original literature. In particular the historical development of each topic is followed, emphasizing the major steps that have been taken (and documenting some of the mistakes made as well). On the other hand subjects of current interest have not been neglected. These books live up to the promise of being a status report summarizing where things stand at present.

Indeed if there is a major negative criticism to be made it is that the approach taken is so wide in scope that some, especially the initiate in the field, may have trouble extracting the major conclusions from the wealth of detail. However, for the researcher in the field who desires a monograph that is current and yet includes many of the detailed developments in the subject, Überall's books largely fulfill this need. With the next generation of electron accelerators upon us, bringing with them even more exciting possibilities of studying the nucleus at high momentum transfer, this monograph comes at an opportune time to collect what is known and prepare for the near future.

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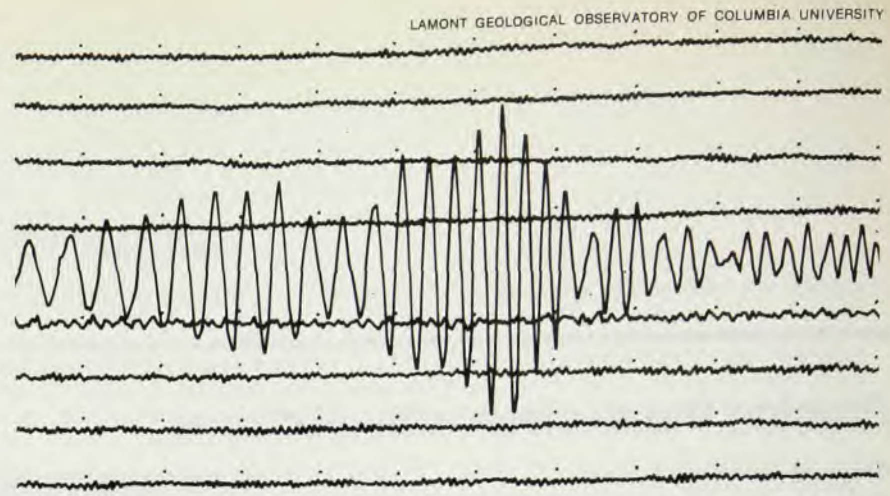

Seismogram of the Cannikin multimegaton nuclear explosion on 6 November 1971. The equally spaced dots on the trace are minute marks. Differentiating between natural and man-made seismic disturbances is dealt with in *Nuclear Explosion Seismology*.

Nuclear-Explosion Seismology

H. C. Rodean
156 pp. US Atomic Energy Commission, Division of Technical Information, Oak Ridge, Tenn., 1971. $3.00

Howard Rodean is the author of several papers and technical reports dealing with aspects of nuclear explosions ranging from chemical and physical properties of rocks in the immediate vicinity of the blast to the seismic hazards of explosion-produced ground motion.

Aside from the purely geophysical interest in seismic wave propagation in the earth, the seismic waves generated by explosions have been of both political and military interest in the last decade or so. This book is meant to be a summary of the unclassified knowledge, both experimental and theoretical, concerning the coupling between underground nuclear explosions and the seismic signals they produce, with an emphasis on the characteristics that distinguish explosions from earthquakes.

Although the book deals mainly with the elastic or seismic region—the region far from the blast—the first few chapters contain a general description of a nuclear explosion itself, followed by a more quantitative treatment of the inelastic or near source region. Important in understanding how an explosion generates seismic waves are the effects of rock properties on seismic coupling, the dynamic process of stress wave propagation, some thermodynamics and the equations of state for solids. The discussion includes a comparison of porous and nonporous solids under shock compression and ends with the results of a computer simulation study of a 5-kiloton explosion in granite.

Only a fraction of the energy of an explosion is radiated in the form of seismic waves that can be detected, recorded and analyzed. Of the several types of waves produced, the P (compressional) and S (shear) body waves and the R (Rayleigh) surface waves are of primary importance in differentiating between explosions and earthquakes. The physical principles of elastic wave theory for these waves is developed along with a discussion of reflection and refraction of elastic waves, wave propagation in a spherically stratified earth and formation of Rayleigh waves at a free surface. A mathematical approximation for an explosive seismic source is given. Also included is a short discussion of seismic wave attenuation, dispersion and the effects of the characteristics of the recording instrument on the signal.

