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Book Reviews

Entropy: A New World View

by Jeremy Rifkin (with Ted Howard)
Viking Press, New York,
1980, 305 pages, $10.95.

The evolution of man has occurred at the expense of his environment. If the human animal and his artifacts have gained in "orderliness" and sophistication, it has been at the expense of other life forms and of his physical environment. Everything outside has gained in entropy. Indeed, we now appear to choke on our own effluvia, which surrounds us. Each new "advance" requires new countermeasures and like rats on a treadmill we have to run faster and faster to sustain the good life we try to create.

This well-understood, if gloomy, state of affairs is the subject of Rifkin's little monograph on entropy and the human condition. He tells us that much of our trouble is the result of our failure to absorb the full import of the Second Law of Thermodynamics. He argues that we organize our lives as though we lived in a world that enjoyed the supposed reversibilities of Newton mechanics. We therefore do more damage than we would if our acceptance of the Second Law were more than merely intellectual.

He begins his account by addressing us as a scholar; then he abandons that pose and puts on the black suit of an itinerant evangelist. I must say that I found the evangelist almost as compelling as I found the scholar annoying. The scholar thinks that Maxwell's Demon and Boltzmann's H-theorem were assaults on the Second Law rather than clarifications of it. The scholar creates bad history by stringing together out-of-context quotations from good philosophers and historians. The scholar seeks to find the way to our hearts through our heads and he simply doesn't have the skill to do so.

How does a scholar turn into an evangelist? He undergoes a baptism by total immersion in sometimes undifferentiated facts. This Rifkin does in the central half of his tract. He counts the calories of our self-indulgences through all of the more sophisticated aspects of our civilization and he totes up the costs in calories per degree. He provides so much ammunition—we are in such a mess! From antibiotics spawning super diseases to agricultural products that cost ten times the food energy that they contain. Beyond convincing us, he almost inures us to the problem.

But the pure evangelist finally emerges to speak from the heart and I am touched by what he says: We cannot escape our task as stewards of God's gifts. And this task can only be accomplished by people with a genuine love for those gifts and for the other people who might enjoy them.

Perhaps Rifkin is the environmentalist's answer to members of the Nuclear Fusion Society who assail us in the airports. They say we should "nuke the whales" and warm up the entire outdoors, if winter is not to our liking. Perhaps there is something to be learned by viewing this complex issue in such cartoon-like polarization.

Yet I remain troubled by one point. While Rifkin quotes Genesis he avoids a key line from that magnificent explanation of the human lot:

> Because thou hast. . . eaten of the tree [of knowledge] . . . cursed is the ground for thy sake; in sorrow shalt thou eat of it. . . thorns and thistles shall it bring forth to thee - - -. In the sweat of thy face shalt thou eat bread.

We can't go back to Eden. Perhaps we are condemned to expand our high technology into higher technology until we all sink back into the now-smelly sea. What Rifkin really wants us to do is to find the equilibrium point just between dying from a lack of human vitality and an accelerated entropy death. I fear that that equilibrium is intrinsically unstable. Yet Rifkin is certainly correct in saying that our only hope is look for it – to seek the "door into summer" that we all wish we could pass through.

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Thermal Energy Storage and Regeneration

by F. W. Schmidt and A. John Willmott

Hemisphere Publishing Corporation,
Washington, D.C.,
1981, Price: $35.50

Energy storage devices are important in the design of many types of conservation and energy conversion systems. An up-to-date and comprehensive treatment of thermal energy storage is therefore an important topic in modern engineering practice. This book is a good start toward this goal but, unfortunately, does not cover the complete range of thermal energy storage technology; it is limited to a treatment of sensible heat storage in stationary solids through which flow channels pass a heat transporting fluid.

The early chapters of the book deal with the "single-blow problem", where a gas passes continuously through a heat-storing solid material in one direction. Since the mathematical models of these systems can be linearized, solutions are obtained analytically by super-position techniques. The results predict the thermal performance of systems experiencing timewise variations in inlet fluid temperature and mass flow rates. Solutions to this type of problem have many applications, e.g., drying or cooling of beds of grain, thermal energy storage in buildings, and industrial waste heat recovery.

Six chapters are devoted to thermal regenerators. These

devices have been used widely in Europe and presentation for the American engineering community is a welcome addition to the technical literature. The treatment includes finite conductivity and nonlinear models, as well as new concepts in computational methodology for generators and heat storage exchangers.

The book, which was originally prepared as a text for a continuing education service course entitled "Prediction of the Performance of Sensible Heat Storage Units" in 1977 is clearly written, contains numerous sketches and schematic diagrams of heat transfer equipment and should be easy to follow by engineers who have had an introductory course in heat transfer and differential equations. The authors have included useful illustrative examples. The sample problems are worked in SI as well as in engineering units and will, therefore, assist in the transition of using SI units by practicing engineers. If a second edition of the book is published, this reviewer would like to suggest that a table of pertinent physical properties be appended and a chapter on the economics of energy storage be included.

Most of the material is devoted to analytical methods suitable for generating parametric solutions, when possible, or for computer technology when closed solutions are unavailable. Unfortunately, little or no experimental data are presented by the authors to indicate the reliability and accuracy of the idealized solutions in practical applications. In many cases the authors present their solutions parametrically in graphical as well as in Tabular form. In one instance, 12 pages of computer printouts are presented, but they contain no more information than three simple graphs. If the book is intended as a text, there appears to be no need for this sort of duplication.

In some cases, the selection of references for the sparse experimental data contained in the book is puzzling. For example, in the chapter on design optimization, which is probably the weakest in the entire book, the authors calculate convective heat transfer in ducts of rectangular cross section with equations proposed in their reference [7], published over ten years ago in *Heat Transfer - Soviet Research,* a publication that is not available in most libraries. More recent correlations for the same geometry have been proposed by American and by West European authors in journals more accessible to the average user. Why not refer to them?

Despite these shortcomings, this book contains sufficient interesting and useful information to be an important reference source for engineers concerned with transferring heat from a gaseous working fluid to a solid sensible heat storage medium and/or a thermal regenerator for effective utilization of energy. It will also be useful for supplementary reading in graduate courses in heat transfer, energy conservation and energy conversion.

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