Another group of new-old materials was described by H. Schnell, in his paper on polycarbonates. Intensive earlier work on polyesters had failed to produce any polycarbonates of satisfactory stability and useful physical properties. Two factors which combined to open up this new field were the production of 'bisphenol *A*' $HO.C_6H_4.CMe_2.C_6H_4OH$ and its conversion to a polycarbonate by reaction with phosgene. It proved possible in this way to obtain polymers of high molecular weight which were crystalline and melted above 200° C. Subsequent work has led to the synthesis of many polymers of the general structure $-(OC_6H_4.X.C_6H_4O.CO)_{\overline{n}}$, where X may be $-CR_2-$, $-O-$, $-S-$, $-SO-$, $-SO_2-$. These are broadly similar in physical properties, an attractive feature being high impact strength. The polymers are all crystalline, generally melting above 200° C.; but a high degree of transparency shows that the crystallites must be small. Moreover, the fact that many of these materials are soluble in organic liquids at room temperature is surprising having regard to their high melting points.

The relation of melting point to chemical structure was discussed by H. C. Raine in his paper on polyolefins. Following the pioneer work of G. Natta, a range of 1-olefins have now been polymerized to crystalline polymers which are generally described as 'isotactic'. Raine emphasized that the ability of a polymer to crystallize is not a sufficient proof of 100 per cent stereochemical purity. In illustration he presented data on a large series of polypropylenes having melting points ranging from 110–180° C., correlated roughly but not exactly with the estimated percentage of crystallinity. For any discussion of the effect of monomer structure, one should clearly use the highest melting point which has been attained; but there remains some doubt as to whether data available at the present time are all reliable. Following the work of C. W. Bunn, Raine sought to interpret the data in terms of three factors: cohesive energy per unit length of chain, intrinsic chain stiffness and spatial symmetry.

Of these new polyolefins, only polypropylene has yet been developed commercially, but it may well prove that some others may have useful combinations of properties: the high melting points of polyolefins with bulky side groups are particularly noteworthy. The presence of these side groups in an isotactic polymer makes a planar zig-zag conformation of the chain sterically impossible. Crystal structure determinations on a series of polyolefins have shown helical structures to be characteristic. With this in mind, it might well have been expected that if vinyl cyclopropane could be polymerized isotactically, the polymer would show a similar structure. In his account of recent work by the polymer group at Brooklyn Polytechnic, M. Goodman reported that this does not appear to be the case. Vinyl *cyclo*propane has recently been synthesized, and polymerized with a Ziegler catalyst. Preliminary X-ray studies suggest that the crystal structure is a planar zig-zag.

The problem of polypeptide conformation in solution is dominated by the possibilities of hydrogen bonding. Goodman described work in progress on the synthesis and study of a series of short-chain polypeptides (2–12 peptide links). Optical rotation and rotary dispersion are being used as tools to study the competition between intermolecular association and formation of an α helix. In the latter, intramolecular hydrogen bonding occurs between links 1–5–9–13, 2–6–10–14, etc. End effects are naturally important in these short chains, and the interpretation of the results is not yet entirely clear.

Two papers remain to be mentioned: by H. M. Stanley, on "The Impact of Petrochemical Development on the Plastic Industry"; and by N. J. L. Megson on "High-temperature Resistant Materials". These approached the question of new polymers from opposite ends. The industrial development of a polymer is naturally highly dependent on economic consideration, and in these the cost and availability of monomers looms large. The remarkable progress of the petrochemical industry is well known, both in cheapening established products by opening up more direct and economical routes, and in making available on an industrial scale products formerly laboratory curiosities. In his survey of current trends, Stanley gave good grounds for the belief that if a polymer can be shown to be sufficiently worth while, the petrochemical industry will find a feasible route to the necessary monomer.

Megson's paper pointed the need for the development of polymers with new properties. The kinetic heating of high-velocity aircraft and rockets is already creating a demand for materials, both metallic and non-metallic, capable of performing more satisfactorily at higher temperatures than those hitherto encountered, and it is clear that the problems will become progressively worse as speeds rise. There are really two groups of problems, concerned respectively with thermal, oxidative and hydrolytic stability under very severe conditions; and with the physical properties of materials which encounter an exceptionally wide temperature range. Megson stressed the shortcomings of all known polymeric materials, but was naturally less able to suggest remedies. The overall problem is certainly too complex for any simple solution, and progress can only be foreseen over a broad and straggling front. General studies of new types of polymer will certainly have the high-temperature problem in view as an objective. At the same time, specific applications will require individual study to determine the best compromise between design and material. This is one of the areas where one may hope to find advances when the Plastics Institute holds its next conference on polymeric progress.

G. GEE

THE SCIENCE ASSOCIATION OF NIGERIA

THE second annual conference of the Science Association of Nigeria was held in Zaria, Northern Nigeria, during December 15–18. This Association, affiliated to the wider organization of the West African Science Association, has only been in existence for one year. Its membership is recruited from all branches of the teaching profession, from government scientists and from industrial organizations.

