

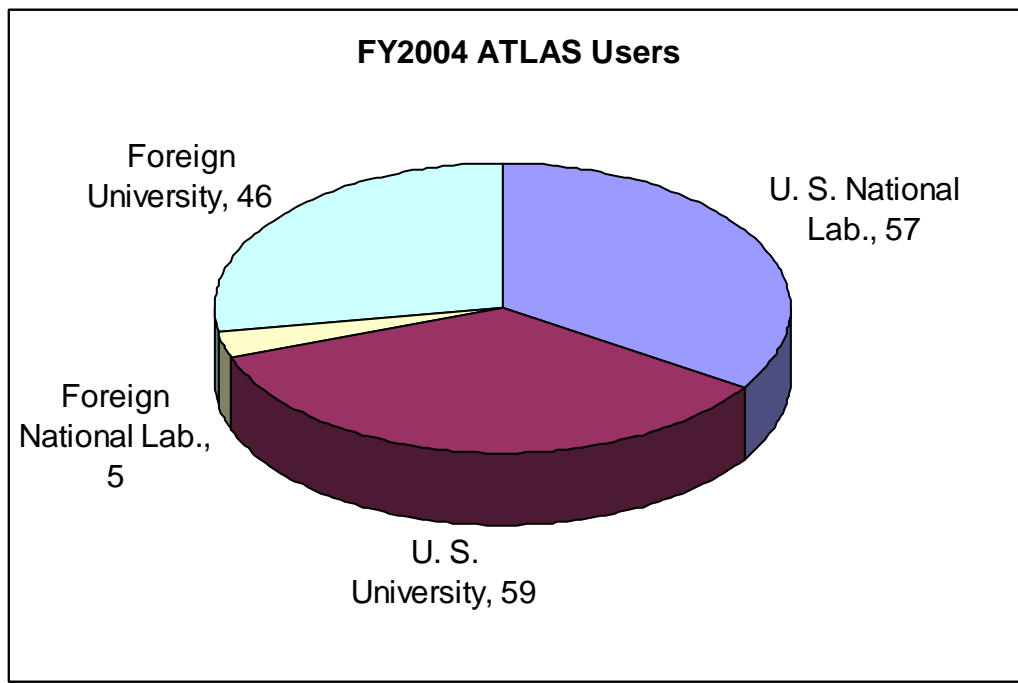
## J. ATLAS USER PROGRAM (E. F. Moore)

During the fiscal year 2004, ATLAS hosted strong "campaigns" involving radioactive beams, the CPT, and, of course, Gammasphere. During the first half of the FY, Gammasphere was coupled to the FMA. In May 2004, Gammasphere was moved over to the old APEX beam line. ATLAS was down for approximately one month during the move. Following the move, Gammasphere was operated in "stand alone" mode, allowing campaigns using CHICO and the Microball. It is anticipated that Gammasphere will return to the FMA in the fall of 2005.

Many of the experimental programs were driven by outside Users, and in all programs, there was considerable outside User involvement. Over 95% of all experiments performed in fiscal year 2004 included one or more outside Users and roughly 50% of the approved experiments had an outside User as the Principal Investigator. Frank Moore continued to be available in a user liaison capacity to handle the

scheduling of ATLAS experiments, provide assistance in experiment proposal submission matters, and help facilitate the effective performance of research at ATLAS by outside scientists. In addition, a large portion of the Heavy-Ion in-house scientific staff and members of the technical support staff spent substantial amounts of their time in experiment setup, preparation and assistance for the many different experiments performed at ATLAS.

A total of 167 Users from 48 different institutions were present at ATLAS for experiments in FY 2004. The pie chart below shows the distribution of the institutions represented by ATLAS Users and the number of Users of each type. Of the 57 Users from U.S. National Laboratories, 48 are from Argonne (47 from the Physics Division, including 7 summer students and 3 long-term visitors). There were 52 students at ATLAS for experiments this FY, of which 11 were based at Argonne long-term. The names and institutions of all outside Users who were present at ATLAS in FY 2004 are listed below in section (b).



