chapter goes into further detail of data testing and concerned with (*a*) visual averaging, (*b*) running average, (*c*) baseline offset correction, (*d*) single point correction, (*e*) subtraction of signal average as in step signal, and (*f*) sloping baseline correction. The author shows how to analyze a step signal which contains 1/f noise and again points out that noise error is independent of measuring time. This occurs when response of MTA is applied to stress-strain curve measurement.

Chapter 7 shows how the PSD method can eliminate the 1/f error. This is strongest in the frequency domain. The simplest type of PSD is the analog multiplier when applied to the strain gage circuit. Additional PSD's are the reversing type and chopping type. This follows with the analysis of a reversing PSD with sine wave signal and analog mutiplier. The latter has a square wave signal. The distortion of the strain function only occurs if the bridge balance is transversed. This can be avoided by applying a large initial unbalance. Should the signal be submerged in noise, the PSD is able to resolve such a signal by reducing the bandwidth of the output filter. The bandwidth of the inner acceptance is narrowed in a similar fashion. If the signal-to-noise ratio is too low to be resolved, the output noise level can be reduced by narrow band pass filtering at the PSD input.

Chapter 8 brings out the concept of digitization and noise. The author goes to great pain to show that noise increase can be avoided. Additional noise occurs due to digitization. The book deals with 3 most commonly used ADCs. They are (*a*) counting ADC, (*b*) successive approximation in ADC, and (*c*) dual range ADC (considered to furnish very high accuracy at a modest cost). The final section in this chapter concerns itself with aliasing. This is extremely important when strong high frequency interference components are present. The anti-aliasing filter is necessary to decontaminate the useful data by extreme limiting of the high frequencies. The aliasing section is too short!

Chapter 9 deals with the measurement of a continuous pulse train. When the pulse shape and timing are known, it is required to ascertain any gradual alteration in the amplitude of the pulse. A number of different types of arrangements can be used for measure of the filter. They are (*a*) flash spectrometer (optical equivalent of a tuneable narrow band filter), (*b*) transversal running average filter if white noise is present for purposes of digitization, (*c*) integrate and hold circuit (analogue integrator instead of transversal filter), and (*d*) low pass filter (smears the pulse and furnishes the last few pulses). In order to further degrade the noise error, the integrate and hold, transversal filter and analog multiplier (equivalent to PSD) could be employed. For more complex signal transients, an op-amp differentiator circuit could be used. Note, one uses only single sampling instead of multitude of sampling events. The "box car" circuit produces true unweighted sampling between limits and has a minor disadvantage. The book reveals the procedure for modifying the pulse sampling in a complicated situation. This can be applied to nonwhite noise. If the maximum or minimum value of signal is regarded, a number of peak and valley detectors come into play. They could be simple and feedback circuits, or filter approximation.

The last chapter reports on the measurement of occurrences of a signal transient. In order to avoid the hazard of effectively point sampling the signal, it is necessary to employ two stages rather than one. Should CR filtering be used, one must take it from the "running average." The book shows how offset, drift, and 1/f noises can be improved by following the required practices. The book concludes with the "autocorrelation method" which shows how one can measure the repetition period of a periodic waveform.

In summary, this is a good book. The author points out a number of interesting items. The reviewer believes that a more detailed section on aliasing is in order, plus how to use the various windows to downgrade the aliasing effect. In addition, some data processing should have been included. This would point out the effects due to good instrumentation. The reviewer recommends this book to all interested in instrumentation and methods of effectively reducing noise in dynamic measurements.

Structural Analysis on Computers,
C. K. Wang,
MacMillan Publishing Co., New York,
1986, 457 pages.

