what we now know of the nucleotide sequence of globin mRNA. Though up to the present still mostly done in rabbits and mice, this work has now entered the realm of human haemoglobin, and comparisons can now be made between some nucleotide sequences of human α and β globin mRNA's and the homologous regions in the rabbit. The co-ordination of synthesis of α and β chains and of haem and globin are described by Tim Hunt. J. Paul discusses haemoglobin synthesis at the level of chromatin and cell differentiation where the maturation of erythrocytes in mammals proceeds from pluripotent to committed cells destined to become morphologically identifiable red blood cells. There is also a valuable section on erythropoietin.

D. J. Weatherall and J. B. Clegg complement these chapters with an analysis of the molecular basis of the thalassaemias where the genetic systems described previously have gone astray. The clinical management of thalassaemia major is described by B. Modell and this includes intensive transfusion schemes as well as the effects of long-term chelating therapy and the prevention of thalassaemia itself by antenatal diagnosis and abortion.

M. F. Perutz mentions in his introduction that haemoglobin was the first molecule in which the transition from one form to another, fetal to adult, was described which still is one of the simplest manifestations of cell differentiation. If the mechanism of that transition could be subjected to outside control a therapy for sickle cell anaemia and thalassaemia could be developed. It is, therefore, fitting that there is also a final chapter by W. G. Wood on haemoglobin synthesis during human fetal development, where one may hope that in due course it will become possible to control the switch from fetal to adult haemoglobin with all its practical consequences.

This *Bulletin* should find its way into almost every biologist's library. Haematologists must be greatly interested in the degree to which haemoglobin has been investigated and can now be integrated with the problems of disease and therapy. Anyone associated with genetics to the slightest degree will find this issue of the *British Medical Bulletin* indispensable.

HERMANN LEHMANN

The HLA System: An Introductory Survey.
By A. Svejgaard, M. Hauge C. Jersild, P. Platz, L. P. Ryder, L. Staub Nielsen, and M. Thomsen. (Monographs in Human Genetics, Vol. 7.) (Pp. 103; Figures + Tables. SFr. 38; DM 36; approx. US $ 14·75.) Basel and New York: Karger. 1975.

This monograph from the Copenhagen Blood Bank and the Odense Clinical Genetics Unit on the HLA system is admirably clear and up to date. First the components of the system are described, the classic A, B, and C series and the MLC or D locus, the loci for the immune response genes, the loci for the complement components Bf, C2, and C4, and the loci for the Bg and Chido blood groups all close together on chromosome 6 Next the linkage disequilibrium between some of the alleles at the four HLA loci is described, the strongest being between some of those at the C and D loci. References are given to geographical variation; the A1 B8 haplotype, common in Europeans, is rare in other races. Amerindians have few of the well-known HLA antigens. Next the homologous systems in the mouse and rhesus monkey are described. Next a brief account of the biochemistry of the HLA of antigens is given. They are probably glycopeptides embedded in the cell membrane and bound to a molecule of β_2-microglobulin. The gene coding for the β_2-microglobulin is probably on chromosome 15. Next the importance of the HLA system for organ transplantation is described and the remarkable association of HLA alleles and a variety of diseases. The strongest of these still seems to be that of ankylosing spondylitis and B27, followed by Reiters syndrome and anterior uveitis with the same allele. This clearly separates this form of arthritis from other forms. The association of juvenile diabetes with B8 and B15 confirms the view that this form of diabetes is distinct from the more common form with onset usually in middle age. The authors think that the association with B27 must be direct since it has been found in three different races, and different races tend to show different gametic associations. The additive affects of B8 and B15 for juvenile diabetes, in contrast to the absence of such an effect for B13, 17, and 37 for psoriasis, suggests that in the former case the two alleles confer susceptibility by different mechanisms. The authors briefly describe the mechanisms that have been suggested for these associations. Next the authors describe the possible biochemical functions of the HLA system, for example the prevention of tumour formation and the incorporation in the cell membrane of viruses, so making these more easily recognizable by the body defences. Both mechanisms would help to account for the remarkable degree of polymorphism found at the HLA locus. The final chapter gives an outline of the laboratory methods involved in work with HLA.

This is an excellent introduction to a most intriguing development in human genetics.

C. O. CARTER

Biology of Radiation Carcinogenesis

Edited by J. M. Yuhas, R. W. Tennant, and James D. Regan. (Pp. xxiii + 341; Figures + Tables. $30·00.) New York: Raven Press. 1976.

