Statistics indicate that in rural areas the average speed of traffic is increasing annually by approximately 1 m.p.h., and during 1956 the average speed of private motor-cars under normal conditions was between 45 and 50 m.p.h., goods vehicles being some 5–10 m.p.h. slower. Economic studies of road improvements are an important feature of the work of the laboratory on the traffic problem.

The section on materials and methods of construction contains accounts of experiments on alternative types of road construction, including foundation aspects such as soil moisture and drainage, soil compaction and soil stabilization. Experiments on concrete have been carried out in connexion with the behaviour of high-strength road surfaces: the mechanism of the cracking of concrete and means of achieving a reduced modulus of elasticity without reduced strength, to lessen the liability to cracking, have been investigated. The use of prestressed concrete for road construction has also been investigated. For this to be feasible, the friction between the foundations and the necessarily long concrete slabs must be such that stresses due to thermal effects are not excessive; the difficulty of achieving this has not yet been overcome. Investigations into the properties and behaviour of bituminous road materials have been carried out with particular reference to anti-skid properties and durability.

Miscellaneous investigations have included the use of radioactive techniques for measuring the density of concrete slabs and the moisture content of soil *in situ*.

Salient features of some full-scale road experiments are given in an appendix. T. M. CHARLTON

A SOLAR 'BLOW-OFF' PROMINENCE

THE solar 'blow-off' prominence of May 18, 1956, and its possible effects are described by Dr. M. A. Ellison in two recent papers (*Mon. Not. Roy. Astro. Soc.*, 116, 6; 1956, and *The Observatory*, 77, 896; 1957). This prominence was one of a number generated during February–April 1956 in the highly active centres of the northern solar hemisphere, and it had been followed across the Sun's disk as a typical quiescent dark filament before it blew-off at the west limb on May 18. The observations relating to this blow-off prominence were made with the combined spectrohelioscope and spectrograph and are discussed in the *Monthly Notices*. A height diagram plotted from measurements made at Edinburgh and Meudon (the latter were supplied by L. d'Azambuja from spectroheliograms) shows the rapid outward acceleration, and before 15h. 00m. the outward velocity along the solar radius was 20 km./sec.; after 16h. 07m. it exceeded 600 km./sec. Calibrated plates of the Hα line were taken at 16h. 01m. and 16h. 04m. with the slit of the spectrograph crossing the arch at a mean height of 88×10^3 km. above the limb. The plates were calibrated immediately afterwards in the spectral light from the centre of the solar disk, thus providing means of deducing the Hα brightness of the various points of the prominence which were traversed by the slit. These are tabulated as fractions of the centre of the disk continuum at a wave-length 15 A. outside the Fraunhofer Hα line. The Doppler shifts on these plates gave components of velocity in the line of sight ranging between − 120 km./sec. in the northern leg and + 360 km./sec. in the southern leg.

Among other points dealt with in the paper, reference may be made to the study of the profiles of the Balmer lines at Edinburgh, which indicated a kinetic temperature for the filaments of 10,000°–15,000° K., and are consequently cool regions embedded in the corona itself at a temperature of 10^6 °K. It has been suggested by F. Hoyle that the higher density and lower temperature in the filaments are maintained by a local magnetic field, which compresses the hot material and cools it sufficiently for the hydrogen atoms to radiate in the Balmer lines. If this occurs, then there must be a great release of magnetic energy during the 2-hr. blow-off phase, and it is extremely improbable that the same material which has blown away into space should return precisely to its original site. In conclusion, Dr. Ellison suggests that such high-speed projection of prominence material may well be associated with the generation of radio-waves of frequencies appropriate to the various levels. There is also the possibility of geomagnetic effects occurring on the Earth after a suitable travel-time in those cases where the blow-off occurs near the centre of the solar disk. It is therefore desirable that all blow-off filaments should be recorded and classified at solar observatories during the International Geophysical Year. A simple scheme of classification has been proposed by Ohman, for inclusion in the Geophysical Year *Solar Patrol Forms*, and the hope is expressed that this classification will be generally adopted.

BROOKHAVEN NATIONAL LABORATORY

THE Brookhaven National Laboratory, which is located at Upton, Long Island, about seventy miles east of New York City, was established in 1947 and is operated by a private institution, Associated Universities, Inc., under contract with the United States Atomic Energy Commission. The board of trustees comprises one scientist and one administrator from each of the nine sponsoring universities—Columbia, Cornell, Harvard, Johns Hopkins, Massachusetts Institute of Technology, Princeton, Pennsylvania, Rochester and Yale. The director of the Laboratory is Dr. L. J. Haworth. The issue of *Atoms for Peace Digest* for June 15 (3, No. 1; 1957), the first of several numbers to be devoted to the description of the large American atomic research centres, deals with the work of Brookhaven National Laboratory. Later issues will deal with Oak Ridge, Argonne, and the smaller research establishments of the U.S. Atomic Energy Commission.