The program advisory committee met once during the 2004 fiscal year, on June 4-5, 2004 to recommend

experiments for beam time allocation at ATLAS. In FY 2004 the Program Advisory Committee members were:

**June 4-5, 2004**

Birger Back  
Art Champagne  
Augusto Macchiavelli

Argonne National Laboratory  
University of North Carolina, Chapel Hill  
Lawrence Berkeley National Laboratory

David Morrissey  
 David Radford (*Chair*)  
 Piet Van Duppen  
 Alan Wuosmaa

Michigan State University  
 Oak Ridge National Laboratory  
 University of Leuven, Belgium  
 Western Michigan University

The PAC reviewed 47 proposals for 236 days of requested running time. Due to the large demand for Gammasphere beam time, the PAC was asked to prioritize experiments into two categories; those that must be run at any cost (*priority I*), and those that should be granted beam time if at all possible (*priority II*). Of the submitted proposals, the Program Advisory Committee recommended priority I acceptance of 28 proposals for a total of 138 days of running time, and priority II acceptance of 2 proposals for 16 additional days of beam time.

Immediately following the Conference on "Nuclei at the Limits" held at ANL from July 26-30, 2004, the ATLAS User Community held a workshop on July 31-August 1, 2004 at the ANL Physics Division. Approximately 80 ATLAS Users attended the workshop and the presentations included future plans for ATLAS and experimental equipment, and a summary of the results of a "User Satisfaction" survey by Susan Fischer. Input from the Workshop attendees was incorporated into the Strategic Plan for the future of ATLAS.

The fall meeting of the American Physical Society, Division of Nuclear Physics was held in Chicago, IL, from October 27-30, 2004. The US national nuclear laboratories with low-energy heavy-ion facilities; ATLAS at Argonne, HRIBF at Oak Ridge, and the NSCL at Michigan States University held a joint User Meeting. In addition, the Gammasphere and RIA User groups meetings were also held during the same session. The Chair of the ATLAS User Group Executive Committee, Prof. Alan Wuosmaa (W. Michigan Univ.) introduced the ATLAS user program, Frank Moore presented a summary of the ATLAS User Program and announced the upcoming election for the ATLAS User Group Executive Committee, and Robert Janssens discussed the results of the User Workshop and the ATLAS Strategic Plan. Mike Carpenter discussed the status of Gammasphere at ATLAS during the Gammasphere Users group session. There were approximately 100 scientists in attendance at the meeting.

In FY 2004, the ATLAS User Group Executive Committee consisted of Alan Wuosmaa (Chair, Western Michigan University), Jolie Cizewski (Rutgers University), Susan Fischer (De Paul University), and Walter Reviol (Washington University).

#### a. Experiments Involving Outside Users

All experiments in which outside users directly participated during FY 2004 are listed below. The spokesperson for each experiment is given in square

brackets after the title, and the collaborators who were present for the experiment are given below each entry.

1. Measuring the Charge Radius of  ${}^6\text{He}$  [Lu]  
 Z.-t. Lu, K. E. Rehm, R. C. Pardo, L.-B. Wang, P. Mueller, K. Bailey, T. P. O'Connor, D. Henderson, T. O. Pennington, J. P. Schiffer, R. J. Holt, and R. V. F. Janssens
2. The Proton Decay of the  $T_z = -1/2$  "Waiting Point" Nucleus  ${}^{69}\text{Br}$  [Seweryniak]  
 D. Seweryniak, G. Mukherjee, B. Blank, C. N. Davids, N. Hammond, M. P. Carpenter, S. Sinha, T. O. Pennington, D. G. Sarantites, D. Rudolph, R. V. F. Janssens, C. J. Chiara, C. H. Fahlander, P. J. Woods, T. Davinson, and S. Zhu
3. Spins of Excited States in  ${}^9\text{Li}$  and the Nuclear Three-Body Force [Wuosmaa]  
 K. E. Rehm, R. C. Pardo, J. P. Greene, S. Sinha, A. H. Wuosmaa, A. M. Heinz, D. Henderson, E. F. Moore, R. V. F. Janssens, X. Tang, D. A. Peterson, J. P. Schiffer, G. Savard, C. Jiang, R. E. Segel, and L. Jisonna
4. Continuation of the Precision Measurement of the Q-Value of the Superallowed Decay of  ${}^{22}\text{Mg}$  with the CPT Mass Spectrometer [Savard]  
 G. Savard, J. Clark, K. S. Sharma, J. C. Hardy, Z. Zhou, J. Wang, A. Levand, W. L. Trimble, N. Scielzo, V. E. Iacob, and A. A. Hecht

