

again evident, and this book should prove invaluable to a worker concerned with proper procedure, the effect of observational errors and incomplete sampling on the results.

This concern for detail is in vivid contrast to his virtual omission of modern interpretation of the observations. For example, solar motion is treated in a classical manner; the cause of variation in solar apex for different stellar groups and the distinction between standard and basic solar motion are not mentioned. Chapters 3 and 4 are concerned with star streaming, which has historical and mathematical interest but little immediate practical use. The next chapter introduces the concept of ellipsoidal distribution of stellar-velocity vectors, but his discussion of its fundamental cause, found in the final chapter on galactic rotation, is very brief. He avoids such interwoven topics as stellar-density distribution and galactic dynamics so limiting the book to kinematic problems, as the title indicates.

Dimitri Mihalas is known for his fine work in stellar atmospheres, and he is to be admired for his motivation in writing *Galactic Astronomy*. A first text in galactic structure is needed, and this book goes far in filling the vacancy. It is regrettable that the first modern text has not been written by an experienced researcher in the field, however, because so much of its value depends on the proper evaluation of available observational data. Unlike *Stellar Kinematics*, discussion and interpretation of observations are included but at times should be more extensive.

The first three chapters in Mihalas's book are devoted to brief descriptive topics found in elementary texts, but these 45 pages should either have been omitted entirely or significantly expanded. The weakness of this section is exemplified in the discussion of errors in trigonometric parallaxes. His explanation for negative parallaxes is actually incorrect. It is regrettable that he did not reference more authoritative sources, such as Peter van de Kamp's *Principles of Astrometry* (W. H. Freeman), which deals in detail with problems of this type. From chapter 4 on, where he is concerned with specific details of stellar motions, galactic rotation and galactic dynamics, there is little to criticize. Mihalas writes well, and the book contains sufficient detail to introduce

the student to the concepts. Unlike Smart, he effectively discusses the currently important problems of galactic structure, such as interstellar absorption and the relation between stellar populations (ages) and motions (velocity ellipsoids). In many cases diagrams would have better conveyed the concepts than the extensive tables, most of which are unnecessary in a book of this type.

The difference in detail in the two books, which illustrates the basic difference in their purposes, is vividly depicted in the respective chapters on statistical parallax; Mihalas devotes six pages to it (a good length for a textbook), and Smart takes 36 pages.

Both books will remain useful for some time: *Stellar Kinematics* because it represents a rigorous mathematical approach to standard problems in the subject, quite independent of the constant, but slow, improvement and increase in observational data; *Galactic Astronomy* because it is presented in a readable form and includes most major topics of interest in the subject at a useful level for a first text in the field.

* * *

Kenneth Yoss is an astronomy professor at the University of Illinois Observatory, Urbana, Ill.

Beauty in the eye of the beholder

LAGRANGIAN DYNAMICS: AN INTRODUCTION FOR STUDENTS. By C. W. Kilmister. 136 pp. Plenum, New York, 1968. \$7.50

by GARRISON SPOSITO

In 1834, while in the process of delivering his own name onto the list of the immortals in physics, Sir William Rowan Hamilton wrote in celebration of the men who had created analytical mechanics. He singled out with obvious gratitude Comte Joseph Louis Lagrange as one who had "perhaps done more than any other analyst to give extent and harmony to such deductive researches, by showing that the most varied consequences respecting the motions of systems of bodies may be derived from one radical formula; the beauty of the method so suiting the dignity of the results, as to make his great work a kind of scientific poem."

Hamilton's elegant praise has in no sense become hyperbole with the pas-

G | B Technological Injury:

THE EFFECT OF TECHNOLOGICAL ADVANCES ON ENVIRONMENT, LIFE AND SOCIETY

Edited by J. Rose

Technological advances in this century have been of immense benefit to mankind: they have also resulted in grave dangers, affecting the very fabric of life and society. Thus, the higher standard of living is accompanied by the catastrophic pollution of our environment, cities in distress, populations under stress and an economy based on waste. But man has a choice of keeping this planet healthy or of dying with it.

This book is a collection of 15 chapters contributed by experts in various fields relating to the effect of technology on environment, life and society. The aim of this work is to present to an intelligent public a sober and fair account of the potential and actual dangers of technological advances. *Technological Injury* points out these dangers, impartially discusses their implications, and shows what steps should be taken to counteract the existing and potential effects. The contents of this book are divided into 2 sections: POLLUTION OF THE ENVIRONMENT and EFFECTS ON SOCIETY AND LIFE. All who care about the world they live in will welcome this book.

-----ORDER FORM----- GORDON AND BREACH, SCIENCE PUBLISHERS, INC.

150 Fifth Avenue, New York, N. Y. 10011

Please send copy(ies) of TECHNOLOGICAL INJURY: The Effect of Technological Advances on Environment, Life, and Society edited by J. Rose.

.....Reference Edition
\$19.50/Prepaid \$15.60
.....*Professional Edition
\$10.00/Prepaid \$8.00

.....TOTAL PAYMENT ENCLOSED

*Professional Editions are available only to individuals who warrant the volumes are for their own personal use and who order directly from the publisher.

