19.X-10 THE ROLE OF CRYSTALLOGRAPHY IN MODERN SCIENCE. By B.K. Vainshtein, Institute of Crystallography, Academy of Sciences of the USSR, Moscow 117333, Leninsky Prospect 59, USSR.

Modern crystallography is the science of the crystalline state of matter, its structure and physical properties as well as of the formation and growth of crystals.

The mathematical basis of crystallography is the science of symmetry. Investigation of the atomic and real structure of crystals with the aid of diffraction methods made a tremendous impact not only on crystallography itself, but also on physics, chemistry, mineralogy, materials sciences and molecular biology. Crystallographic methods extend to the investigation of less ordered systems such as liquid crystals, polymers and so on. Crystal physics considers the electrical, optical and mechanical properties of crystals, and borders directly on solid state physics. The production of synthetic crystals has acquired great practical importance and has influenced, to a large extent, the development of such vital branches of science and industry as semiconductor electronics, radiotechnics, optics and lasers, instrument making, etc. Thus modern crystallography and its methods produce a substantial effect on the development of many branches of science and industry.

19.X-11 CRYSTALLOGRAPHIC METHODS APPLIED TO MATERIALS SCIENCE. S. C. Abrahams, Bell Laboratories, Murray Hill, New Jersey 07974, U.S.A.

Materials science, a multidisciplinary research area that has gradually evolved over the past three decades, is concerned with relationships between composition, structure and processing of materials, and their properties and uses. All materials undergo at least some of the following processes: initial extraction from the natural environment, refinement, purification, conversion into basic constituents, and modification to give the composition and configuration of the required end product. After the product is no longer needed, the material is either returned to nature as waste or is recovered to provide new basic constituents. Materials science contributes to each of these processes, particularly the sequence from formation of the basic constituents to the recovery of new constituents by recycling methods. The most important materials may be classified, on the basis of their ultimate use, as electrical, electronic, superconducting, nuclear and other-energy related, magnetic, biomedical, building, and aerospace materials. Crystalline phases form at many stages throughout the life cycle of most classes of materials. Virtually all crystallographic techniques can be applied to the study of these phases, and a survey of major applications will be presented. Emphasis will be placed on electronic materials. Examples will be presented that illustrate the value of crystallographic insight in leading to the recognition of new families of potentially useful materials in addition to the clarification of the nature of atomic contributions to dielectric properties.

19.X-12 MINIMUM MINIMORUM OF CRYSTALLOGRAPHY FOR MATERIAL SCIENTISTS. By J.D.H. Donnay, Geol. Sci., McGill Univ., 3450 University St., Montreal, Canada, H3A 2A7.

Crystallography is a field where birds of many feathers flock together. They come from many nests: mining, geology, mineralogy, chemistry, biology, metallurgy, textile, physics, spectroscopy, solid state science, material science. My talk is not meant to put down any one! Material scientists are fellow-crystallographers: we need them as much as they need us. The breadth of their problems is challenging; our expertise, although limited to periodic structures, may help. One primer is *Introduction to Crystallography* (Sands, D.E.(1969) Benjamin, New York), good for a bird's-eye view. The high points of morphological and structural (X-ray) crystallography are considered in a didactic paper (D. and D., Am. Min. (1978) 63, 840), which may serve as a guide. A few pointers from an old teacher: master the two lattices (direct and reciprocal) from the start; the former expresses the triperiodicity of the crystal structure and accounts for all the early morphological laws, the latter is the key to X-ray diffraction by crystals. The lattice concept is central to crystallography. Its point symmetry (at any lattice point) must be one of the 32 point groups; only 7 are possible lattice symmetries, and they form the only satisfying basis for the classification into systems (J.D.H.D. Acta Cryst. (1977) A33, 979). The hexagonal lattice (hP) symmetry, $6/m\ 2/m\ 2/m$, has 16 subgroups; the rhombohedral lattice rP=hR, symmetry $\bar{3}\ 2/m$, has five. (Beware of the "trigonal system" in *Int. Tables*: its five symbols stand for eight hexagonal subgroups and the five rhombohedral ones, regardless of lattice consideration.) And make sure not to confuse the point group *of one property of the crystal* with that *of the crystal as a whole* or the site symmetry *of one atomic center in the structure*. A space group accommodates sets of equivalent atoms; the site symmetry is a subgroup of the crystal point group.

19.X-13 DEVELOPMENTS IN THE TEACHING COMMISSION'S PAMPHLET PROJECT. By Charles Taylor, Department of Physics, University College, PO Box 78, Cardiff CF1 1XL.

At the teaching commission's summer school at Erice in 1977 the idea of producing a set of pamphlets each devoted to a specific approach to the teaching of a single topic was launched. After a good many problems the first set of ten pamphlets has now been published and a limited number of copies will be on sale at the congress. Subject to successful financial achievements it is now hoped to extend the number of pamphlets and indeed manuscripts of some are already available. Particular attention is to be paid to teaching X-ray crystallography to students of many different sciences and at different levels. A report on the present and future status of the project will be presented.