

opaque in style. His method of analysing the racial components of populations seems to be artificial and fallacious. It is not clear how the characteristics of the hypothetical ancestral populations are known and the assumption that their constellations of characters segregate *en masse* as if due to single genes has no foundation in genetics. In his chapter on the racial biology of the South African Bantu, J. D. J. Hofmeyr suggests that adaptation to extreme environments leads to loss of genetical variability. He provides no evidence that variability is notably reduced in peoples such as the South African Bushmen whom he cites, and when he suggests that the Tasmanians succumbed because of depletion of variability one wonders whether any amount of polymorphism would have helped them against firearms.

It is a relief to turn to the article by I. Schwidetsky on race and the biological history of peoples. This is one of the more thoughtful and cautious contributions, emphasizing the pitfalls of attributing cultural achievement or decline to genetical events. C. D. Darlington, dealing with the related theme of human society and genetics, is less cautious. D. C. Rife's chapter on race and heredity contains much that is sound but is too dogmatic on some points, such as that genes for skin, hair and eye colour are "fixed" in unmixed Asian and African populations. He finds no evidence for biological advantages or disadvantages in miscegenation but seems to feel that it is better avoided.

The most sensitive area in controversies about race is the question of inherited differences in intelligence and other mental attributes. Probably few geneticists would deny that such differences may exist but the technical problems of demonstrating them satisfactorily are formidable. American Negroes have often been found to make lower average scores than white people on standard scholastic tests and the interpretation of such data has been hotly debated. F. C. J. McGurk reviews some of this work together with his own studies in which an attempt was made to equate the tested groups in cultural background. He forcefully denies that the "culture hypothesis", which has been ably defended by Klineberg elsewhere, has any factual support. S. D. Porteus provides an interesting account of his experiences in using his well-known maze test on Australian aborigines and other non-European peoples, some of whom achieved high scores. He believes that qualities different from those brought out by scholastic tests, and broadly defined as mental alertness, are revealed by the maze.

It is impossible to comment on all the articles in this book in a short review. Suffice it to mention also quite interesting articles by R. E. Kuttner on biochemical anthropology, by L. Gedda on inter-racial crosses in Italy, by C. Gini on the sociology of racism, and by F. Keiter on the cultural preferences of various racial groups. The authors were chosen, so the editor tells us, because their ideas were known to be "original, provocative and even controversial". It seemed to me that the last two qualities were more in evidence than the first.

N. A. BARNICOT

induced cancer in experimental animals. The expectation that this great discovery would be followed by the elucidation of the mechanisms involved in the carcinogenic process has not so far been fulfilled. However, the study of carcinogenesis still constitutes the most promising approach towards a solution of the central problem in cancer research, namely, to describe in biochemical terms the nature of the changes which are responsible for cells acquiring malignant properties.

Most modern theories of carcinogenesis lie between two extremes, a wholly direct and a wholly indirect mode of action. According to the first, the function of the carcinogen consists of converting a normal cell into a malignant one, as a result of direct chemical reaction with the DNA in the cell. The appearance of the cancer is seen as an inevitable consequence of the multiplication of the genetically transformed cells. The concept of indirect action arises from experiments which appear to show that spontaneous transformation to malignancy is a relatively common event in animals, but that the vast majority of such cells are eliminated before developing into a tumour. The role of the carcinogen is seen as facilitating the "escape" of such malignant cells, possibly by interfering with normal host defence mechanisms that are directed against them.

The publication of the thirty-seven papers, contributed by the leading workers in the field of carcinogenesis to the Annual Symposium on Fundamental Cancer Research held by the M. D. Anderson Hospital and Tumor Institute of Houston, Texas, is most timely and valuable. By taking a broad look at the problem of human carcinogenesis from multiple approaches it is bound to influence the direction of future research and cannot fail to interest everyone engaged in cancer research and cancer prevention. Though most of the data come from studies on small animals, the emphasis is on its application to cancer in man. The hard road of going from mouse to man is illustrated particularly clearly in the section dealing with the aetiology of lymphomas and leukaemias. In two other sections dealing respectively with carcinogenesis in mammary tissues and in the liver, there is a most stimulating confrontation of animal experiments with human experience.

While at the mechanistic level the key discoveries have yet to be made, from a practical point of view there can no longer be any doubt that external factors are responsible for a high proportion of human cancer and that prevention is not only a realistic aim but may already in the near future contribute to a significant reduction in cancer. Carcinogenesis is also becoming closely linked with new advances in treatment such as immunotherapy and viral interference which cannot be applied without some knowledge about the aetiology of the tumour to be treated. This aspect also is dealt with in this symposium.

The production and editing of this book are of the highest standard and the price is most reasonable.

PETER ALEXANDER

CARCINOGENESIS

Carcinogenesis

A Broad Critique. (A Collection of Papers presented at the Twentieth Annual Symposium on Fundamental Cancer Research, 1966.) Pp. xii + 774. (Baltimore, Md.: The Williams and Wilkins Company, 1967. Distributed in the U.K. by E. and S. Livingstone, Ltd.) \$16; 147s. 6d.

Forty years ago, Sir Ernest Kennaway isolated 1 : 2.5 : 6 dibenzanthracene, the first pure chemical substance which

ANALYSING AMINO-ACIDS

Amino Acid Determination

Methods and Techniques. By S. Blackburn. Pp. xi + 271. (London: Edward Arnold (Publishers), Ltd.; New York: Marcel Dekker, Inc., 1968.) 110s. net.

The salvation of protein chemistry lies in the recognition of proteins as polymers. Structural elucidation is thereby reduced to the determination of the number, type and sequence of the monomer units, the amino-acid residues, in the polymer chain; synthesis, to the assembly of the