

the complexities of Nature, the calculated effects are shown to be in reasonable accord with observation.

In a final chapter calculations are made of the paths of charged particles which remain trapped in the Earth's field, of their distribution around the Earth and of their associated electric current and magnetic field; the current comprises a westwards-directed 'drift-current' and an additional part caused by the diamagnetic nature of the gas. Such trapped particles are now generally identified with those comprising the Van Allen radiation belts discovered by early satellite measurements; the electric current is considered to be closely related to the equatorial 'ring current' originally invoked to explain the 'main phase' (decrease of horizontal force) of a magnetic storm. Some comparisons are made between the calculated particle distributions and combined dipole and radiation belt fields and those measured by satellite. Chapman ends with the comment that the calculations represent only the 'primitive beginnings' of a complete theory of the ring current and its associated field and that rapid and complex changes must occur in this region during magnetic storms.

Since only about one page of the book is devoted to the subject of aurora there is a danger that the appearance of this word in the title may mislead. The author in fact expresses in the preface his intention to omit 'aurora' from the title of this edition, but there would appear to have been an eventual lack of liaison with the publishers on this point.

D. H. McINTOSH

SINGLE-CRYSTAL FILMS

Single-Crystal Films

Edited by Maurice H. Francombe and Hiroshi Sato. (Proceedings of an International Conference held at Philco Scientific Laboratory, Blue Bell, Pennsylvania, May 1963.) Pp. ix+420. (London and New York: Pergamon Press, 1964.) 100s. net.

THIS book consists of papers presented at a conference at the Philco Scientific Laboratories in 1963. After a short introduction by M. Blackman, the first papers deal with some theoretical aspects of nucleation and growth. Hirth, Hruska, and Pound review their earlier work and more recent developments, dealing mainly with low supersaturations and correspondingly large critical nuclei. Walton and Rhodin, on the other hand, adopt a more kinetic point of view and consider small nuclei formed under high supersaturation. In epitaxial films there is still some doubt about whether small unfavourable nuclei form but do not grow or simply do not form. A paper by Bauer deals with film textures or preferred orientations which cannot be attributed to epitaxial growth and occur even with films on amorphous substrates.

Later in the book a paper by van der Merwe reviews his ideas on oriented overgrowth, critical misfit and interfacial dislocations. Later papers by Matthews and by Grunbaum and Mitchell describe experimental observations of interfacial dislocations, while Hirth considers the origin of forces acting on such dislocations. Honjo directs attention to the lack of evidence for pseudomorphic growth of the initial layers of single-crystal films, emphasizes the importance of supplementing electron diffraction by electron microscopy, and shows some of the difficulties of interpreting electron diffraction results.

There are two widely separated papers on copper films, the first showing that X-ray measurements can be used to show orientation and to calculate fault densities, while the second describes the differences between films deposited and annealed on sodium chloride cleavage faces and similar films deposited on sodium chloride but afterwards transferred to electron microscope grids before annealing. The

first films contain stacking faults but a low density of dislocations, while the second films always have a high dislocation density.

Other metal films on sodium chloride are described by Sella and Trillat, who show the improved orientation obtained on surfaces cleaved under vacuum.

A number of papers deal with the growth of germanium, silicon and other semi-conducting compounds on various substrates including germanium, silicon and ionic crystals, by evaporation, sputtering and other methods. Some observed effects in permalloy and 75/25 iron/nickel films are also described.

A fascinating paper by Sato uses the gold-copper alloy system to show the ways in which the composition of epitaxial alloy films can be varied and the use of this technique to investigate the factors determining the stability of long period superlattices.

Neugebauer summarizes and analyses the work on continuous ferromagnetic films below 100 Å thick and discusses the problem of superparamagnetism in films having an island structure. The general field of single-crystal ferromagnetic films is reviewed by Heavens with particular emphasis on nickel, iron and nickel-iron alloys. The importance of vacuum conditions and purity is stressed. The subject of domain structure in epitaxial films of iron, nickel and cobalt is covered by Sato, Toth and Astrue for films less than 1000 Å thick. Films were grown mainly on cleaved magnesium oxide crystals ((001) plane), but nickel films were grown more easily on lithium fluoride and some nickel films were grown on copper single crystals of (110) orientation. The pattern was always influenced by defects in the substrate, but there was a general tendency for 90° walls to predominate over 180° walls.

A single paper on the resistivity of thin films compares single crystal gold films produced by sputtering with polycrystalline films, and discusses the results in terms of diffuse or specular scattering of the conduction electrons.

The main criticism of the book would be that the papers are inconveniently grouped, and a cursory examination could give a false impression of its general value. This field is developing rapidly and the conference has performed a valuable function. The decision to publish in this form was wisely taken.

C. WEAVER

AMOEBIA CHROMATOSA

A New Protozoan

Its Relation to Malignant and other Diseases. By Roger Wyburn-Mason. Pp. 104+40 illustrations. (London: Henry Kimpton, 1964.) 32s. 6d. net.

IN the past attempts have been made to demonstrate a relationship between worms and slime moulds and the development of malignant disease. In this book the author attempts to demonstrate a relationship between a previously unrecognized amoeba, *Amoeba chromatosa*, and the development of premalignant and malignant conditions. Using cold minced tissues on a membrane filter with pore diameters 0.5–1.0 μ above warm Ringer's solution, the author claims to have found this amoeba in the Ringer's solution from all the spontaneously occurring tumours in animals and man that he examined. He also found it in unaffected muscles and lymph nodes from patients with carcinoma, and in a wide variety of non-malignant conditions such as rheumatoid arthritis, cystic mammary dysplasia, cirrhosis of the liver, Paget's disease of bone, and Crohn's disease. The organism was also isolated from samples of raw butcher's meat, milk, uncooked eggs, and soil.

The clinical histories of patients with malignant disease are considered, and features such as pyrexia, tumour necrosis, eosinophilia, neuropathy, secondary