tial reasonably approximated by a quadratic form, are accounted for rather well by the theory associated with the names of Kirkwood, Rouse, Bueche, and Zimm, and this theory is lucidly reviewed by Yamakawa. The incorporation of more realistic potentials has led to a variety of approaches, such as the use of rigid arrays of segments, modification of dimensional averages required in the theory, or modification of the force constants in the quadratic form. The difficulties, shortcomings, and successes are more or less briefly explained.

The industrial and biological significance of macromolecules, and perhaps even more importantly the variety of problems, and their suitability to statistical mechanical and experimental investigation, have generated an explosion of interest in macromolecular theory. The experienced theorist who cares to know what has been accomplished in dilute-solution theory, or of methods and models that find much wider applicability, and the student with a good introduction to statistical mechanics behind him will find Yamakawa's book an invaluable guide. There is nothing else remotely like it.

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Spermine, Spermidine, Etc.

Introduction to the Polyamines. SEYMOUR S. COHEN. Prentice-Hall, Englewood Cliffs, N.J., 1971. xii, 180 pp., illus. $7.95.

Until a few years ago studying the biochemistry and physiology of the naturally occurring polyamines putrescine, spermidine, and spermine was almost exclusively the province of a small number of research groups whose prime interest was in these polyamines. Recently a change has occurred so that a number of workers who have been interested primarily in the control of RNA synthesis, the effects of hormones on nucleic acid synthesis, and processes associated with the cell cycle are now either interested in or working on polyamine biochemistry.

A number of factors account for this change in status of polyamine biochemistry; among the most important are (i) the establishment of a correlation between polyamine metabolism and RNA metabolism in a wide variety of procaryotic and eucaryotic cells, (ii) the demonstration that ornithine decarboxylase activity correlates well with the growth rate of many tissues, that its turnover in regenerating liver is remarkably fast, and that its activity in many tissues is increased by the administration of appropriate hormones, (iii) the development of rapid electrophoretic and thin layer chromatographic methods for the sensitive assay of polyamines, and (iv) the isolation of mutants of *Escherichia coli* defective in certain of the enzymes necessary for polyamine biosynthesis.

It is thus timely that Seymour Cohen should write the first book devoted exclusively to naturally occurring polyamines. It is the most extensive review of polyamines since that of Hugh and Celia Tabor in 1964 (*Pharmacol. Rev.* **16**, 245). The book comprises four chapters, the first of which opens with an interesting account of the history of polyamines since 1674 including snippets of the biographies of the men involved. The second and third chapters are devoted to polyamines in eucaryotic and procaryotic cells, respectively, and the final chapter is entitled "Organic cations in the structure and function of nucleic acids."

From reading the book it becomes very clear that there is now an abundance of evidence showing a correlation between polyamines and RNA synthesis, but also that we know very little about the nature of this correlation. Cohen presents a number of novel and speculative suggestions as to how polyamines might act. He also analyzes why many molecular biologists shrug their shoulders after posing the question, "Won't magnesium ions do the job equally well?"

The book, which is based on four lectures which Cohen gave to the Collège de France in 1970, could be better organized. The development of the themes is sometimes illogical and the subheadings are often uninformative and bear little relation to one another. For example, the biosynthesis of spermidine is dealt with under three separate headings in three separate chapters; it could surely be dealt with more logically in a single section. The book has a good index and bibliography and in spite of shortcomings should prove stimulating reading for potential workers in the field and a useful reference work for those already in the field.

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Viral Oncology

Growth Control in Cell Cultures. A Ciba Foundation symposium, Oct. 1970. G. E. W. WOLSTENHOLME and JULIE KNIGHT, Eds. Churchill Livingstone, Edinburgh, 1971 (U.S. distributor, Williams and Wilkins, Baltimore). x, 276 pp. + plates. $11.75.

This symposium is concerned with the mechanism of growth restriction in crowded cell cultures. The discovery that oncogenic viral transformation relieves this restriction has stimulated renewed interest in the problem. Some investigators have assumed that this density-dependent inhibition of growth is the consequence of cell-to-cell contact, whereas others have argued that it is due to decreased accessibility to serum growth factors. Papers presented at the symposium support both points of view. Indeed, as evidenced by the spirited discussion following each paper, there was little agreement on the relation between the respective roles of plasma membrane and components of the culture medium. This difficulty is easy to understand in view of the multiplicity of growth factors, inhibitors, and surface phenomena studied. It is certainly compounded by the fact that different cell systems and a variety of assay techniques have been employed.

Among the more promising approaches to the problem of the relation between cell surface structure and growth control is that of Max Burger and associates. Burger found a difference in the molecular surface structure of normal cells and their counterparts after transformation by oncogenic viruses. This difference is expressed in the exposure of wheat germ agglutinin receptor sites in the transformed cells. These sites are present in masked form in normal cells, where they can be demonstrated transiently after brief treatment with a proteolytic enzyme and during normal mitosis. A correlation between the degree of exposure of agglutinin sites and loss of density-dependent inhibition of growth was also found.

The use of genetic methods to analyze the relationship between topoinhibition (contact inhibition of growth), surface changes, and stimulation of cellular DNA synthesis was a lively topic of discussion. The results of studies with temperature-sensitive mutants of polyoma virus were interpreted by Dulbecco to show that low topoinhibition and high wheat-germ agglutinating ac-

tivity are controlled by the same viral gene. On the other hand, Dulbecco found the serum requirement of wounded cell layers not to be related to topoinhibition. Both parameters were measured by their effect on cellular DNA synthesis. As more mutant viral strains and, we may hope, cell membrane mutants become available, we can expect accelerated progress in this area.

The presentation and discussions have been useful in clarifying existing concepts of growth regulation in culture and in stimulating the development of new ideas for future experimentation. Although the symposium is directed primarily to workers in viral oncology, it will be of interest to all who use cell cultures as a model system.

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