NAME _____

ADDRESS _____

CITY/STATE/ZIP _____

Prepaid Orders: All orders from individuals must be prepaid. Prepaid orders average 20% discount and we pay all handling and postage charges. USA residents add applicable sales tax.

New and Outstanding Texts from Wiley

THE ELEMENTS AND STRUCTURE OF THE PHYSICAL SCIENCES

Second Edition

By J. A. RIPLEY, JR., *Stanford University*; and R. C. WHITTEN, *National Aeronautics and Space Administration*.

Discusses the development of the underlying principles of the physical sciences. 1969 Approx. 704 pages \$11.50

QUANTUM MECHANICS

Second Edition

By EUGEN MERZBACHER, *University of North Carolina, Chapel Hill*.

Revised and expanded, this new edition includes a thorough treatment of second quantization and an introduction to the quantum field theory of photons and electrons.

1969 Approx. 608 pages In press

THERMAL PHYSICS

By CHARLES KITTEL, *University of California, Berkeley*.

A new, modern, elementary approach to thermal physics based on the methods of Gibbs. 1969 Approx. 448 pages \$10.95

OPTICS

By MILES V. KLEIN, *University of Illinois*.

An intermediate level text on classical geometrical and physical optics. 1969 In press

NUMBERS AND UNITS FOR PHYSICS

A Program for Self-Instruction

By ROBERT A. CARMAN, *San Bernardino Valley College*.

A programmed introduction to the quantitative language of physical science; designed as a self-study supplement to beginning courses. 1969 In press

ELEMENTARY RADIATION PHYSICS

By G. S. HURST, *University of Kentucky*; and J. E. TURNER, *Oak Ridge National Laboratory*.

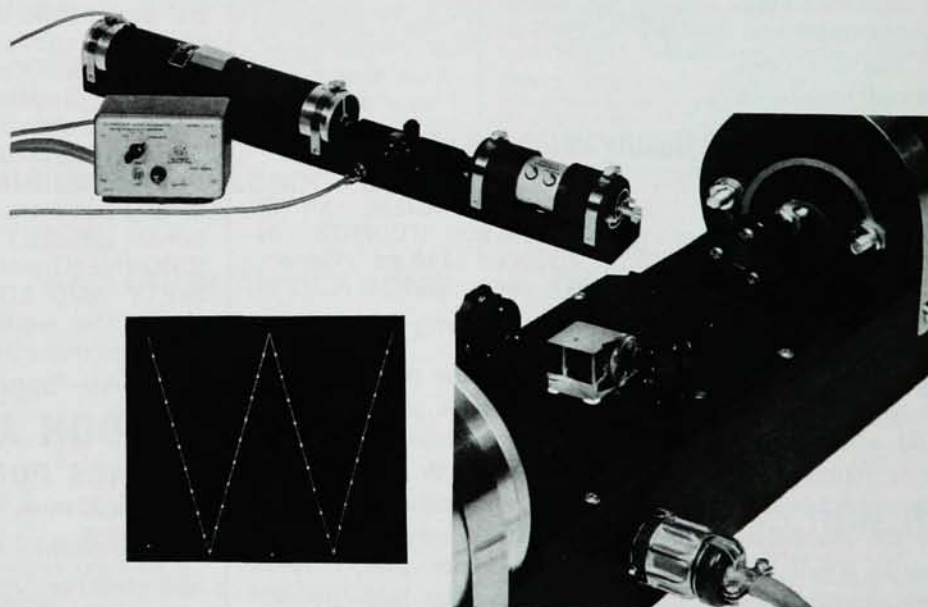
Explains basic atomic and nuclear physics, emphasizing aspects of importance in medicine and nuclear engineering.

1969 Approx. 326 pages In press

John Wiley & Sons, Inc.

605 Third Avenue, New York, N.Y. 10016

In Canada: John Wiley & Sons Canada Ltd., 22 Worcester Road, Rexdale, Ontario



Need to know the velocity at each channel of your Mössbauer Spectrum? You can. How? Count He-Ne laser interferometer fringes. In the display above, velocity varies linearly from -41 to $+41$ mm/sec. (actually, 41.58 mm/sec). In each channel is stored a number from which the absolute velocity can be calculated. (6320.9144 counts = 1 mm motion).

Complete calibrator includes laser, interferometer, detector, amplifier and signal conditioner, and crystal calibrator. \$1,500 F.O.B. Austin.

Be sure to see it at the Chicago APS Show, Booth 380, Palmer House, Jan. 26-28, 1970. Also, the Mössbauer symposium, Jan. 25, at the Palmer House.

AUSTIN SCIENCE ASSOCIATES, INC.

P. O. Box 7728
Austin, Texas 78712
512 472-4509

P. O. Box 1207
Melrose Park, Illinois 60161
312 848-4624

Go ahead, Compete with N. B. S. !

sage of time. In remarkable analogy with its creator's undiminishing prestige as succeeding revolutions racked his adopted country, the Lagrangian method has stood impervious to the two great revolutions that have transformed dynamics in this century. The words written by Hamilton could in all respects have been written as well by Richard Feynman or Julian Schwinger.

