

name the same objects by touch). It appears to me that Efron's insistence on the priority of perceived over neural units would have been quite congenial to Mach's way of thinking.

Robert Palter
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Large Elastic Deformations

By A. E. Green, and J. E. Adkins

2nd ed. 324 pp. Oxford U.P., New York (London), 1971. \$15.25

In the last quarter century the subject of finite elasticity has undergone a rapid development, until it is now an established branch of theoretical mechanics. The authors of this book, Albert E. Green and the late John E. Adkins, are two of the earliest and most distinguished workers in the field. The book is a revised version of an earlier work published in 1960, from which it differs mainly in the omission of the chapters on viscoelastic materials and stability. Both of these subjects have undergone so rapid a development in the last ten years that to cover them adequately would have required a very considerable enlargement of the work. In addition, the chapter on thermoelasticity has been changed. In it the governing equations and the equation relating stress and strain-energy are now derived, with considerations of invariance under rigid motion, from an energy-balance equation and an entropy production inequality. At various other points in the book changes of a minor character have been made that reflect the increased sophistication of our point of view on the subject since the earlier version of the book was written. Although the range of problems discussed has not been extended significantly, references are given to the more recent papers in which further problems have been solved with the various techniques discussed in the book.

The book presents the basic theory of the mechanics of elastic materials, which can be subjected to large deformations. It derives in an elegant manner the form of the strain-energy function for isotropic materials, for materials that have transverse isotropy, and for symmetries appropriate to each of the crystal classes. The authors discuss the effects of kinematic constraints, such as those arising from incompressibility of the material, or the incorporation in it of inextensible cords. Solutions to problems involving a high degree of symmetry, such as simple extension, biaxial extension, torsion and flexure are discussed in the case when the material is incompressible and isotropic and, in some instances, when it has transverse isotropy. Successive approximations in the solution of problems involving less symmetry, applicable to elastic materials subjected to

small finite deformations, is also treated.

Other chapters include the theory of elastic membranes, the experimental determination of the strain-energy function for vulcanized rubber and the experimental verification of some of the predictions of finite elasticity theory and many other topics. As a whole, the book illustrates well the power of the phenomenological theory of large elastic deformations to solve problems and make valid predictions in the branch of physics with which it is concerned.

In both the present edition and the earlier edition, the authors have tried to minimize overlap with the material contained in *Theoretical Elasticity* by Green and W. Zerna. This has led to the omission of certain topics for which one immediately looks in a book on large elastic deformations, such as the theory of the superposition of small deformations on large deformations and the results of Green and Richard Shield on the superposition of small torsions on finite extension of a rod—surely one of the most elegant results in the mechanics of continua.

The book is written in a very forthright manner and has great clarity. It does, however, assume a considerable measure of sophistication on the part of the reader and, while not a book for beginners, it is surely a classic in the field and should be part of the library of any workers interested in finite deformations.

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Lehigh University
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THE FOUNDATION OF PHYSICS By PIETER J. VAN HEERDEN

Are you not satisfied with the present state of Theoretical Physics? In 1967, *Wistak* published "The Foundation of Physics" by P. J. van Heerden. This book investigates the apparent clash of the physical ideas of quantum mechanics with reality, which has been clearly brought out by Einstein and Schrödinger (the famous "cat in the box" experiment: are you real or is the wave function real?). The book shows that this serious paradox is completely resolved by a philosophical idea that is long overdue in physics. After all, it goes back to the philosopher Hume. This idea is that the mathematics of theoretical physics cannot be more than a human analysis of reality, coupled with reality only by the principle of induction: whatever our analysis finds to be constant, we may expect to remain constant for a little while longer. For arithmetic and geometry, it has long been realized that their truth is not subject to confirmation, or contradiction, in the real world. They are selfconsistent human games, useful because they allow a well defined, simple analysis of the real world. (We can count objects, but there is no guarantee that they won't break or evaporate).