5. Electromagnetic Decay Properties of the  $T_z = \sim 1/2$   $A = 67$  Mirror Pair: Isospin Symmetry From E1 Amplitudes [De Angelis]  
G. De Angelis, D. V. Tonev, D. R. Napoli, S. Lunardi, E. Farnea, C. A. Ur, D. G. Sarantites, C. J. Chiara, W. Reviol, O. Pechenaya, M. P. Carpenter, C. J. Lister, G. Mukherjee, and N. Hammond
6. High-Resolution Particle-Gamma Coincidence Spectroscopy [Rudolph]  
D. Rudolph, L.-L. Andersson, J. Ekman, C. H. Fahlander, E. K. Johansson, R. K. G. du Rietz, R. J. Charity, C. J. Chiara, O. Pechenaya, W. Reviol, D. G. Sarantites, L. G. Sobotka, C. Andreoiu, D. A. Torres Galindo, C. J. Lister, D. Seweryniak, and S. Zhu
7. Measurement of the Beta-Delayed Alpha Spectrum of  $^{16}\text{N}$  With a New Technique [Rehm]  
K. E. Rehm, A. H. Wuosmaa, C. Jiang, S. Sinha, G. Mukherjee, J. P. Schiffer, R. C. Pardo, E. F. Moore, R. E. Segel, L. Jisonna, X. Tang, G. Savard, J. P. Greene, and D. Henderson
8. Finding the Oblate Excited States in  $^{72}\text{Kr}$  [Fischer]  
S. M. Fischer, C. J. Lister, S. J. Freeman, N. Hammond, G. Mukherjee, S. Sinha, T. O. Pennington, D. Henderson, R. V. F. Janssens, M. P. Carpenter, D. Seweryniak, D. P. Balamuth, P. A. Hausladen, and E. F. Moore
9. Neutron-Proton Correlations and the Wavefunction Purity of Low-Lying  $T = 0$  and  $T = 1$  States in the  $N = Z$  Odd-Odd Nucleus  $^{74}\text{Rb}$  [Lister]  
C. J. Lister, S. M. Fischer, M. P. Carpenter, E. F. Moore, N. Hammond, R. V. F. Janssens, T. L. Khoo, T. Lauritsen, and S. Sinha
10. Radiative Capture and Fusion Dynamics in Cold Fusion  $^{90}\text{Zr} + ^{89}\text{Y}$  Reaction [Kondev]  
