THE NATIONAL SCIENCE FOUNDATION

THE eleventh annual report of the National Science Foundation*, covering the year ended June 30, 1961, records grants for research totalling 69 million dollars, compared with 62 million dollars in 1960, requests for support increasing, however, much more rapidly, from 163 million dollars to 256 million dollars. Some 15 million dollars were also made available for research facilities, including 8.5 million dollars for construction and modernization of graduate research laboratories and a further 8 million dollars were awarded to the three national research centres: the National Radio Astronomy Observatory; the Kitt Peak National Observatory; and the National Centre for Atmospheric Research. In the biological and medical sciences support has been afforded in molecular, genetic, developmental, metabolic, regulatory, environmental and systematic biology and psychology. In these fields significant research developments noted in the report are: the determination of the amino-acid sequence of tobacco mosaic virus protein; the successful photographing of unbroken deoxyribonucleic acid; the synthesis of a substance containing 23 amino-acid groups with all the biological properties of adrenocorticotrophic hormone; and of luciferan, the light-emitting compound in fireflies. It has also been established that nucleotides play a key part in cell differentiation, that cobalt is essential for the growth of soya bean plants under symbiotic conditions and for the growth of the symbiotic bacteria, that even a few alder trees can play a major part in providing nutrient material for lakes and leaf-fall from alders contains four times as much nitrogen as defoliation from other species, and that carotenoids protect the plant cell from chlorophyll-catalysed photooxidation damage, while further information has been obtained on the structure and function of mitochondria.

In the mathematical, physical and engineering sciences, Project Mohole, a joint venture with the U.S. National Academy of Sciences, was probably the

* National Science Foundation. Eleventh Annual Report for the Fiscal Year ended June 30, 1961. Pp. xxxi+325. (Washington, D.C.: Government Printing Office, 1962.) 1.25 dollars. (See also p. 319 of this issue.)

most spectacular project supported by the Foundation during the year, and this deep penetration of the Earth's sub-oceanic crust has established the feasibility of deep-ocean drilling (*Nature*, 184, 140; 1959).

Extra-galactic cosmic particles with an energy 500 million times that generated by the largest accelerator were detected during the year, and an atomic hydrogen maser constructed with an accuracy 100,000 times that of the best time standard yet known. Quantization of magnetic flux in superconductors was confirmed and 17 new exploding supernovæ were discovered during the year.

For the programmes of its Division of Scientific Personnel and Education, the Foundation allocated some 70 million dollars during the year. The 4,196 fellowship awards, totalling 14.1 million dollars, brought the totals since the inception of the programme in 1952 to some 17,000 Fellows and 57 million dollars. The Foundation also supported 771 institute programmes during the year. Of those, 396 were summer institutes attended by 21,000 teachers; 33 were academic year institutes, attended by 1,534 teachers of science and mathematics; 191 were in-service institutes attended by 8,900 secondary school teachers, with a further 13 institutes for 400 participants from elementary schools, all on a part-time basis. Besides containing programmes for secondary schools, such as visits from outstanding scientists and travelling science libraries, and a programme designed to develop co-operation between colleges and secondary schools in improving the quality of education in the sciences, the Division promotes programmes for advanced education in science, including supplementary training for science teachers and studies to improve the extent of courses in science and engineering, the design and development of prototypes of new equipment for teaching science. For this 57 grants were awarded, and since 1958 the Foundation has awarded grants totalling 4 million dollars to the School Mathematics Study Group for projects aimed at improving the teaching of mathematics.

TECHNOLOGICAL IMPORTANCE OF INDUSTRIAL DIAMOND

THE name 'diamond' conjures up to many only beautiful costly gemstones, yet diamond is a technological hard material of the greatest importance; indeed, it can be now regarded technically as a fundamental strategic raw material. Of the annual world output of mined diamond, which is some 25 million carats, that is, 5 tons, only 1 ton is used for gemstones, the remaining 4 tons being eagerly consumed in industry largely as a hard abrasive or a cutting material. This 4 tons of crystalline matter, as raw material alone, fetches something like £20 million, and its extraction involves the formidable problem of sorting from something like 125 million tons of diamondiferous ore, the diamond being very thinly distributed indeed.

The technological importance of diamond lies in its immense hardness, which surpasses that of all other materials. The uses of diamond are growing

rapidly in two broad categories: (1) single individual diamonds; (2) crushed grit. The range of use is enormous, from lathe-cutting tools to gramophone needles, from the truing and shaping of precision grinding wheels to the cutting and drilling of glass. Then again diamond rock-saws, diamond rock-drills, diamond wire-drawing dies, indeed even diamond microtome cutting-knives, all these are but a few of the multifarious industrial uses of singly mounted diamonds.

The strategic importance of the material, even to the military as well as to industry, is immediately apparent when one considers, for example, such aspects as mass-produced engines, automobiles, etc; for many basic components are rapidly shaped by accurately made silicon-carbide grinders of precise form and dimension. But, of course, the grinders wear and they must be continually reshaped and trued, and

with what? In fact, diamond is the only material hard enough to re-true the hard carbide grinders, so a handful of diamonds becomes of strategic importance in these heavy industries.

