202 | Reviews | 230 |
| Watumull Research Fellowships | 202 | Science Notes and News | 232 |

RESEARCH AND EXPLOITATION OF FOREST PRODUCTS

INDUSTRIAL raw materials from land that lend themselves to economic conversion and utilisation by man can be broadly classed as agricultural, silvicultural and mineral. Agricultural products like cotton, jute, and food crops are receiving considerable attention, and it is expected that comprehensive schemes of research on these will be included in the post-war plans. The silvicultural products, on the other hand, have not been so favoured, partly because of the unceasing suggestion from all sides that India is mainly an agricultural country and partly because of the neglect in exploring the industrial potentialities of the large variety of raw materials that the country is endowed with. The latest available figures indicate that the surplus forest revenue of India is hardly 26 per cent, as against 35 to 50 per cent. in more technically advanced countries of the West. Of the 400 million people in the country only about a million and a half are employed directly in the collection and distribution of forest raw materials. In independent India we may look forward to a sustained and

purposive programme of intensive research and exploitation in this field. It may, therefore, be desirable to outline here a plan for the study and development of industries based on the forest wealth of the country.

The principal products of recognised economic value in Indian forests are timber, fuel, grass, bamboo, sandal and lac. A number of minor products also contribute in a small measure to forest revenue. Investigations carried out at the Forest Research Institutes of Dehra Dun, Coimbatore and a few other centres have no doubt helped in improving the productivity of the forests of India and better exploitation of the forest products with increased financial returns. But the enormous scope for research and exploitation can be gauged by the fact that we have yet to evolve timber trees coming early into maturity, render saplings and timber pest-proof, discover pulp for varieties of paper and rayon; nor have we exhausted the uses or perfected economical methods of production of sandal wood, sandal oil, lac, lac dye, essential oils, gums, resins and grasses.

With regard to timber afforestation following deforestation as a routine practice is all that is mostly being done. Comprehensive, long-term investigations on plant physiology, genetics, hybridisation, forest botany, entomology, mycology and allied branches of silviculture still remain to be undertaken. Basic and wide knowledge of our national resources are of obvious necessity in turning the forest wealth to greatest advantage. For it is strange that the Indian forests which include practically all types in the world, ranging from dry tropical to Alpine and moist temperate forests, should not be able to supply the right pulp for paper or rayon. While trying, therefore, to induce foreign plants of known utility to grow in our forests, unceasing search must be made for indigenous wood for modern industrial uses. A basic survey coupled with technical progress and sound forestry should certainly promote in increasing measure the use of indigenous pulp.

Sandal culture and utilisation is another instance demanding attention at the hands of both the scientist and industrialist. Sandal wood is a monopoly, particularly of South India, enjoying a very high priority among products of luxury and pharmaceutical value in the world. The income from this source forms a respectable fraction of the forest revenue in Mysore State. The necessity for careful nurture and protection of the plant from pests will be all the more appreciated when it is realised that sandal requires about forty years before it is ready for harvest. But as things stand to-day the annual loss of sandal, especially in the form of saplings as a prey to spike disease, is beyond computation. It is needless to emphasise that an effort in this direction cannot be made too soon. To eliminate or reduce the incidence of the disease, fundamental investigations into the physiology of the host as well as of the virus responsible for the disease are essential. Only such a study is likely to suggest sure methods of tackling the pest. Further, production of sandal oil could also be raised by evolving strains of early maturity and higher oil content. In utilising the oil there could certainly be a more thorough study of its applicability in the pharmaceutical industry. During the last decade a good deal of work was carried out at the Indian Institute of Science on the physiological and biochemical aspects of sandal and its leguminous host plants as well as on the nature of spike disease. With the establishment of the Board of Scientific and Industrial Research in Mysore it is to be hoped that these investiga-

tions will be continued towards a fruitful conclusion.

Shellac offers similar and equally extensive scope for both basic and applied research. Shellac is also vulnerable to pests. But in addition, the production is critically influenced by the vagaries of the weather. There have been years when the crop of lac has been cut down to fifty per cent. of the normal production owing to failure of rains. In the early thirties investigations were carried out at the Indian Institute of Science on the nature, production and composition of lac. The Indian Lac Research Institute, Ranchi, has made valuable contributions to our knowledge on the dielectric properties, constitution, effect of storage, etc., of lac. Applied researches on the utilisation of lac derivatives, esterification of rosin with shellac, manufacture of de-waxed lac have also been carried out at this Institute. A good number of industrial applications of lac have been thoroughly investigated by the Imperial Institute, London. We hope that co-ordinated, comprehensive schemes of investigation covering the various aspects of production and utilisation of lac will be continued.

