

tion Einstein's revealing remarks in the published papers that the derivation is "amazingly simple" and that the argument "commends itself by its simplicity and generality."

In telling of Einstein's journey from the special theory to his masterpiece, the general theory of relativity, Pais speaks of some of the errors that led Einstein astray. He does not, however, mention the difficulties caused by a confusion of active and passive transformations or Einstein's long-held erro-

neous belief that if one went from Minkowski coordinates to more general coordinates, one would no longer be dealing with the special theory of relativity. However, Pais makes ample amends by quoting the following from a letter that Einstein wrote to Hendrik Lorentz in January 1916 about the general theory: "The series of my papers about gravitation is a chain of false steps which nevertheless by and by led to the goal. Thus the basic equations are finally all right but the

derivations are atrocious...." One could hardly want a clearer indication of the extraordinary power of Einstein's intuition. As Pais says:

The portrait of Einstein the scientist in 1913 is altogether remarkable. He has no compelling results to show for his efforts. He sees the limitations of what he has done so far. He is supremely confident of his vision. And he stands all alone. It seems to me that Einstein's intellectual strength, courage and tenacity to continue under such circumstances and then to be supremely vindicated a few years later do much to explain how during his later years he would fearlessly occupy once again a similar position, in his solitary quest for an interpretation of quantum mechanics which was totally at variance with commonly held views.

In telling about the long quantum debate between Bohr and Einstein, Pais sides completely with Bohr. Nevertheless, in telling of Einstein's tenacious search for a unified field theory, Pais stresses that behind the search was Einstein's hope that an overdetermined set of field equations would limit the singularity-free solutions to discrete sets, thereby leading in an unforced way to the presence of quantum effects.

In an appendix Pais tells the intriguing inside story of how Einstein came to be awarded the Nobel Prize. In another he presents Einstein's recommendations to the Prize committee. The final entry in a summarizing chronology makes a charming unexpected ending for this warmly recommended book.

* * *

Banesh Hoffmann, professor emeritus at Queens College, collaborated with Einstein and wrote with Helen Dukas Albert Einstein, Creator and Rebel and Albert Einstein, the Human Side.

Atomic Many-Body Theory

I. Lindgren, J. Morrison

469 pp. Springer, New York, 1982. \$55.00

The stationary properties of atoms can, in principle, be computed by diagonalizing an effective Hamiltonian in a space spanned by a large number of (configuration) basis vectors. For most systems this procedure is not feasible, and it has become customary to resort to many-body theory, which is based on perturbative expansions of Green's functions and on coupled-cluster expansions. These expansions can be represented with diagrams that increase understanding and simplify computation. A special feature of atomic physics is the "goodness" of a

BERTAN High Voltage

Quality & Reliability

BERTAN's sophisticated quality control procedures meet or exceed MIL I-45208A. Every unit is "burned in" for up to 100 hours.

Ask us about field proven MTBF's that exceed 100,000 hours!!!

There are BERTAN high voltage power supplies operating continually for over a decade in critical applications.

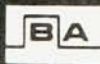
Standard or Custom Designs

BERTAN provides the widest range of standard off-the-shelf catalog units available. If our standard units do not meet your requirements, our unique high voltage engineering and production capability can provide power supplies to meet your custom specifications.



- 0-50kV ● Instruments ● Modules
- Single or Multiple Output ● Remote Programming
- Remote Monitoring ● Digital Interfacing
- Other custom requirements.

See EEM or GOLD BOOK for specifications on over 100 standard products available from stock



BERTAN ASSOCIATES, Inc.

3 Aerial Way, Syosset, N. Y. 11791 • (516) 433-3110 • TWX 510-221-2144

Circle No. 41 for Immediate Application
Circle No. 42 for Literature Only

wide variety of angular-momentum quantum numbers and the relations among them. These relationships can be expressed in terms of $n-J$ symbols and the Wigner-Eckart theorem. In 1962 A. P. Jucys and coworkers introduced a graphical representation of these relations that also increases understanding and simplifies calculations. These two graphical theories can be combined into a unified atomic theory.

In *Atomic Many-Body Theory* Ingvar Lindgren and John Morrison of the Chalmers University of Technology, Göteborg, Sweden, give a superb presentation of this unified atomic theory. Lindgren is an established investigator in many-body theory; Morrison has performed significant calculations on atomic properties. Their book is organized as an advanced text in atomic theory: They develop their material from the beginning, inserting problems along the way.

