61[X, Z].—N. METROPOLIS, ET AL., editors, *Experimental Arithmetic, High Speed Computing and Mathematics*. Proceedings of Symposia in Applied Mathematics, Volume 15, American Mathematical Society, Providence, R. I., 1963, ix + 396 pp., 26 cm. Price $9.10.

This interesting collection includes all but two papers which were given at two symposia: *Experimental Arithmetic* at Chicago, and *Interactions between Mathematical Research and High-Speed Computing* at Atlantic City, both in April, 1962. The papers here are:

Purposeful and unpurposeful computing, by Harvey Cohn.

Eliminating the irrelevant from mechanical proofs, by Martin Davis.

The mechanization of mathematical arguments, by Hao Wang.

Towards more versatile mechanical translators, by E. T. Irons.

Information theory and decoding computations, by Peter Elias.

Adaptive neutral networks as brain models, by H. D. Block.

Computer investigation of orthogonal Latin squares of order ten, by E. T. Parker.

Determination of division algebra with 32 elements, by R. J. Walker.

How programming difficulties can lead to theoretical advances, by E C. Dade and H. Zassenhaus.

Methods of successive restrictions in computational problems involving discrete variables, by C. B. Tompkins.

An experimental study of the simplex method, by Harold W. Kuhn and Richard E. Quandt.

Large and nonconvex problems in linear programming, by R. E. Gomory.

Some high speed logic, by D. H. Lehmer.

Stability questions for some numerical methods for ordinary differential equations, by Germund G. Dahlquist.

Some applications of the quotient-difference algorithm, by Peter Henrici.

Plane-rotations in floating-point arithmetic, by J. H. Wilkinson.

New aspects in numerical quadrature, by F. L. Bauer, H. Rutishauser, and E. Stiefel.

On Jacobi rotation patterns, by H. Rutishauser.

Automatic numerical integration of ordinary differential equations, by Arnold Nordsieck.

Survey of stability of different schemes for solving initial value problems for hyperbolic equations, by Peter D. Lax.

Unexpected dividends in the theory of prime numbers, by J. Barkley Rosser.

The particle-in-cell method for numerical solution of problems in fluid dynamics, by Francis H. Harlow.

Numerical experiments in atmospheric hydrodynamics, by J. G. Charney.

The oscillations of the earth and of the atmosphere, by Gordon J. F. MacDonald.

Few particle experiments in statistical mechanics, by Berni J. Alder.

An approach to the Ising problem using a large scale fast digital computer, by Chen-Ping Yang.

Applied mathematics as used in theoretical chemistry, by Joseph O. Hirschfelder.

The mechanization of science, by R. W. Hamming.

The editors have combined the papers of both symposia, and have ordered them here without regard to the particular symposium at which they were given, and with no indication of that symposium. The title of the volume similarly reflects this loss of precision. In extenuation, it must be said that the resultant fuzzing of two admirably precise and important subjects stems mostly from the fact that more than one of the speakers did not really speak to the point. They presented "papers." Perhaps it could even be said that these were good papers. Still, the willingness to disregard the title of the symposium seems to this reviewer an attitude that should be corrected.

Consider the subject of the second symposium. That seems clear enough. Ideally, a paper here would examine a chain of theoretical and computational problems that led from one to the other and then back at a higher level. Such chains are surely known. Had every speaker presented material of this type, it could then be hoped that the commentators would attempt to generalize these experiences and formulate a resulting scientific methodology. The symposium was of value, but was not that successful. Surely, though, this is a subject of great scientific importance. If mathematicians are to learn to consistently use computers as scientific tools (say, in the way Ernest Rutherford used physical equipment) and not merely to obtain scattered results, a study of such interactions remains a prime necessity.

Some speakers at the second symposium, such as Zassenhaus and Lehmer, did speak directly to the point. But others did not. Likewise, Rosser and Charney spoke directly to the point of the first symposium.

For all that, the volume is certainly of value.

D. S.

62[Z].—FRANZ L. ALT & MORRIS RUBINOFF, editors, *Advances in Computers*, Volume 3, Academic Press, New York, 1962, xiii + 361 pp., 23 cm. Price $12.00.

This third annual volume of *Advances in Computers* serves well to cover a number of additional areas in the computer field. Subjects include the Computation of Satellite Orbit Trajectories, Alternating Direction Implicit Methods, Recent Developments in Nonlinear Programming, Multiprogramming, Combined Analog-Digital Techniques in Simulation, and Information Technology and the Law.

S. D. Conte's contribution on the calculation of satellite orbit trajectories considers the problems of both predicting and determining such orbits. He presents a lucid survey and evaluation of methods of numerically integrating the equations of motion for a satellite moving under the influence of a central body force and subject to various perturbative forces. There is a careful discussion of various accuracy tests, including methods of estimating truncation and roundoff error accumulation. Results of a numerical study are presented which compare the computational efficiency of various methods. The problem of determining satellite orbits based on data received during launching and subsequent tracking is considered. In addition, building blocks for a comprehensive orbit prediction and determination computer program package are outlined.

Alternating-direction implicit methods constitute in many cases the best methods available to us today for solving large systems of elliptic and parabolic partial difference equations. G. Birkhoff, R. S. Varga, and D. Young present an excellent review of the status of the problem of providing a rational explanation of their