mental processes in the premixed laminar flame is impressively presented in their book, and it serves as an example of what can be done, an example that may stimulate others concerned with these alternate types of flames.

In comparing this book with other recent combustion treatises, I found that the treatment overlaps to some extent that of C. P. Fenimore's *Chemistry in Premixed Flames* (Macmillan, 1964) but contains a far more comprehensive account of experimental techniques. Fenimore discusses a greater variety of chemical processes, however (soot formation, nitric oxide decomposition, and halogen effects, for example). Neither book explores the theory of flame structure in depth. The recently published volume, *Combustion Theory*, by F. A. Williams (Addison-Wesley, 1965) covers entirely different ground; for example, its eight-page author index fails to list either Fristrom or Fenimore (Westenberg is briefly mentioned). Students who wish to acquire an overview of current combustion research should certainly look at *Combustion Theory* as well as *Flame Structure*.

Flame Structure is remarkably free from errors, as far as I noted. On page 139, Fristrom's "frustrum" is really a frustum, and (p. 30) the H_2-F_2 flame is actually much hotter than the authors are willing to concede.

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Biological Energy Transformations

Bioenergetics: The Molecular Basis of Biological Energy Transformations. Albert L. Lehninger. Benjamin, New York, 1965. xvi + 258 pp. Illus. Paper, $2.95; cloth, $6.

This book presents in a clear and easily readable form the transformations and use of energy in biological systems. It is very welcome because it is good to be reminded that the flux of energy through a living system is essentially what makes the system alive, and that an understanding of energy feed-in into biosynthetic processes was the necessary premise, for example, for today's dramatic comprehension of the biochemistry of information transfer.

It is agreeable that, in a text geared to students largely in biology and medicine, thermodynamic formalism is kept at a minimum and its meaning is explained in a commonsense manner rather than in abstraction. In this commonsense environment, one is all the more surprised to find the old complaint that the terms "energy-rich" or "high-energy" bonds are misnomers, repeating the, by now, rather stale reference to a usage in a different context of the term "bond energy" as the energy liberated in the formation of a bond (for pertinent discussion, compare W. P. Jencks, in *Survey of Progress in Chemistry*, vol. 1, p. 249). Nonetheless, the book is filled with squiggles (~); the urgent need for this symbol standing for energy-rich bonds has, indeed, made some sections of metabolic literature almost a kind of "squiggology." If one does not like high-energy or energy-rich bonds, one might well speak instead of "high group potential," a useful and more flexible term that is not introduced here.

The main strength of the book is quite naturally the discussion of biological energy transformations, this being the author's field of greatest experience. The outline of biosynthetic mechanisms, in some ways, does not come off as well. For example, a synthesis of sucrose from glucose 1-phosphate and fructose is mentioned as being exergonic; in fact, it is an endergonic reaction, and the biosynthetic path for sucrose is, rather, through uridine diphosphoglucose (UDGP) + fructose, which is exergonic [L. F. Leloir, in *Proc. Plenary Sessions*, 6th Intern. Congr. Biochem. **33**, 15 (1964)]. Subsequently, UDPG is presented in the synthesis of glucosidic bonds in glycogen, and the rather large "waste" of energy in this synthesis is emphasized. Elsewhere in the book, however, there may be a little too much fascination and marveling about the perfection of biomechanisms at a time when, in some fields, we are discovering that man-made devices are frequently superior.

One would have liked to see a few more references to pertinent literature. Although the author included a partial quotation of the famous introduction by Lewis and Randall to their *Thermodynamics* (McGraw-Hill, 1923), the name of G. N. Lewis does not appear in these pages. This is particularly deplorable to those who consider Lewis a pioneer in the application of thermodynamics to biochemical problems, and who grew up using, as he proposed, the $\triangle F$ rather than the $\triangle G$ for change in free energy. The use in this book of $\triangle G$, in view of the almost exclusive use of $\triangle F$ in biological literature, should at least have been introduced as an alternative to $\triangle F$ rather than without further explanation.

Finally a word on the reference to negative entropy as a measure of information. Here I should like to quote from MacKay (in *Man and His Future*, p. 154): "One could say that whereas physics looks for explanations in terms of the *dependence of force upon force*, the science of communication constructs its "causal chains" out of the *dependence of form upon form*, . . . regardless of where the necessary energy came from." I think that, at the moment, there is a great deal of loose talk which glosses over this fundamental difference.

My minor reservations are not meant to detract from the great usefulness of this book as an introduction to biological energy transformations. The large number of well-designed illustrations will be quite helpful to the newcomer's understanding of essential features, on which the book rightly concentrates.

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Cytogenetics

Human Chromosome Methodology. Jorge J. Yunis, Ed. Academic Press, New York, 1965. xiv + 258 pp. Illus. $8.50.

A new era in cytogenetics was instituted in 1956 when Tjio and Levan published the report that human cells contain 46 chromosomes. Since that time events have moved with almost explosive rapidity, and the large accumulation of literature describes results of great importance to both fundamental biology and medicine. The coincident rise in interest in the practical aspects of this phase of genetics has resulted in the publication of a large number of monographs and reviews on the subject.

This book, however, does in part fill a need unmet by most other re-