F. G. Kondev, A. Bracco, F. Camera, O. Wieland, M. P. Carpenter, T. L. Khoo, R. V. F. Janssens, C. J. Lister, I. Ahmad, C. N. Davids, S. J. Freeman, N. Hammond, T. Lauritsen, G. Mukherjee, D. Seweryniak, D. J. Hartley, T. Goon, P. Chowdhury, U. Garg, S. Zhu, and E. F. Moore
11. Possible Improvements in  $^{39}\text{Ar}$  AMS at ATLAS [Collon]  
P. Collon, K. E. Rehm, C. Jiang, R. Golser, R. Vondrasek, R. C. Pardo, R. H. Scott, M. Paul, and G. Zinkann
12. Quadrupole Moments of Wobbling Bands in  $^{167}\text{Lu}$  [Amro]  
H. Amro, G. B. Hagemann, P. J. Bringel, A. Neusser, C. Engelhardt, C. R. Hansen, B. Herskind, D. J. Hartley, G. Gurdal, Y. Zhang, W. C. Ma, D. G. Roux, R. B. Yadav, D. A. Meyer
13. Measurement of  $^3\text{He}$  to  $^4\text{He}$  Ratios in Isotopically Purified Helium [Doyle]  
R. C. Pardo, K. E. Rehm, P. R. Huffman, S. Dzhosyuk, C. Jiang, J. P. Schiffer, P. Collon, R. Vondrasek, R. H. Scott, S. Sinha, X. Tang, and L. Yang
14. Proton Decay of  $^{121}\text{Pr}$  [Davids]  
C. N. Davids, D. Seweryniak, W. B. Walters, P. J. Woods, A. P. Robinson, A. A. Hecht, R. V. F. Janssens, M. P. Carpenter, S. Sinha, and S. Zhu
15. Study of the  $^{18}\text{Ne}(\alpha, p)^{21}\text{Na}$  Reaction in Inverse Kinematics [Sinha]  
S. Sinha, J. P. Greene, A. H. Wuosmaa, D. Henderson, R. V. F. Janssens, C. Jiang, L. Jisonna, R. C. Pardo, D. A. Peterson, K. E. Rehm, J. P. Schiffer, R. E. Segel, R. H. Siemssen, E. F. Moore, X. Tang, A. A. Chen, and P. D. Parker
16. Is There Octupole Deformation at High Spin in  $^{240}\text{Pu}$ ? [Wiedenhöver]  
I. Wiedenhöver, A. P. Bernstein, E. S. Diffenderfer, C. Teal, Jr., P. C. Wilson, A. Larabee, B. A. Meredith, I. Ahmad, J. P. Greene, T. L. Khoo, E. F. Moore, R. V. F. Janssens, S. Zhu, T. Lauritsen, G. Mukherjee, C. J. Lister, D. Seweryniak, M. P. Carpenter, and A. A. Hecht

