

## SCIENTIFIC RESEARCH IN INDIA

THE Survey and Planning of Scientific Research Unit of the Council of Scientific and Industrial Research, New Delhi, has issued a survey of scientific research in Indian universities, based primarily on the annual reports of some twenty-five universities, and covering twelve scientific subjects\*. Forty-eight universities have scientific departments, and nine sent reports for the full 10 years (1952-62); some of the new universities did not send annual reports. The survey gives the total number of papers published by the university departments each year since 1952-63, and the distribution by subject and by periodicals, with statistics of authors. In the period covered, the number of Indian universities has grown from twenty, with 108,722 students in science faculties, to fifty-five, with 1,386,374 in science faculties.

In agriculture, Allahabad, Andhra, Annamalai and Calcutta appear to have active research departments; at Calcutta and Banaras most of the emphasis is on agricultural botany, and at Annamalai on pathology; animal husbandry and veterinary science are receiving little attention. Most of the universities except Aligarh, Jabalpur, Jadavpur, Mysore, Saugar and Karnatak are active in botanical research, notably at Allahabad, in the physiology and ecology of angiosperms and plant pathology due to fungi. The morphology of angiosperms is being studied at Andhra, the physiology and ecology of angiosperms at Annamalai, cytogenetics of angiosperms and other groups at Calcutta, morphology and physiology of angiosperms at Delhi and Utkal, and plant pathology due to fungi at Madras. In chemistry, 589 papers came from Andhra, 438 from Calcutta, 374 from Delhi, 360 from Lucknow, 265 from Banaras, 236 from Jadavpur, 234 from Utkal and 216 from Madras. In Delhi, Lucknow, Calcutta, Banaras, Annamalai and Poona, the emphasis was mainly on organic chemistry; at Allahabad on physical chemistry; inorganic work came chiefly from Allahabad, Andhra, Banaras, Jadavpur and Utkal. Only Calcutta was concerned with research in industrial chemistry and work on analytical chemistry was mostly insignificant. In engineering, 80 per cent of the papers published were in

chemical engineering and only in Banaras was there any research in metallurgy.

There is considerable research activity in geology at Andhra, Calcutta, Jadavpur and Lucknow, while in mathematics the contribution has come mainly from Lucknow, Calcutta, Delhi and Banaras. Out of 95 papers from Banaras, 63 were published in 1961-62, the theory of numbers and theory of functions accounting for 60 per cent of the total. Those from Banaras were concerned mainly with relativity and theory of functions; from Lucknow, with algebra, theory of functions and mechanics; from Delhi, with geometry and mechanics; from Calcutta, with algebra and geometry; and from Allahabad, with the theory of functions. Research in the medical sciences was most active at Lucknow, followed by Andhra, Bombay, Delhi, Nagpur and Poona. Medicine and pharmacology, with some pathology and physiology (Lucknow), physiology and medicine (Bombay), physiology (including biophysics and biochemistry) (Calcutta), and pathology, anatomy, medicine and gynaecology (Andhra) were the chief fields. Only at Andhra, Banaras and Panjab was effective research in progress in pharmacology, about 90 per cent of papers from Andhra and 70 per cent from Banaras being in chemotherapy.

Most universities were consistently active in physics, especially nuclear physics (Bombay and Delhi); theoretical physics (Madras, Annamalai and Delhi); spectroscopy (Andhra); electronics (Andhra and Calcutta); microwaves and acoustics (Andhra); crystallography, biophysics and mechanics (Madras). Bombay and Calcutta have published a few papers on cosmic rays. Calcutta, Baroda, Bombay and Poona, with Karnatak (since 1958), have published most of the research papers in statistics, largely on the design of experiments, theory of inference and descriptive statistics. Only at Utkal, Kerala and Sri Venkateswara has there been any research in veterinary science, but Lucknow, Madras, Andhra, Baroda, Delhi, Allahabad, Annamalai and Sri Venkateswara have active research departments in zoology. Cytogenetics appears to be neglected except at Allahabad. Of the Council's total research grants to universities of 8.8 million rupees in 1958-65, 45 per cent was for chemical research, 22 per cent for physical research and 11 per cent for biological research.

\* India: Council of Scientific and Industrial Research. Survey Report No. 6: *Scientific Research in Indian Universities*. By U. Sen, A. Rahman, S. P. Gupta, A. K. Roy, S. Malik, S. H. M. Husaini, S. Des Gupta and Y. K. Agarwal. (New Delhi: Council of Scientific and Industrial Research, 1965.)

## FUNCTIONAL ARCHAEOLOGY

THE value to the prehistorian of experimentation with archaeological material has long been recognized. The list of materials submitted to testing for methods of production and for possible functions is a long one, ranging from the working of flint and stone to the firing of Romano-British pottery in reconstructed kilns, and this article draws attention to two recent experiments in functional archaeology.

Among the first archaeologists to consider the possibilities of this approach was Sir John Evans, who compared his prehistoric flintwork with that produced by his nineteenth-century contemporaries at Brandon in Norfolk and in other countries as well. In Scandinavia, Jorgensen and Steensberg have in recent years directed experiments

with flint axes to see how efficiently these could fell trees, and the next stages in primitive cultivation, burning and sowing of seed, have also not been neglected. In Britain, ploughing experiments with reconstructed Danish ards have recently been carried out, and these may be of real assistance in interpreting the traces of ploughing recovered from such sites as Gwithlan in Cornwall. The Council for British Archaeology has also carried out experimental work on storage pits to see how efficiently these basketry-lined pits preserved grain. In Ireland the cooking experiments on Bronze Age sites are quite well known, and seem to have been successful both in function and in the taste of the finished product. Many other experiments involving the reconstruction of larger-scale