Research and development work at Brookhaven is carried out by eight major scientific departments, including the departments of physics, chemistry and biology and medicine. The cosmotron department is now operating the 'Cosmotron' particle accelerator in three shifts, five days a week, and the main study is that of the unstable particles, including heavy mesons and hyperons. An efficient method for the extraction from the 'Cosmotron' of an intense proton beam and its direction on to a liquid-hydrogen target placed outside the accelerator has been developed. The construction of a proton synchrotron was commenced in 1954; it will consist of a steel and copper

hoop, 842 ft. in diameter, and will use the new 'strong focusing' principle of accelerator design to accelerate protons to energies of 25,000 MeV. The Brookhaven research reactor, completed in 1950, operates at 30 megawatts, and is a natural uranium, graphite-moderated, air-cooled reactor. It is used for many types of experiments in nuclear research, including a large number of simultaneous experiments involving neutrons and also for the production of radioisotopes. The nuclear engineering department is continuing to contribute to the general development of a liquid-metal fuel reactor and is collaborating closely with Messrs. Babcock and Wilcox, who are responsible for the engineering aspects of the design, fabrication and operation of a liquid-fuel reactor experiment for the U.S. Atomic Energy Commission. The experiment is based on research work done at the Laboratory on the concept of a reactor using uranium fuel dissolved in molten bismuth.

Brookhaven was the first institution in the United States to establish a hospital devoted primarily to research in the use of atomic energy for the diagnosis and treatment of disease. The hospital has 115 beds and treats 'terminal cases', that is, persons suffering from an incurable disease, usually some form of cancer. A new Medical Research Centre is being built which will house a forty-eight-bed research hospital, an industrial medical branch and research departments in medical physics, pathology, microbiology, biochemistry and physiology. The Centre will have the first nuclear reactor designed specifically for medical research and therapy and will be capable of producing a beam of neutrons about fifty times as powerful as the beam from Brookhaven's present general research reactor.

PASTEUR INSTITUTE OF SOUTHERN INDIA

THE brilliant research of Louis Pasteur in the 1880–90 decade not only established bacteriology as a science but also revolutionized the practice of medicine by the introduction of therapeutically and often dramatically effective sera and vaccines. Public recognition of the value to humanity of this new science led to the establishment of, in the words of Pasteur, "those sacred dwellings meaningly described as *laboratories*" through funds provided by, to use the modern idiom, voluntary agencies. To quote the names of a few such laboratories of world-wide repute is to put into perspective the Pasteur Institute of Southern India, this year celebrating the golden jubilee of its foundation in 1907; Pasteur Institute of Paris, founded in 1890; Institute of Infective Diseases in Berlin (1891); Lister Institute of London (1891); Rockefeller Institute for Medical Research of New York (1901); Haffkine Institute of Bombay (1896); Pasteur Institute at Kasauli, India (1900). The scientific achievements of the Pasteur Institute of Southern India, so delightfully situated in the Nilgiri Hills at Coonoor, were acclaimed in 1952 by its selection as the venue for the World Health Organization Rabies Conference.

In his foreword to a souvenir volume issued to mark the golden jubilee* the present director, Dr. N. Veeraraghavan, pays tribute to the distinguished men who have guided the destinies of the Institute and to the workers to whose unremitting endeavours it owes its position in the scientific world to-day. The directors were: Lieut. Col. J. W. Cornwall, 1907–26; Lieut.-Col. T. H. Gloster, 1926–28; Lieut.-Col. K. R. K. Iyengar, 1928–38 and 1941–46; Major H. W. Mulligan, 1938–41; Lieut.-Col. M. L. Ahuja, 1946–47. At its inception, the Institute was a non-governmental organization managed by a committee on which a wide variety of interests were represented. The objectives were to make available effective means of preventing the occurrence of rabies, to spread the knowledge of such means among the public and to undertake research work on rabies or any other disease in so far as funds and the qualifications of the staff permitted. Changes in vaccine for rabies and methods of production over the years are briefly described, and especial reference is made to the painstaking record-keeping, instituted by Cornwall and still maintained, of the history of hundreds of patients bitten by rabid animals, but untreated, considered in parallel with the results of treatment of persons bitten by the same animals; this continued investigation is considered to be a unique record. In recent years the present director has tested the effect of hyperimmune antirabies serum, as well as a host of drugs claimed to be of therapeutic value in established cases of hydrophobia.

Among many other subjects of research at the Institute have been the entomological studies of Patton about 1920 which culminated in his well-known two-volume text-book; Iyengar's interest in clinical laboratory practice, which led to the creation of a separate department; Mulligan's preoccupation with problems of immunity in malaria and with protozoon parasites generally; Ahuja's heed for the potency of vaccines and his association with the action of heparin on Russell's viper venom.

The potential for research and expansion available at the Institute to-day is in large measure due to the scientific ability, administrative capacity, sterling character and vision of Col. Cornwall during his twenty years of service as director. To-day the Institute's laboratories co-operate with the World Health Organization in their world-wide studies on rabies, *Q*-fever and international interlaboratory testing of freeze-dried sera from syphilitic and non-syphilitic sources. Dr. I. G. K. Menon, assistant director, is a member of the World Health Organization expert advisory panel on virus diseases and has instituted new inquiries on the respiratory group of viruses, the intestinal group of viruses and on the recombination and mutations phenomena in influenza viruses.

A section of the souvenir volume describes briefly the scientific contributions by the Institute during fifty years on the following subjects: rabies, influenza, *Q*-fever, cholera, typhoid fever, diphtheria, fuso-spirochætosis, serology of syphilis, tropical eosinophilia, malaria, leishmaniasis, venoms and entomology. The last section is the Scientific Report of the Institute for the year 1956 and includes an experimental evaluation of recent advances in anti-rabies treatment, an assessment of the value of 5 per cent simple vaccine in human treatment and studies on the cultivation of the rabies virus *in vitro*.

R. Ford Tredre

* Pasteur Institute of Southern India, Coonoor. Golden Jubilee Souvenir, 1907–1957. Pp. ii+150+24 plates. (Coonoor: Pasteur Institute of Southern India, 1957.)