Of equal importance to industry has been the rapid extension of the use of diamond grit bonded into wheels. Such bonded wheels have a fierce cutting and abrasive action and are extensively used for polishing, grinding, cutting and shaping; for gear wheel teeth, manufacture of hard tools, sawing of rocks, etc. These are but a few of the extensive uses of the newer bonded wheels.

Now it is evident that so ubiquitous a use of a material must have led to development of an extensive technical literature and to an equally extensive industrial patent bibliography.

It was in order to assist technologists in this rapidly expanding field of technical publication that more than twenty years ago the de Beer's South African diamond producing and marketing organization took two steps. First, it established in London the Industrial Diamond Information Bureau (2 Charterhouse Street, London, E.C.1), which offered gratuitous technical information on production and use of diamond; secondly, it founded the journal, *Industrial Diamond Review and Abstracts*. Under its first editor, Dr. P. Grodzinski, this journal made rapid strides and was quickly recognized as the most authoritative monthly periodical dealing not only with diamond and its uses but also with the use of other hard materials, such as the hard carbides.

For some years now the journal has been most competently edited by Mr. Patrick Greene, and,

early this year, after remaining unchanged for twenty-one years, it appeared in a new format, which is not only attractive in appearance but also essentially practical. The international A4 size has been adopted and colour is introduced. The quality of the reproductions is now admirable, and advertising matter has been removed from the main body to the covers and back pages only.

The principal innovation has been the separation of the *Industrial Diamond Abstracts* into a separate companion journal to the *Review*. These abstracts are effectively culled from four hundred journals, and especially those referring to patents are well and clearly illustrated. The classification of the abstracts is made into no less than twenty-one distinctive categories, typical examples being: *B*, properties of diamond; *K*, wire drawing; *L*, rock drilling; *R*, powder metallurgy; and so on. The cross-reference system is very helpful. Indeed, to anyone interested in either the behaviour, properties or applications of diamond and other hard materials these abstracts are a boon. Linked to the publication is a useful loan photostat and reprint service. The subscription is a mere 30s. a year for the two companion journals, which is very little for the monthly service rendered.

There is no doubt that these two publications are performing a very real service, and even if it be admitted that one of their purposes is to encourage increased consumption of diamond, this is in no way a detraction, for diamond is a unique material and its unique physical properties deserve to be used as much as possible to help promote industrial production.

S. TOLANSKY

RECENT NUCLEAR EXPLOSIONS AND EARTH TIDES

ELASTIC deformation of the solid Earth, independent of the marine surface, is called an 'Earth tide'. Because of its rigidity, the Earth will not deform as would a case of the same size but of liquid content. It will assume an intermediate degree of deformation depending on the density and elastic properties of the materials that constitute the solid Earth. This change in shape will cause a change in gravity, value g , which is also dependent on the latitude, local geological structure and physical properties of the materials. Thus, the variation in tidal forces caused because of the changes in the position of the Sun and the Moon with respect to the observation station on the Earth will indirectly affect the gravity-time variation curve. The maximum of the tidal action corresponds to a measured minimum of gravity.

Continuous recording of the variation of g value with time is being made in the Geology Department, Osmania University, Hyderabad, by S. Balakrishna (*J. Sci. and Indust. Res. (India)*, 20 A, No. 12; December 1961). The influence of the oceans on the tidal values on continental stations shows that, at a distance of 66 km. from the seashore, the effect of the oceanic tides can be minimized to a large extent. The Osmania observation station has this advantage besides being located on the so-called stable peninsular shield.

When an earthquake occurs, a certain stress energy is usually released which causes an extra, temporary deformation other than the long-period deformation of the Earth-tide type. This temporary deformation

is of short duration and the whole process of disturbance can be observed in the normal gravity-time curve. Many such records have been obtained during the past few months. The most intense earthquake which occurred in the year 1961 was that of Kyushu on February 26, 1961. The gravity record showed a violent disturbance at exactly the same time, but the disturbance was of a few hours duration. In cases where the energy is of high magnitude, as in the case of the Chile earthquake of May 1960, the Earth is thrown into its own free oscillation, the period of which is estimated to be 53 min. 47 sec.

During September and October of 1961, disturbances of a different nature were noticed. The characteristic features of these disturbances are longer duration and constant high amplitude. Nearly thirty disturbances of this nature have been recorded, the first being on September 10, 1961. From the records of the gravity-time curve during these disturbances, it appears that they are not due to the energy that is supplied after an intense earthquake, but are caused by the release of enormous stress energy and are possibly due to a different mechanism. The records of September 10, September 25, October 18, October 23 and October 30, 1961, stand out prominently in that the duration of the disturbances was often for a period of more than 24 hr.

The record on October 23, 1961, when the reported megaton bomb was exploded by the U.S.S.R., showed a minor disturbance at about 0700 hr.; this suddenly became intense at about 1000 hr. and reached its maximum amplitude at about 1430 hr. The disturb-