2. GAM-I, a FORTRAN II program for the IBM-7090 is now available for distribution. This program computes the slowing down spectrum in either the P_1 or the B_1 approximation using 68 groups of neutrons with a constant group width $\Delta u = 0.25$. The code calculates multigroup constant for up to 32 fast groups. Special features of this code include:
   (a) A subroutine that calculates resonance integrals from the resonance parameters for each group using the quantitative methods developed by L. W. Nordheim.
   (b) The energy angle correlation is retained for slowing down in all isotopes. That is, the P_0 and P_1 components of the scattering kernel are treated rigorously. For the common moderating materials and for some of the more common isotopes, terms up to P_6 in the Legendre expansion of the scattering cross section in the center of mass system are retained. For other isotopes, the scattering matrices are correct for linearly anisotropic scattering in the center of mass system.
   (c) The code contains a large library. At present, the library tape consists of 127 nuclides. The library tape contains all of the data needed in the calculation for each of the 68 subgroups.
   (d) Inelastic scattering and $(n,2n)$ processes are explicitly included.
   (e) The code contains an option that will calculate the neutron age in an infinite medium by the moments method.
   (f) Both microscopic and macroscopic cross sections can be obtained for as many isotopes as are on the data tape for any specified group structure.
   (g) Self-shielding factors may be included for any nuclide, if desired.
   (h) Nine different source spectra are included as options.
3. The running time for a typical problem is about one minute.
4. *Reference:* G. D. Joanou, E. J. Leshan and J. S. Dudek, GAM-I, A consistent P_1 multigroup code for the calculation of the fast neutron spectrum and multigroup constants. GA-1850 (May, 1961).

G. D. Joanou
General Dynamics
General Atomic Division
San Diego, California

SLOP-I

1. Code name: SLOP-1
2. Computer, programming system: Program is written in SAP for the IBM-704
3. Problem solved: SLOP-1 solves multigroup equations appropriate to the thermal neutron energy band and computes a position dependent thermal neutron flux spectrum. It is intended, primarily, for the study of the time independent flux shape produced, in the thermal range, by a given slowing-down density. However, a modified version of the code (not described in the referenced code report) may be used to determine the main mode flux shape in a pulsed moderator. Code treats one-dimensional slab, cylindrical, and spherical geometries.
4. Basic approximations: For slowing-down or pulse calculations the P_1, P_3, or double P_1 approximations are available in slab geometry. P_1 in other geometries. In addition, simple die away calculations may be done in P_3 for spheres. General P_0 through P_3 scattering is treated through transfer matrices.
5. Method of solution: Within each group, P_3 or double-P_1 equations are solved by inner iteration (see reference). The different groups are treated sequentially by Gauss-Seidel outer iteration. Overrelaxation or extrapolation may be used to accelerate convergence of the outer cycle. Microscopic cross sections and transfer matrices are stored in program library so that only number densities need be supplied as input.
6. Restrictions on complexity of problem: No. of groups ≤ 50. No. of mesh points ≤ 250 in P_1, ≤ 150 in double-P_1. No. of regions ≤ 25. No. of isotopes in any region ≤ 15. Restrictions quoted hold for 32K IBM-704. Program will run on smaller machines with reductions in maximum number of groups, points, etc. In slowing-down problems the slowing-down density is assumed to be isotropic and regionwise flat and, in all versions of SLOP-1, the temperature is assumed to be position independent. Only one element may act as a moderator. The moderating properties of that element are fixed by the transfer matrices stored on the program tape.
7. Typical running times: Depends on number of groups, number of points, order of approximation and convergence rate of outer cycle. This convergence rate decreases as the absorption cross section per moderating atom decreases. In P_1, 45 min for 100 mesh points and 36 groups would be typical. In double-P_1, roughly 75 min would be typical.
8. Status: Code is in production and is available from IBM.
9. *Reference:* H. Bohl, E. Gelbard, P. Buerger, and G. Culpepper, SLOP-1—A thermal multigroup program for the IBM-704. WAPD-TM-188 (October, 1960).

E. Gelbard
H. Bohl
Bettis Atomic Power Laboratory
Pittsburgh, Pennsylvania

ECESS

1. Code name: ECESS
2. Computer and programming system: Code is written in SAP for the IBM-704.
3. Problem solved: The ECESS code is designed, primarily, to compute parameters required in a multigroup treatment of the thermal neutron flux. The computation of multigroup parameters is based on a monatomic gas model of the physical moderator. ECESS may also be used, however, to obtain spectra for the scalar flux and current in large geometry. Averages over these spectra are evaluated to provide, in addition, coefficients for a one-group description of thermal neutrons.

   Coefficients are computed for the ratio M/m of atomic mass to neutron mass and the temperature specified. Coefficients for a treatment up to P_3 or double P_1 are obtained.
4. Method of solution: After the multigroup parameters are computed, the infinite medium flux spectrum is determined by Gauss-Seidel iteration. The current spectrum in the low buckling limit is then deduced from the flux spectrum.