The immense developments in Nigeria since the Second World War have given rise to a large increase in the numbers of scientific workers, both African and European. Yet the overall numbers are still grossly inadequate for the country's need in an age of technological expansion. The Association was brought into being for the dual purpose of providing a forum for scientists working in the country and of informing the general public of the role which scientific work is playing in their lives. Already the Association has achieved considerable success. The quality of the papers and the discussions at the present meeting was extremely high, and it gave a picture of a general standard of work and achievement which would have been unthinkable not many years ago.

The most obvious immediate technological needs of Nigeria are in the agricultural and allied fields. It is not surprising, therefore, that a great deal of emphasis was laid on agricultural developments and of the relation of these developments to nutrition. But other subjects were not neglected. The vexed question of the biological effects of radiation—a real issue in Nigeria since the first mention of Sahara atom bomb tests—was dealt with in a most scholarly and authoritative manner. There were brief incursions into the realms of physiology and even of philosophy.

The importance of the meeting, though, really lay in that it brought together workers from many parts of Nigeria and from many fields of work. Physical and intellectual isolation are an ever-present danger in such a vast under-developed territory, and the real necessity is an interchange of ideas and points of view.

This meeting underlined a phenomenon of great significance certainly in Africa, probably also in other territories, namely, a re-orientation in the pattern of research. Before the War the tropics at the best were field stations visited by scientists from Europe, who collected their material for examination in properly equipped laboratories in Europe. To-day, Nigeria not merely has the laboratories—insufficient in number, perhaps, but still there—but also the scientific personnel to carry out the work. The opportunities here are immense, and the challenge is something which Europe cannot match. There is, after all, a fundamental absurdity, justified at the time they were created, in institutions of tropical research situated in England or indeed anywhere outside the tropics. This alone is a big development. Most of the original work carried out in Nigeria is, perforce, in applied subjects such as agriculture and medicine. Nevertheless, the third step towards scientific maturity has already been taken, for there is now a great deal of 'pure' research being carried out, particularly at the University College, Ibadan.

Science and technology in Nigeria are still young, but one feels that the plant is viable, that scientific activity will continue to grow, and that the nation as a whole will increasingly come to accept the new technologies as her best guarantee of future prosperity.

B. Hopkins

THE SMITHSONIAN INSTITUTION

The annual report of the Smithsonian Institution for the year ended June 30, 1959, includes the Secretary's report, reports of branches of the Institution, the library and publications, and the financial report of the Executive Committee of the Board of Regents (Pp. x+243+10 plates. Smithsonian Publication No. 4389.) Washington, D.C.: Government Printing Office, 1959). Real progress continued to be made in transforming the museum displays into modern effective teaching exhibits and with 951,608 visitors at the National Gallery of Art, an estimated 4,055,673 at the National Zoological Park, the total number of visitors was 11,358,633. Some 260,000 specific inquiries were handled and 1,144,445 specimens were added to the National Museum, including four collections of Micronesian ethnological material, the entire herbarium of Goucher College, consisting of about 6,100 specimens, the legendary Hope diamond, a superb collection of Chinese jade carvings, more than 7,300 specimens of Carboniferous plants, the Monrós collection of more than 54,000 chrysomelid beetles, and many molluscs and marine invertebrates collected by the Bredin–Smithsonian Caribbean expedition; a collection of early handmade locks, bolts and decorative hardware, and dental instruments, furniture and equipment relating to the history of dentistry. Efforts to acquire early scientific apparatus used in colleges continued, and a group of scientific instruments used by Ira Remsen at Johns Hopkins University was acquired. Field work was conducted by members of the Museum staff in Central America, South America, the Caribbean and many parts of the United States.

Systematic researches by the Bureau of American Ethnology ranged from the River Basin Surveys, Arctic and Eskimo studies, the Seminole and Seneca Indians to archæological work at Russell Cave, Alabama, and progress is reported with the bibliography of the Arctic. The survey parties have now located 4,909 archæological sites in the River Basin Surveys and, of these, 1,017 have been recommended for excavation or limited testing. Work at the Astrophysical Observatory included solar physics, the development of two methods for determining the structure of non-grey stellar atmospheres, a study of atmospheric structure and its correlation with solar activity, studies of the secular acceleration of artificial satellites, meteoritic studies and the design of a telescope for use in space. The satellite-tracking programme continued and the Division of Radiation and Organisms continued its studies on the biochemical changes that occur during the development of the chloroplasts of higher plants. In a study of the lag phase of chlorophyll synthesis it has been shown that X-irradiation of 5–10 kr. can increase the lag phase in etiolated bean leaves, and radiant energy in the region 710–820 mμ significantly increases the frequency of chromosomal aberrations when used as a supplement to X-irradiation. Accessions totalling 341 specimens in 56 separate accessions to the Natural Air Museums included an early example of a German one-man helicopter, a *DM*-1 delta-winged glider of the Second World War, and many documents pertaining to pioneer rocketry research.

Accessions of 1,286 animals brought the total count at the National Zoological Park to 2,384; about 400 people visited the Canal-Zone Biological Area, including 54 scientists, students and observers using the station's facilities for special researches.