

my colleagues may actually use isoscalar factors in the privacy of their homes, but I will never know. It is certainly undeniable that all techniques are equally ghastly for higher multiplets, but I personally believe that for playing with low-lying multiplets, which in practice is what one usually deals with, some methods are clearly superior to others. I suggest that the student studying from Gibson and Pollard supplement his reading by working through Coleman's article entitled "Fun with SU(3)." (The exact reference can be found in Gibson and Pollard's bibliography.) This step is especially important if the student is to be able to cope with the more involved symmetry groups he will encounter in research.

Students first exposed to symmetry considerations in physics are often confused over the conceptual foundations, particularly the relation between symmetry and dynamics. This is partly because the subject can be approached from different directions, depending on the circumstances. One may be driven—by a desire to have certain symmetries—to construct a Lagrangian having such symmetries. Alternatively, the Lagrangian has either been postulated or been well established, such as Maxwell's, for example. Then the symmetry one has is just whatever symmetry the Lagrangian is invariant under, which is completely determined by the Lagrangian. I would have liked the authors to discuss these basic considerations thoroughly. I find some unfortunate examples that may serve to confound the students on these issues. For example, in a discussion on the time-reversal property of Maxwell's equations the authors said "... the sign of the electric charge is assumed to be unchanged ..."

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Theory of Lepton-Hadron Processes at High Energies: Partons, Scale Invariance, and Light-cone Physics

P. Roy
172 pp. Oxford U. P., New York, 1975.
\$19.25

This handy monograph was issued to provide an introduction to important theoretical developments that have recently occurred "in the wake of experiments on deep inelastic lepton-hadron processes." The work certainly evolved with prescience from a summer lecture series. Alas, the main shock wave of experimental discoveries came after the printing presses had rolled. Deviations from Bjorken scaling were officially reg-

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istered in muon-scattering experiments at Fermilab and in electron-scattering data from SLAC; the new vector mesons and charm were discovered in electron-positron storage rings; Nobel Prizes have been awarded, and much theoretical work has been brewing. With so much experimental and theoretical activity having gone on, the key question for this book becomes a simple one: Is it surviving? Certainly the views of David Pines are. His comments as editor of W. A. Benjamin's "Frontiers in Physics" Series may be found in a foreword to Richard Feynman's *Photon-Hadron Interactions*, a competitive inhibitor among the pedagogical enzymes related to mastering quark fundamentals. Pines reminds us of the timeliness difficulties found in active and exciting fields of physics, where there is no leisure of the theory class. But it is not fair to digress to a comparison of Prohir Roy's book with Feynman's; the scope of the two volumes is different.

Part 1 of the work is a review of the parton model and its motivation. The key features of inelastic ep scattering, circa 1972, are clearly presented, as are the highlights of exciting lepton-hadron theoretical papers that emerged until that time. These chapters, like the others in the book, are at the graduate-student level. They contain concise, clear presentations that should spare the student some haste in his running to the original papers (which are, incidentally, conveniently listed as references at the end of the book). At the end of the chapters are exercises that bring out interesting points and let the reader gauge his progress. Part 2, entitled "Scale Invariance," contains a lucid discussion of anomalous and canonical dimensions, of broken-scale invariance and of Ken Wilson's operator-product expansion approach. Part 3, "Light Cone Physics," is a formal presentation of the relation between lepton-nucleon scattering and light-cone singularities and expansions. The equations are buttressed with explanations that help the reader see where things came from and why.

In spite of the rapid advances since the book's publication, this work is definitely relevant to current research. Present attempts to understand Bjorken scaling, though it is imperfect, involve a wide spectrum of theoretical ideas: anomalous dimensions, asymptotic freedom, charm, color, parton form factors and non-Abelian gauge fields. These all come up in the text, although some of these topics would undoubtedly be treated with a more elaborate and pointed emphasis if the book were written today. Bjorken pointed out in his summary at the 1975 SLAC Conference that experiments in the past few years have increased the credibility of the parton model for deep inelastic lepton-hadron processes. True, there are ψ 's, χ 's, charm and so forth; but there is also Drell-Yan production. And

there are also many interesting high-energy μp , νp , and $e^+ e^-$ experiments in the pipeline.