17. Study of Excited States in  ${}^7\text{He}$  - Update [Wuosmaa]  
A. H. Wuosmaa, K. E. Rehm, J. P. Greene, J. P. Schiffer, R. E. Segel, L. Jisonna, S. Sinha, E. F. Moore, X. Tang, R. C. Pardo, C. Jiang, G. Savard, and D. A. Peterson
18. Search for Hyperdeformation in  ${}^{126}\text{Xe}$  [Hübel]  
H. K. Hübel, P. J. C. Bringel, C. Engelhardt, A. Neusser, B. Herskind, G. B. Hagemann, G. Sletten, C. R. Hansen, P. Fallon, R. M. Clark, A. Bracco, G. Benzoni, F. Camera, S. W. Ødegård, M. P. Carpenter, T. L. Khoo, T. Lauritsen, R. V. F. Janssens, P. Chowdhury, and J. Roccas
19. Measurement of the  $\beta$ -Delayed  $\alpha$  Spectrum of  ${}^{16}\text{N}$  With a New Technique-2 [Rehm]  
C. Jiang, G. Savard, J. P. Schiffer, X. Tang, S. Sinha, R. C. Pardo, E. F. Moore, R. V. F. Janssens, R. E. Segel, L. Jisonna, D. Henderson, J. P. Greene, T. O. Pennington, K. E. Rehm, and M. Paul
20. Shape Transitions at High Spin in Neutron-Rich  ${}^{180,182}\text{Hf}$  Nuclei [Chowdhury]  
P. Chowdhury, S. K. Tandel, U. S. Tandel, S. P. Sheppard, D. Cline, C.-Y. Wu, D. Seweryniak, S. Zhu, R. V. F. Janssens, M. P. Carpenter, F. G. Kondev, T. L. Khoo, and T. Lauritsen
21. How Does the  $j_{15/2}$  Neutron Pair Align in Actinide Nuclei? [Wu]  
D. Cline, A. Hayes, M. A. Riley, C.-Y. Wu, A. O. Macchiavelli, E. Rodriguez-Vieitez, R. V. F. Janssens, M. P. Carpenter, S. Zhu, I. Ahmad, and J. P. Greene
22. Search for Triaxial Superdeformation and Wobbling Mode in Even-Even  ${}^{172}\text{Hf}$  [Ma]  
W. C. Ma, D. G. Roux, R. B. Yadav, S. W. Ødegård, S. Rigby, D. M. Cullen, D. J. Hartley, J. A. Winger, Y. Zhang, T. Lauritsen, M. P. Carpenter, E. F. Moore, R. V. F. Janssens, T. L. Khoo, S. Zhu, and D. T. Scholes
23. Determination of  $P_{\text{cn}}$  for Cold Fusion [Loveland]  
W. Loveland, D. A. Peterson, P. H. Sprunger, C. J. Lister, P. Chowdhury, C. Jiang, S. Zhu, X. Tang, S. Sinha, and R. S. Naik
24. Measurement of  ${}^{64}\text{Ni}$  Induced Fusion on the Transitional Nucleus  ${}^{100}\text{Mo}$  at Extreme Sub-Barrier Energies [Jiang]  
C. Jiang, K. E. Rehm, R. V. F. Janssens, X. Tang, S. Sinha, D. A. Peterson, S. Zhu, P. Collon, I. Tanihata, A. H. Wuosmaa, D. Seweryniak, and C. N. Davids
25. Shapes and the Shell Model at  $A = 60$  [Freeman]  
S. J. Freeman, R. V. F. Janssens, J. F. Smith, B. J. Varley, A. N. Deacon, S. L. Tabor, I. J. Calderin, D. Seweryniak, T. Lauritsen, S. Zhu, and N. Hammond
26. Determining the End-Point for Nova Nucleosynthesis: Evaluating the  ${}^{30}\text{P}$  ( $p,\gamma$ ) Reaction Rate [Jenkins]  
D. G. Jenkins, C. J. Lister, M. P. Carpenter, D. Seweryniak, P. Chowdhury, N. Hammond, S. Sinha, K. E. Rehm, A. S. Jokinen, and H. T. Penttilä
27. Search for Wobbling Excitations in Odd-Odd  ${}^{164}\text{Lu}$  [Ødegård]  
S. W. Ødegård, P. J. C. Bringel, A. Neusser, C. Engelhardt, H. K. Hübel, C. R. Hansen, B. Herskind, G. Sletten, D. G. Roux, M. P. Carpenter, T. L. Khoo, F. G. Kondev, T. Lauritsen, and W. C. Ma
28. Entry Distribution for SD Bands in  ${}^{152}\text{Dy}$  [Lauritsen]  
T. Lauritsen, R. V. F. Janssens, P. Fallon, C. J. Lister, M. P. Carpenter, A. J. Larabee, S. Zhu, E. F. Moore, T. L. Khoo, I. Ahmad, F. G. Kondev, D. Seweryniak, A. A. Hecht, N. Hammond, and P. Chowdhury