The accepted method of exploiting by-products as a means of cheapening the principal commodity can be applied to lac also. The scarlet dye of the lac insect, which formed the main product in the ancient industry, can find to this day a demand among silk dyers. The dye is not inferior to any of the synthetic products in its sheen or fastness to light. But the drawback is the inconstancy of the shade of the dye extracted from different batches. The immediate demand is, therefore, the working out of methods of quality control in the dye. The washings of the stick-lac, now running to waste in the industry, is also a potentially rich source of nitrogen and vitamins. If we are, therefore, able to work up systematically all the produce of the lac insect, ensure quality in them and press them into service in the national economy of the land, there should indeed be no need to despair of the future of the lac industry.

The forest department is also shouldered with the pressing responsibility of providing a ceaseless supply of fuel to the nation's homes. But the conservators of forests have yet to insist on their right to demand a thrifty and economic use of the fuel which they have to grow with so much pain and care. For it is deplorable that in burning fuel, as we now do, we are able to utilise little more than twenty per cent. of its calorific value. This waste can

hardly be justified when known methods of fuel technology ordinarily followed in coal-burning countries make possible a far less wasteful use of the national supply. It is within the domain of research on forest products to work out ways of conservation of fuel, not only in forests but in the citizen's home, the cumulative value of which will mean an

enormous saving of an essential commodity. It is to be hoped that the authorities in charge of forestry will formulate comprehensive plans of investigation on all aspects of the problem and insist on their execution with the same speed as other technical and industrial schemes are favoured with.

EDITORIAL NOTES

MORALITY OF SCIENCE

UNTIL before the atom bomb, Science was considered non-moral. The search for the laws of nature and the knowledge of them was thought to be the right of every one who would seek it. No discrimination in gaining such knowledge and training for further discovery was tolerated. But the burst of the atom bomb on Hiroshima and Nagasaki has suddenly awakened the scientist's conscience and sense of responsibility. It has made him doubt if Science is, after all, outside the purview of human ethics. Prof. Norbert Weiner of the Massachusetts Institute of Technology voiced the opinion of all thinking men when he raised serious objections against freely imparting his findings on controlled missiles. In his letter to a fellow-worker—probably on a war weapon—he questions the current morality of disseminating all knowledge indiscriminately. "In the past, the comity of scholars has made it a custom to furnish scientific information to any person seriously seeking it," writes Prof. Weiner. "However, we must face facts: The policy of the government itself during and after the war, say in the bombing of Hiroshima and Nagasaki, has made it clear that to provide scientific information is not a necessarily innocent act, and may entail the gravest consequences. One, therefore, cannot escape reconsidering the established custom of the scientist to give information to every person who may inquire of him. The interchange of ideas, one of the great traditions of science, must of course receive certain limitations when the scientist becomes an arbiter of life and death.

"The measures taken during the war by our military agencies, in restricting the free intercourse among scientists on related projects or even on the same project, have gone so far that it is clear that if continued in time of peace this policy will lead to the total irresponsibility of the scientist, and ultimately to the death of science. Both of these are disastrous for our civilisation and entail grave and immediate peril for the public."

Continuing, the professor writes, "The experience of the scientists who have worked on the atomic bomb has indicated that in any investigation of this kind the scientist ends by putting unlimited powers in the hands of the people whom he is least inclined to trust with their use. If, therefore, I do not desire to participate in the bombing or poisoning of defenceless peoples—and I most sincerely do not—I must take a serious responsibility as to those to whom I disclose my scientific ideas."

These contentions of Prof. Weiner and men like him—who are many—strongly remind us of the age-old Hindu precept which enjoins the *Guru* to be careful, circumspect and severely strict in choosing his successor who will be called upon to carry forward the torch of Knowledge. And to-day we are driven to think on almost exactly similar lines, that all men could not be trusted with the power for evil.

The importance of psychological fitness for the respective professions is being increasingly recognised. In this era of the atom bomb, therefore, a huge responsibility devolves on the scientist in imparting to the world at large new scientific information, especially information of the kind likely to be misused as a weapon of war. It is clear that the profession of science can only be entrusted to those who entertain such an abhorrence of war and human suffering that they would rather sacrifice science as a career than co-operate with the war-monger in any form. Another and more practical way of preventing the abuse of science is for the scientists, as a class, to refuse, in the words of Sir J. C. Ghosh, to be the camp followers of politicians. We trust the urgent realisation of the gruesome consequences of the use of the atom bomb will swell the volume of opinion in favour of humane and rational science taking the lead in the management of world affairs. For it is abundantly clear that current politics has woefully failed to keep pace with the progress of science which has broken barriers and erased man-made frontiers. We wish the Atomic Scientists, led by Professor Einstein, every success in their efforts to rationalise the application of science for the promotion of human happiness.

FACTORY TRAINING FOR INDIAN STUDENTS OVERSEAS

WE are receiving repeated complaints from our scholars in the United Kingdom and United States that facilities for practical training are lacking in both the countries. While the universities and technical schools have extended a warm welcome to Indian students, the factories and industrial plants have failed to encourage them. Mr. Krishnamurti from Akron, Ohio, writes in a letter to *The Hindu*, "With great difficulty I was able to arrange and complete three months' training in the Firestone Tyre Company ... I have been trying to arrange for further practical instruction,