This philosophical idea may be new, and therefore at first sight abhorrent to the physicist, but it enables one to free quantum mechanics of all anthropomorphic concepts (forces, causality), and it leads to a new wave equation of great simplicity and promise.

One important reason for renewed interest in the book is that the author has now practically finished the mathematics of this new formulation of quantum mechanics in a new paper. A key idea is that it does not speak of excited states which decay exponentially to ground states, but instead analyzes all events in equivalent states, which exchange a package of energy and momentum back and forth between each other in periodic fashion: Two hydrogen atoms with one resonant light quantum in a closed space act as two coupled oscillators.

Furthermore, it becomes attractive to hypothesize that the

group of reversible optical transformations (with lenses, mirrors, beamsplitters, at rest or in motion) of coherent beams, which in modern physics has become the sole basis of the measuring process of frequencies and wave-lengths, can be described by the mathematical group of unitary transformations in $4n$ homogeneous coordinates (unitary, not orthogonal, and homogeneous, not Euclidean, because of the necessary symmetry between point and plane!)

The elements of the unitary eigenvalue matrix of the wave function are identified with the packages of momentum, angular momentum and energy which are periodically exchanged between the particles in emission and absorption. The conservation laws of dynamics are therefore automatically satisfied.

Finally, the assumption that the physical world is of almost maximum probability, leads to **Simple explicit formulas** for all energy levels of all n -particle systems. (APS Bulletin, Nov. '70, Jan. '71)

To sum it up: In the real world, we find that all matter consists of a small number of types of particles (protons, electrons, photons, mesons, etc.). Systems of these particles have discrete energy states, and our limited present knowledge suggests that these states can be described by the laws of quantum mechanics. We also realize that the actual measurement of all these frequencies and wavelengths is based on the group of reversible optical transformations. **Could it be that the particles of physics and their interactions follow completely from the logic of our own measuring process?** The advanced state of the theory makes it likely that this question will soon be answered. There are many good indications that the answer will be yes.

The author makes this new paper available for \$1.00 (to be sent to his address, 308 Holden Wood Road, Concord, Mass. 01742). The book is still available, and can be obtained by sending a personal check of \$5.00 to:

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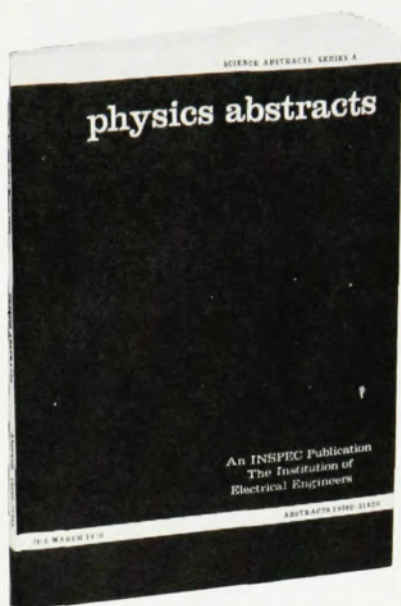
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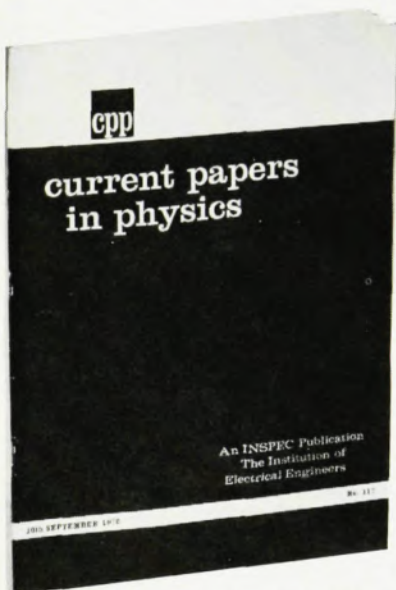


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