29. Mass Measurements on Refractory Isotopes Around the rp-Process Waiting Point Nuclei  $^{80}\text{Zr}$ ,  $^{84}\text{Mo}$ , and  $^{92}\text{Pd}$  [Savard]  
G. Savard, J. Clark, J. Wang, Z. Zhou, A. Levand, N. Scielzo, K. S. Sharma, A. A. Hecht, S. Sinha, and N. Scielzo
30. Structure of Threshold States in the  $^{21}\text{Na}(p,\gamma)^{22}\text{Mg}$  Reaction [Woods]  
P. M. Davidson, P. J. Woods, D. Seweryniak, C. N. Davids, J. M. Shergur, S. Sinha, M. P. Carpenter, T. Lauritsen, R. V. F. Janssens, and D. G. Jenkins
31. In-Beam  $\gamma$  Spectroscopy of the Proton Emitter  $^{117}\text{La}$  [Seweryniak]  
D. Seweryniak, P. J. Woods, Z. Liu, A. P. Robinson, C. N. Davids, T. Davinson, R. V. F. Janssens, M. P. Carpenter, X. Tang, and S. Zhu
32. Reflection Asymmetry in the Actinides [Hammond]  
N. Hammond, M. P. Carpenter, R. V. F. Janssens, D. Seweryniak, E. F. Moore, T. Lauritsen, F. G. Kondev, S. Zhu, T. L. Khoo, J. F. Smith, S. J. Freeman, A. N. Deacon, G. D. Jones, and P. Chowdhury
33. Studies of Excited States in  $^{101}\text{Sn}$ . Phase I: Search for  $^{101}\text{Sn}$   $\beta$ -Delayed Protons [Seweryniak]  
D. Seweryniak, S. Zhu, R. V. F. Janssens, C. J. Lister, M. P. Carpenter, N. Hammond, D. Henderson, A. A. Hecht, W. B. Walters, and D. A. Peterson
34.  $T = 0$  Pairing in the Even-Even  $N = Z$  Nucleus  $^{92}\text{Pd}$  [Chiara]  
C. J. Chiara, D. G. Sarantites, W. Reviol, O. Pechenaya, L.-L. I. S. Andersson, E. K. Johansson, D. Rudolph, D. Seweryniak, A. O. Macchiavelli, and S. Zhu
35. Studies of the Breakout Reaction  $^{18}\text{Ne}(p,\alpha)^{21}\text{Na}$  in Inverse Kinematics [Sinha]  
A. H. Wuosmaa, K. E. Rehm, X. Tang, S. Sinha, L. Jisonna, C. Jiang, J. P. Schiffer, R. C. Pardo, J. P. Greene, D. Henderson, R. E. Segel, R. V. F. Janssens, E. F. Moore, M. M. Notani, and N. Goodman
36. Search for TSD Bands and Wobbling Excitations in  $^{171}\text{Ta}$  [Hartley]  
D. J. Hartley, J. R. Vanhoy, W. H. Mohr, M. A. Riley, A. L. Aguilar, C. Teal, Jr., L. L. Riedinger, M. T. Danchev, M. K. Djongolov, S. W. Ødegård, R. V. F. Janssens, F. G. Kondev, M. P. Carpenter, T. Lauritsen, P. Chowdhury, S. K. Tandel, and E. F. Moore
37. Continuation of the Mass Measurement Program on Refractory Isotopes around the rp-Process Waiting Point Nuclei  $^{80}\text{Zr}$ ,  $^{84}\text{Mo}$ , and  $^{92}\text{Pd}$  [Savard]  
G. Savard, J. Clark, Z. Zhou, J. Wang, Y. Wang, B. Lundgren, A. Levand, A. A. Hecht, N. Scielzo, I. Tanihata, A. C. Villari, H. Sharma, J. Fallis, S. Russell, and M. Scholte-van de Vorst
38. Test of the Upgraded Area II Enge Spectrograph in Gas-Filled Mode [Savard]  
G. Savard, J. Clark, K. S. Sharma, B. Lundgren, I. Tanihata, N. Scielzo, Y. Wang, W. L. Trimble, A. Levand, A. A. Hecht, M. Sternberg, M. Scholte-van de Vorst, S. Russell, J. Fallis, and I. M. Percher
39. The Structure of Neutron-Rich sdf-Shell Nuclei using Multi-Nucleon Transfer Reaction Studies at Gammasphere [Fallon]  
P. Fallon, I.-Y. Lee, E. Rodriguez-Vieitez, M. Descovich, C.-Y. Wu, D. Cline, S. Zhu, D. Seweryniak, M. P. Carpenter, and R. V. F. Janssens