It is no wonder then that one might wish to include at least a peek at Lagrangian dynamics in an advanced undergraduate course on classical mechanics. The problem is that such a peek has to be elementary but not superficial, and that this condition is difficult to meet in most textbooks without their becoming impossibly bulky. The solution to the dilemma, according to C. W. Kilmister, mathematics professor at King's College in London, is to add to the reading list a little volume such as his *Lagrangian Dynamics: An Introduction for Students*.

Kilmister's book contains six chapters, of which the third through fifth are involved directly with illustrations of the Lagrangian method. To be honest, one must say that these chapters will be largely incomprehensible to the reader who does not know fairly well the calculus of variations and vector analysis. Moreover the reader must have a feeling for, or at least a great tolerance of, the dynamics of rigid bodies, because the discussions deal solely with macroscopic systems subject to constraints.

In chapter 3, for example, we meet the symmetric top, a hoop (inside of which dangles a simple pendulum) a bell and clapper slightly idealized and a centrifugal governor. In the fourth chapter, on small vibrations, we face the double pendulum; in the fifth, on impulsive forces, we observe a rhombus of uniform rods collide with a wall. The character of these applications will likely preclude the use of the book by anyone who believes heartily that the notion of constraint is artificial in the present milieu of dynamics.

It is probably not without some value to remark that this book might have a special appeal to professors or students who prefer to see classical mechanics as applied mathematics rather than theoretical physics. The tone of the book is decidedly mathematical, and it achieves its finest form with the statement, in chapter 2, that "the reason why the anholonomic case can arise is now simply that not all

vector fields are families of normals to hypersurfaces." In the same sense one might add, with a twinkle in one's eye, that the reason why aperiodic oscillations in three-space can arise is that not all numbers are rational. Evidently beauty is indeed in the eye of the beholder.

* * *

An associate professor at Sonoma State College, California, the reviewer has taught courses on analytical dynamics for the past few years.

Highly coherent

FUNDAMENTALS OF QUANTUM OPTICS. By John R. Klauder and E. C. G. Sudarshan. 279 pp. W. A. Benjamin, New York, 1968. \$13.50

by MARVIN M. MILLER

Since the publication in 1963 of a series of papers by R. J. Glauber, the quantum theory of optical coherence has become an active area of research. However, with the notable exception of Glauber's 1964 Les Houches lecture notes, an authoritative account of the many interesting developments in this field has not been available in book form. The appearance of a monograph by two of the leading contributors in the field, J. R. Klauder and E. C. G. Sudarshan, is especially timely because of the importance of this research, and the fruitful application of the notion of coherent states to the study of problems outside the domain of quantum optics.

The first three chapters are devoted to a concise review of selected topics in classical-coherence theory and semiclassical-counting statistics. Chapter 4 considers the physical origin and treatment of coupled, nonlinear, partial differential equations with stochastic-driving terms, or stochastic-initial conditions or both. Although such equations arise in many physical contexts, this discussion has particular relevance in quantum optics, in view of the success of model-laser theories that describe the dynamics of the nonlinear interaction between the laser systems and reservoirs by means of fluctuation equations with Markoffian noise-source excitation.

Chapters 5 and 6 provide a lucid exposition of some basic concepts of abstract quantum mechanics and a nonrelativistic analysis of the operator equations of motion for the electro-

Thinking about... HIGH VOLTAGE PULSE GENERATORS?

THINK POSITIVE

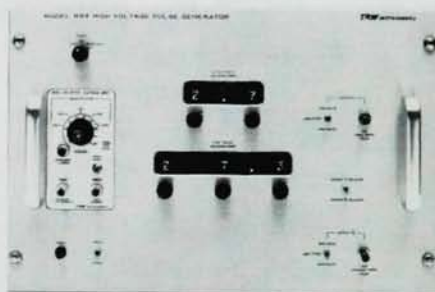
Besides POSITIVE OUTPUT PULSES OF 1000V or 500V, the new TRW Model 89A High Voltage Pulse Generator gives you

**LOW INTERNAL DELAY
VARIABLE PULSE WIDTH
VARIABLE DELAY**

Pulse width is variable from 100 nsec to 9.9 μ sec.

Rise and fall times are fast: 40 nsec.

Two interchangeable input plug-ins provide a choice of external, internal, low-level or optical trigger.



The Model 89A has been tested for these applications, among others:

- laser diode pulsing
- shockwave studies
- testing semiconductors and components
- input triggering
- measuring delay lines
- pulse transformer, dielectric, induced voltage testing of magnetic devices
- determining transient response of photodiodes
- driving photochemical devices

For complete specifications on the Model 89A High Voltage Pulse Generator, WRITE OR CALL OUR FACTORY OR NEAREST SALES OFFICE.

TRW INSTRUMENTS

PT-129

Factory: 139 Illinois Street, El Segundo,
California 90245 • (213) 535-0854
Sales Offices: New York (516) 333-1414,
Los Angeles, California (213) 887-9374

TRW