The various phenomena mentioned above and the complexities involved in the problem of detecting and identifying seismic signals related to underground nuclear test are brought out in an extensive analytic and numeric generation of P-wave solutions which include the effects of the source function, attenuation, dispersion, explosion yield and seismometer response characteristics. Some theoretical amplitude-yield curves are produced and compared to actual experimental amplitude-yield curves obtained from several geologic regions.

The book concludes with a discussion of the possibilities of clandestine nuclear testing by means of seismic decoupling through the technique of detonations carried out in large cavities. There is also a summary of what is known and not known about seismic waves generated by underground nuclear explosions.

Due to the scope of the book, the treatment of each topic is necessarily brief. However the author includes the pertinent mathematics and enough descriptive material to make the book very readable. Well worth mentioning are the many references to technical reports, scientific papers and books throughout the text that would be very helpful to anyone interested in pursuing a given subject further. The book can be recommended to anyone interested in the geophysical effects related to a nuclear explosion.

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The Caloric Theory of Gases: From Lavoisier to Regnault

R. Fox
378 pp. Oxford U. P., New York, 1971. $16.00

Almost all physicists refer to the caloric theory of heat at one time or another, but few know what it involved in detail except that heat is considered to be a material fluid. Up until now it has been difficult to find an accurate and definitive discussion of this theory, which held the attention of physicists for about 150 years. But now we have a scholarly treatise on the subject growing out of a doctoral thesis at the University of

Oxford by Robert Fox, who is at present a Lecturer in the History of Science at Furness College at the University of Lancaster.

Although many people may not be attracted to such a detailed account of the ins and outs of a complicated and archaic theory, the book has great merit in focusing attention on the people who were most intimately involved in proving and disproving this classic theory. From this point of view, it is a real contribution to our understanding of men such as Laplace, Carnot, Avogadro, and Regnault and their disciples.

There is a great deal of repetition inherent in the structure of Fox's presentation because he first presents the various caloric theories and then discusses the individual contributions of the various physicists and chemists. Quite naturally, to present both a logical sequence of ideas and a chronological story of the contributions of individual people often requires the developments to be given twice, from these two points of view. Although I found this repetition somewhat annoying, it appears to be a necessary procedure for completeness.

The scholarship evident in the careful documentation and detailed discussion of original papers and reports assures that this work is both authoritative and long lasting. It appears as if the details of the caloric theory have now been sufficiently reported that no more work on this development will need to be done in the foreseeable future.

As a biographer of Count Rumford it is perhaps incumbent on me to comment briefly on Fox's position on the role that the Count played in discrediting the caloric theory. Fox states in his introduction: "Rumford's work is, I believe, a red herring for the historian, and I hope that my placing of the great era of the caloric theory in the first quarter of the nineteenth century—after Rumford's famous 1798 paper—will serve to make the point." I am in full agreement with this statement.

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Collected Problems in Classical Mechanics

G. L. Kotkin, V. G. Serbo
278 pp. Pergamon, New York, 1971. $8.00

This collection of 289 problems is concerned almost exclusively with the dynamics of particles. Solutions of some 250 exemplify comprehensively the mathematical methods available for ascertaining the motions, unperturbed and perturbed, of particles subject to mechanical forces and to gravitational, electric and magnetic fields. Only 19 are devoted to rigid-body motion, and a few others require evaluation of specified Poisson brackets or description of various canonical transformations. None of the problems deals with relativistic mechanics, quantum mechanical analogies, or with the Lagrangian and Hamiltonian formulations of the equations governing continuous mechanical systems and fields.

The order of presentation follows that of L. D. Landau and E. M. Lifshitz's *Mechanics,* specifically, motion in three-dimensional potentials; scattering, collision and disintegration; Lagrange's equations; small oscillations, linear and nonlinear; rigid body motion; Hamilton's equations; Poisson brackets and canonical transformations; the Hamilton–Jacobi equation; adiabatic invariants. It is noteworthy that the problems set under the last three of these topics number 36, 19 and 32 respectively.

The outstanding value of the work, which will be appreciated by teachers and students alike, is in the 211 pages of "Solutions." The authors' objective in preparing these extensive solutions is stated in their preface, in part as follows: "As a rule, the solution of a