**b. Outside Users of ATLAS During the Period October 1, 2003 - September 30, 2004**

This list includes all outside Users who were an experiment spokesperson (a), alternate spokesperson (b), student (s), or collaborator actually present at ATLAS for an experiment. An additional 30 Users

listed as collaborators on the various experiment proposals were not at ATLAS in person, and thus are not represented in the list below.

1. Clark University  
G. Gurdal (s)
2. CSNSM  
J. Roccaz (s)
3. De Paul University  
S. M. Fischer (a)
4. Florida State University  
A. L. Aguilar (s)  
A. P. Bernstein (s)  
I. J. Calderin (s)  
E. S. Diffenderfer (s)  
M. A. Riley (b)  
S. L. Tabor  
C. Teal, Jr. (s)  
I. Wiedenhöver (a)  
P. C. Wilson (s)
5. GANIL  
A. C. Villari
6. Greenville College  
A. J. Larabee  
B. A. Meredith (s)
7. Harvard University  
J. M. Doyle (a)  
L. Yang (s)  
S. Dzhosyuk
8. Hebrew University of Jerusalem  
M. Paul (b)
9. Lab. Nazionali di Legnaro  
G. De Angelis (a)  
D. R. Napoli  
D. V. Tonev
10. Lawrence Berkeley National Lab.  
R. M. Clark  
M. Descovich  
P. Fallon (a)  
I.-Y. Lee  
A. O. Macchiavelli (b)  
E. Rodriguez-Vieitez (s)
11. Lawrence Livermore National Lab.  
C.-Y. Wu (a)
12. Louisiana State University  
T. Goon
13. Lund University  
L. S. Andersson (s)  
R. K. G. du Rietz (s)  
J. Ekman (s)  
C. H. Fahlander  
E. K. Johansson (s)  
D. Rudolph (a)
14. McMaster University  
A. A. Chen
15. Mississippi State University  
W. C. Ma (a)  
D. G. Roux (b)  
J. A. Winger  
R. B. Yadav (s)  
Y. Zhang (s)
16. National Institutes of Standards and Technology  
P. R. Huffman (b)
17. Northwestern University  
L. Jisonna (s)  
R. E. Segel (b)
18. Oak Ridge National Laboratory  
P. A. Hausladen
19. Oregon State University  
W. Loveland (a)  
P. H. Sprunger (s)
20. Saha Institute of Nuclear Physics  
G. Mukherjee
21. Texas A & M University  
J. C. Hardy  
V. E. Iacob
22. United States Naval Academy  
D. J. Hartley (a)  
W. H. Mohr (s)  
J. R. Vanhoy

23. Universidad Nacional de Colombia  
D. A. Torres Galindo (s)
24. Universität Bonn  
P. J. C. Bringel (s)  
C. Engelhardt (s)  
H. K. Hübel (a)  
A. Neusser (s)
25. Universität Wien  
R. Golser
26. Università degli Studi di Milano  
G. Benzoni (s)  
A. Bracco  
F. Camera  
O. Wieland
27. University of Chicago  
W. L. Trimble (s)
28. University of Copenhagen  
G. B. Hagemann (b)  
C. R. Hansen (s)  
B. Herskind (b)  
G. Sletten
29. University of Edinburgh  
T. Davinson  
A. P. Robinson (s)  
P. J. Woods (a)
30. University of Groningen  
R. H. Siemssen
31. University of Guelph  
C. Andreoiu
32. University of Jyväskylä  
A. S. P. Jokinen  
H. T. Penttilä
33. University of Liverpool  
G. D. Jones (b)
34. University of Manchester  
D. M. Cullen  
A. N. Deacon (s)  
S. J. Freeman (a)  
S. Rigby (s)  
D. T. Scholes (s)  
J. F. Smith  
B. J. Varley
35. University of Manitoba  
J. Clark (b)(s)
36. University of Maryland  
K. S. Sharma  
J. M. Shergur (s)  
W. B. Walters  
A. A. Hecht (s)
37. University of Massachusetts, Lowell  
P. Chowdhury (a)  
S. P. Sheppard (s)  
S. K. Tandel  
U. Tandel (s)
38. University of Notre Dame  
Ph. Collon (a)  
U. Garg  
S. Zhu
39. University of Oslo  
S. W. Ødegäard (a)
40. University of Padova  
E. Farnea  
S. Lunardi  
C. A. Ur
41. University of Pennsylvania  
D. P. Balamuth
42. University of Rochester  
D. Cline  
A. Hayes (s)
43. University of Surrey  
Z. Liu  
S. Williams
44. University of Tennessee  
M. T. Danchev  
M. K. Djongolov (s)  
L. L. Riedinger
45. University of York  
D. G. Jenkins (a)  
R. Wadsworth
46. Washington University  
R. J. Charity  
C. J. Chiara (a)  
O. Pechenaya (s)  
W. Reviol  
D. G. Sarantites (b)  
L. G. Sobotka
47. Western Michigan University  
N. Goodman (s)  
A. H. Wuosmaa (a)(b)

- 48. Yale University
  - H. Amro (a)
  - D. A. Meyer (s)
  - P. D. Parker