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Space Structures: Their Harmony and Counterpoint

A. L. Loeb

169 pp. Addison-Wesley, Advanced Book Program, Reading, Mass., 1976. \$19.50 clothbound, \$9.50 paperbound

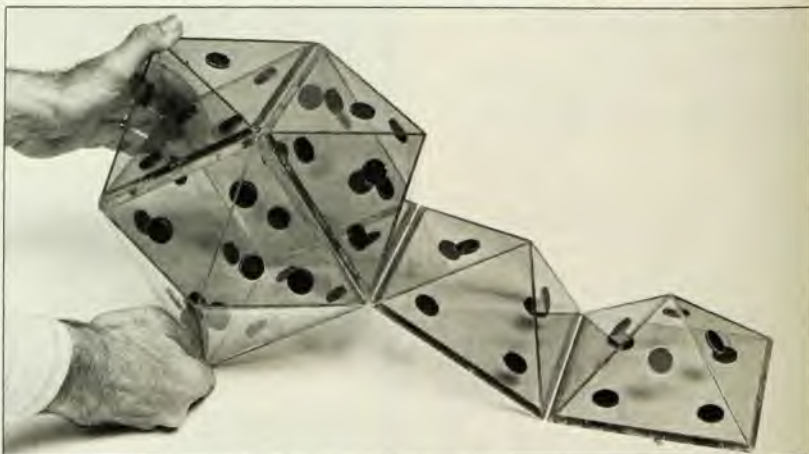
Naturally occurring polyhedra such as are found in many minerals have fascinated observers since antiquity. Regular polyhedra were discussed by Plato; their geometry was studied by Euclid. Polyhedra continued to be sources of interest over the centuries, and more recently they have been put to practical use by architects and engineers in a variety of applications. Mathematical and popular attention paid to polyhedra has increased sharply in the past decade or two. Scores of books have now appeared that treat their various properties: Some discuss the symmetry of polyhedral assemblages, others the properties of patterns and designs produced by packing polyhedra in space-filling arrangements.

Arthur L. Loeb, a senior lecturer in the department of visual and environmental studies at Harvard, is interested in space filling and in the general mathematics of spatial complexities from the viewpoint of design science. *Space Structures* introduces the reader both to regular and irregular polyhedra, bounded either by planar or nonplanar faces. The concepts developed, according to the Pretext (Loeb eschews use of the conventional preface on the grounds that it implies the existence of pre-edges and prevertices), are intended to be common to widely diverse

fields. These include the arts, metallurgy, crystallography, mathematics, architecture, planning, sociology and biology, each of which is considered to contain elements of design science.

Space Structures explores the variables involved in polyhedral structure in a leisurely, somewhat pedantic, approach. Structure is initially taken in the general sense of the relationships that exist among the components of any system, but this broad view does not continue beyond the first few pages. Rather, structure is confined to the consideration of polyhedra in which the essential relations are based upon enumeration of the component vertices, faces and edges. Loeb makes use of an additional parameter he calls "valency." This somewhat unexpected choice of word, with its widely known connotation in other fields, is taken as the number of elements of a given dimension that form an element of a different dimension, as in the number of faces (two dimensions) that form an edge (one dimension). With these parameters, Loeb derives a variety of numerical and functional interrelationships. For example, polyhedra with two different vertex valencies are shown to have a fixed number of one valence necessarily present.

The reader is led toward greater familiarity with the internal relationships among the parameters of polyhedra, presumably to prepare him for the consideration of other systems, as the complexity of the polyhedra studied is systematically increased. The favored method is replacement of edges by faces or vertices, in processes known as "truncation" or "stellation." Loeb uses Schlegel diagrams, in which all polyhedral faces are projected on a basal face, for their easier representation. He then proceeds through a complete enumeration of all semiregular structures formed by truncating and stellating regular polyhedra, thereby providing a detailed ex-



Pyramidal sections from one of two plastic cubes are annexed to the second cube to form a rhombododecahedron. From "Unwrapping the Cube: A Photographic Essay," in *Space Structures*. The photo was provided courtesy of Addison-Wesley's Advanced Book Program.