Structural analysis has come a long way. From the old time approximation schemes to the present-day computer programs, we accomplish a great deal in understanding the various ramifications of structural analysis other than simple beams. The author intends this book to act as a supplement text to the standard books on structural analysis. Present-day computer programs play important roles in analyzing structures, regardless of the size and complexity. Present-day analysis employs stiffness matrices subjected to matrix manipulations. Beginning with matrix analysis, the author provides a good explanation of its ability and capability and applies it to structural studies. As stated by the author, "This book is neither an introduction to structural theory nor an advanced text on matrix methods. It is assumed that the readers are already knowledgeable in such subjects as moment area/conjugate beam theorems, virtual work method and moment distribution method . . . . For those structural engineers who want to write their own computer programs, this book provides a vehicle by which they can learn the basic method through line by line explanation of the model computer programs." The author writes the programs in BASIC and claims it is easier to debug. Appendix B contains a FORTRAN listing of the 12 computer programs stressed in this book. Each computer program is explained in great detail, accompanied by a typical problem. Again, they are explained thoroughly and each has its checks based on statics and deformation analysis.

The book contains 12 chapters, each with its computer programs and 2 appendices.

Chapter 1 introduces the fundamentals of matrix multiplication. This includes linear transformation, matrix multiplication, and the computer program entitled, "PROGA" (Matrix Multiplication). Chapter 2 reports on matrix inversion and solution of banded equations. The Gauss-Jordan elimination method, inversion by in-place and longhand computation, initiates the subject. Solution of simultaneous equations and Gauss elimination method usher in the subject of the solution of banded equations. "PROGB" is on inversion and "PROGB1" is the solution of the banded equations.

Chapter 3 covers truss analysis by method joints. Introducing the definition of the statics matrix, we build up the truss geometry from the former. This follows with inverse static matrix and its application to joint analysis. The chapter concludes the use of "PROGC" (truss analysis by method of joints). Chapter 4 continues with displacement method. The force method is initially considered but due to ease of the displacement method, the former is rarely considered. The global stiffness matrix is unveiled with methods of computing it. The principle of virtual work is exposed. This follows with the procedure in obtaining the global stiffness matrix from the compilation of the local stiffness matrices. A discussion of the

displacement method and analysis of support settlements conclude the chapter. The computer program entitled "PROGD" (Displacement Method of Truss Analysis) is studied in great detail.

Chapter 5 treats continuous beam analysis. The initial topics are transfer of loads on elements to degrees of freedom and stiffness matrix of a beam span. This continues with the derivation of the stiffness matrix of the entire beam model and the effect of support settlements. The accompanying computer program is entitled "PROGE" (Analysis of Continuous Beams by the Displacement Method). The concluding section extends the use of "PROGE" to rigid frames without joint translation. Chapter 6 proceeds with plane frame analysis. Beginning with the calculation of joint jorces from fixed-end forces, this forges ahead to the analysis of the local stiffness matrix of combined truss and beam element. This continues with the previously derived local stiffness matrix of a truss element. The rigid frame analysis includes axial deformation. Program, "PROGF" (Plane Frame Analysis) solves a combined truss and beam element plus the proper checks.

Chapter 7 neglects axial deformation in rigid frame analysis. The chapter opens with a choice of 2 sideways freedom action from the 4 static horizontal and vertical deflections. We journey ahead into the composition of the global stiffness and deformation matrices. This encompasses the solution of the acting gravity and wind loads on the truss and their redistribution to the joints. The conjugate beam method is employed to determine the member stiffness matrix. This continues with the implementation of the matrix displacement method. A detailed solution is furnished using "PROGG" (Rigid Frame Analysis Neglecting Axial Deformation).

Chapter 8 speaks about plane grid analysis and its variations. The local stiffness matrix is derived using the beam element with torsion effect. The principle of virtual work explains the torsional effect quite well. The local stiffness matrix (east-west and north-south) can be easily obtained from the more elaborate local stiffness matrix which includes the effect of torsion. Elastic supports are included since they do play an important role. An elaborate solution utilizing "PROGH" (Plane Grid Analysis) is made. This includes rigid supports under uniform load. The next chapter covers space rigid frame analysis. This is a 3-D space frame and includes the 12 degrees of freedom and the proper angle inclination. The element deformation and stiffness matrices are derived and used in a computational version using "PROGI" (Space Rigid Frame Analysis).