Until quite recently it was common practice to think of, or to work with, virus-induced cancers, or radiation-induced cancers, or genetically-determined cancers. There has, however, been a growing realisation that to consider any one of the aetiological factors in isolation is to ignore the most important fact of all, namely, that cells acquire the properties that we call malignant as the result of a relatively complex series of events which can be influenced by a great many interacting factors. The title of this book should, therefore, be the 'Role of Radiation in the Biology of Carcinogenesis'. Not only would that fit better with current concepts, it would also describe more accurately the contents of the book. It is not confined to 'radiation carcinogenesis'—indeed the editors make it quite clear in their introduction that the intention of the Gatlinburg conference in April 1975 on which this volume is based was to try to examine the role of radiation in relation to other factors, and they claim, quite justifiably, that this is an 'up to date summary of carcinogenesis in general'. Its broad base and manner of presentation—a mixture of background and detail in a rather large number of short chapters—makes it a most useful book even for those with only a passing interest in carcinogenesis. Chapters by Ormerod, Cerutti, and Remson, Regan and Setlow, Robbins *et al.*, and Maher and McCormick, provide an excellent review of current work on the significance of DNA damage and its repair in the initiation of carcinogenesis. Not only are the molecular mechanisms considered but in Robbins' chapter we have a clear indication that in xeroderma pigmentosum the severity of the neurological symptoms of the disease is related to the extent of the insufficiency of the cells at the molecular level.

The interaction of the environmental factors with the genome of the cell is emphasised. In the case of chemicals Miller and Miller, and Greenberger and Weinstein point out that interaction with DNA, especially conformational changes in the DNA as a result of carcinogen binding, are of particular importance. In a series of beautiful chapters, Lilly, Lowry, and others show how virus genome, either exogeneous or endogeneous in origin, may have a specific chromosomal localisation and in some cases at least respond to cellular regulatory mechanisms. The role of radiation in the expression of virus information is also explored. Though it has been published before I still find the claim by Carmia Borek that cells can be transformed *in vitro* by doses of *X*-rays as low as one rad quite extraordinary, as is the report in this paper that 0.1 rad of neutron irradiation will transform cells. This is potentially of such importance I would like more information about the properties of the transformed cells. Vague statements about tumorigenicity like 'the ability to produce tumours varied among the cell lines studied' are not enough. What I want to know (and have done since I first learned of this work several years ago) is just how many lines are tumorigenic, how many cells are required to produce tumours, what is the latent period, what controls were carried out? Come on Dr Borek, let's have the facts—with transformation at 0·1 of a rad it affects us all.

D. G. HARNDEN

Proceedings of a Workshop on Basic Aspects of Freeze Preservation of Mouse Strains (1974, Bar Harbor, Me.)

Edited by Otto Mühlbock. (Pp. x + 133; 36 figures + 42 tables. DM 48.) Stuttgart: Gustav Fischer. 1976.

Since 1972 the stirring slogan 'freeze, wait, resuscitate.' has been a reality for some mammalian embryos at least. Thousands of these, in suspended animation at −196°C, now wait to be born months, years, or decades hence, after successful thawing and transfer to a foster-mother. As this volume reveals, success has been achieved in rats, rabbits, cows, and sheep as well as mice, at embryonic stages varying from 2-cell to blastocyst. The importance of this breakthrough, for the indefinite preservation of important strains and genetic variants, needs no emphasis. In the proceedings of this workshop the pioneers describe the critical factors necessary for success, the most essential being very slow freezing with the right sort of additive and almost as slow thawing. Actual techniques are discussed in some detail in a final section. Other contributors deal with such matters as the logistics of the exercise in an actual genetics laboratory (as compared with preservation of mutants by breeding), possible effects of ionizing radiation, consequences of removing the embryo from its normal maternal environment, and the prevention of contamination. It is a pity that there is no index, that very few papers have summaries, and that typographical errors are common. Nevertheless, this is an essential source of information for anyone interested in this fascinating new technique.

A. G. SEARLE

RNA Polymerase (Cold Spring Harbor Monograph Series).

Edited by R. Losick and M. Chamberlin. Parts I and II. (Pp. ix + 581; figures + Tables. $38·00.) New York: Cold Spring Harbor Laboratory. 1976.

The scientific publications of the Cold Spring Harbor Laboratory are of a uniform excellence. Based on a conference held in 1975, this book is in two parts.

Part I opens with a personal account by S. E