The book treats statics and not dynamics: radiative processes, Auger effects and electron scattering. The only group theory it employs is $SU(2)$; it omits the symmetric group, the unitary group, and the group chains describing the approximate symmetries of the atom (covered fully, for example, by Brian R. Judd, in *Operator Techniques in Atomic Spectroscopy*). Two recent competitors that come to mind, which collectively cover the same ground, are P. Jørgensen and Jack Simons, *Second Quantization-Based Methods in Quantum Chemistry* and Lawrence C. Biedenharn and James D. Louck, *Angular Momentum in Quantum Physics Theory and Application* and *Racah-Wigner Algebra in Quantum Theory*.

Lindgren and Morrison have written a splendid text, suitable for advanced students and relevant to atomic, molecular, solid-state and nuclear physics.

F. A. MATSEN

University of Texas
Austin

Quantum Fields in Curved Space

N. Birrell, P. Davies

340 pp. Cambridge U.P., New York, 1982.
\$49.50

The past decade has seen a great deal of interest devoted to the study of quantum effects associated with gravitation. Some of this interest, particularly of particle physicists, has followed from the desire to formulate a quantum theory of gravitation and (perhaps) thereby to unify gravity with the other fundamental forces of nature. Significant further interest, particularly among relativists, has stemmed from Stephen Hawking's calculation of particle creation by black holes, which suggested a deep connection between

gravitation, quantum theory and statistical physics.

All attempts thus far to formulate a quantum theory of gravity have encountered serious difficulties. During the past decade, however, there has been considerable progress in the study of quantum fields in curved space-time. This study consists of using a semiclassical approximation, in which one treats gravity in the framework of classical general relativity as a curved space-time and studies the quantum

field theory of matter fields present in this space-time. In this way, while still treating gravity classically, one can study effects that a strong gravitational field produces on matter fields. Such effects include spontaneous particle creation and vacuum polarization.

There are at least two important goals motivating the study of quantum field theory in curved space-time. First, some issues that arise—and pose great difficulties—in the formulation of a quantum theory of gravity

High Resolution Infrared... New Products, New Frontiers

At Spectra-Physics, Laser Analytics Division, we've been working hard, improving the state-of-the-art in Pb-salt semiconductor Tunable Diode Lasers (TDL's), and developing new products to enhance their capabilities and expand their application.

Technology Advancements

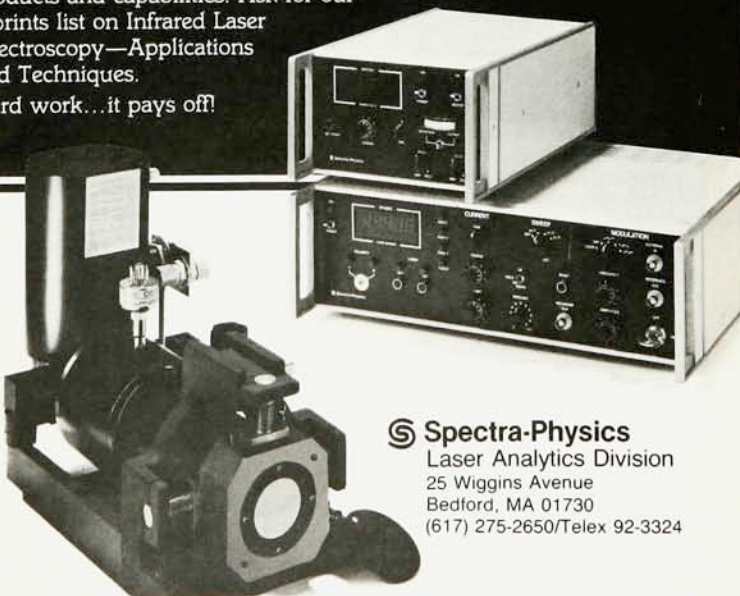
- Improved laser yield
- Increased stability
- Improved reliability
- Higher power
- Increased per mode tunability

New Products

- Cryogen-free, copper-doped Germanium detectors
- Closed Cycle refrigerator with new stabilized cold finger
 - for Ge:Cu detector
 - for diode laser sources
- Ultra-stable 100 m White Cell
- Cryogenic Temperature Sensors and Controllers

If your research is in the 3-30 micron region, put our technology to work. Call or write today for more information about Laser Analytics products and capabilities. Ask for our reprints list on *Infrared Laser Spectroscopy—Applications and Techniques*.

Hard work... it pays off!



Spectra-Physics
Laser Analytics Division
25 Wiggins Avenue
Bedford, MA 01730
(617) 275-2650/Telex 92-3324

Circle number 43 on Reader Service Card