Chapter 10 reports on limit analysis of continuous beams and rigid frames. The author defines plastic moment capacity, plastic hinge rotation and stepwise elastic analysis to collapse. The latter comprises the first and second stage elastic analysis and can be employed to shorten the solution of the plastic analysis of a truss element. "PROGJ" (Limit Analysis of Rigid Frames) studies numerically an example of a continuous beam and rigid frame. Based on knowledge gleaned in previous chapters, this leads to truss analysis by methods of parts. One divides a truss into interior connecting degrees of freedom. The most direct and economical way of assigning element numbers are pointed out. One uses them in obtaining the local and connecting stiffness matrices. We employ "PROGK" (Truss Analysis by Method of Parts) in solution of the truss.

The concluding chapter focuses upon plane frame analysis by the method of parts. The standard method of finite elements with the proper significance of the element numbers for a box girder containing diagonal braces is the computational subject of this chapter utilizing "PROGL" (Plane Rigid Frame Analysis by Parts).

Appendix A contains additional examples with accompanying solutions employing "PROGA" to "PROGL."

In summary, this is a good book. The worked out problems and their solutions are the highlights of this book. The reviewer would have liked to see more extensive analysis of beam elements including shear deformation. Transfer matrices applied to beams would be a great asset to this book. A short section on vibration analysis would be a most welcome addition to this book. This would employ matrix methods and stiffness matrices. The reviewer further believes that FORTRAN should be stressed instead of BASIC. The former is used extensively in engineering office computer programs on microcomputer and main frames. However, the reviewer does recommend this book to those interested in the matrix analysis of structures.

Probability, Random Variables and Stochastic Processes—2nd Edition,
A. Papoulis,
McGraw-Hill Book Co., New York, NY,
1984, 576 pages, $44.

This is not an ordinary book on stochastic processes! The author revised the first edition in a very complete scientific manner and included a number of new topics. This authoritative text is seldom referred to in the technical journals. It is a gem; the author explains the various facets in a clear and lucid manner devoid of higher mathematics. Random variables and stochastic processes have trudged along a rocky road. This stems from the vagueness and obvious lack of continuity between the various aspects of probability as studied in introductory courses and the more sophisticated ideas required in present-day applications. Books on this subject present a short discourse on the above topics but lack the basic understanding of the fundamental concepts. The book remedies this situation by taking the reader in hand and cleverly leads us along a straight path devoid of obstacles. As stated by the author, "I made a special effort to stress the conceptual difference between mental constructs and physical reality . . . . In physical sciences the theories are so formulated as to correspond in some useful sense to the real world, whatever that may mean . . . . The physical justification of all the theoretical conclusions is based on some form of inductive reasoning." The book consists of 3 parts divided into 15 chapters and a fairly comprehensive bibliography.

The initial part describes probability and random variables. Chapter 1 reports on the meaning of probability and its various definitions. This encompasses relative frequency definition, probability of an event, validity of data and choice of possible and favorable outcomes, i.e., (*a*) Maxwell-Boltzman statistics, (*b*) Einstein statistics, and (*c*) Fermi-Dirac statistics. The three proposed models are in reality only hypothesis and the researcher will only select one of the above where his consequences agree with his experience. This continues with the relative concept of probability and the idea of induction and follows with the category of casualty versus randomness. The author concludes that scientific theorems are not discoveries of the laws of nature but rather inventions of the human mind.

Chapter 2 reports on the axioms of probability. He defines set theory and operations, probability space, axiomatic definition of an experiment, and the conditional probability of an event. The book investigates the idea of total probability, independence of events, and introduction to Bayes theorem. Chapter 3 follows with the topic of repeated trials. This proceeds with asymptotic theorems (Gaussian function) and DeMoivre-Laplace theorem. This is noted as an equality of the limit plus Poisson processes. An application of the latter is "random points" where the probability of a certain number