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Curriculum Vitae

Philip G. Roos

Professor of Physics

Education:

B.A. Ohio Wesleyan University, Summa cum laude, 1960
Ph.D. Massachusetts Institute of Technology, 1964

Experience in Higher Education:

1960-62 Teaching Assistant, M.I.T.
1962-64 Research Assistant, M.I.T.
1964-65 Visiting Assistant Professor of Physics, University of Maryland
1965-67 Visiting Postdoctoral Fellow, Oak Ridge National Laboratory
1967-71 Assistant Professor of Physics, University of Maryland
1971-75 Associate Professor of Physics, University of Maryland
1973-74 Sabbatical Leave at Institut de Physique Nucleaire, Orsay, France
1975- Professor of Physics, University of Maryland
1982-83 Sabbatical Leave at IUCF, Bloomington, Indiana
1989-90 Sabbatical Leave at LAMPF, NAC, and TRIUMF
1997 Sabbatical Leave at CEBAF, Jefferson Lab.

Publications:

See Attached List

Professional Activities:

Fellow, American Physical Society
Sigma Xi
Review manuscripts for Phys. Rev. C, Phys. Rev. Lett. and Nucl. Phys.
Review proposals for NSF and DOE
Session Chairman, APS meetings
Member, IUCF Program Advisory Committee, 1976-79
Chairman, IUCF Users Groups, 1982-83
UMd. representative to Oak Ridge Associated Universities, 1982-86
Member, NSF/DOE Nuclear Science Advisory Committee, 1983-85
Member, LAMPF Program Advisory Committee, 1984-88
Chairman, LEP Subcommittee, 1984-88
Member, Program Committee of Nuclear Physics Division of APS, 1985-87
Member, IUCF Long-Range Planning Committee, 1988-91

Member, TJNAF Board of Directors, 1996-98

Honors and Awards:

First in class of 1960, Ohio Wesleyan University
National Football Foundation Scholar-Athlete Award, 1960
University of Maryland General Research Board Grant, 1965
Honorable Mention, AAPT apparatus competition (with Barry Block), 1965
AEC Fellowship at Oak Ridge National Laboratory, 1965-67
University of Maryland General Research Board Semester Research Award,
Spring Semester, 1987
Fellow, American Physical Society
GRB Award, Spring Semester, 1999

Theses Directed:

Harrison, G., Deuteron-nucleus reactions at 69.1 MeV and a determination of neutron detector efficiencies, Ph.D. thesis (1972).

Cheng, V. K. C., A study of deuteron breakup reactions by protons at 65, 85 and 100 MeV, Ph.D. thesis (1973).

Carey, T. A., A systematic study of alpha-particle spectroscopic strengths using the $(p, p\alpha)$ reaction at 101.5 MeV, Ph.D. thesis (1979).

Woo, L. W., Elastic and inelastic scattering of 100 MeV protons from the even-even titanium isotopes, Ph.D. thesis (1981).

Wesick, J. S., A study of the continuum spectra from few nucleon targets using 100 and 150 MeV incident polarized protons, Ph.D. thesis (1982).

Chen, H. L., A systematic study of the helium-3 elastic and the $({}^3\text{He}, \alpha)$ transfer reaction at 132 MeV on ${}^{12}\text{C}$, ${}^{16}\text{O}$, ${}^{58}\text{Ca}$, ${}^{58}\text{Ni}$, and ${}^{90}\text{Zr}$, Ph.D. thesis (1983).

Hyman, S. D., A study of pion absorption on oxygen-16 at 165 MeV, Ph.D. thesis (1989).

Zhang, D., A study of positive pion absorption on lithium-6 around the δ resonance, Ph.D. thesis (1990).

Adimi, F., Pion absorption in ${}^4\text{He}$ at 114 MeV, Ph.D. thesis (1994).

Nguyen, L., $\pi^- p \rightarrow \pi^0 n$ cross sections in the region of the $\Delta(1232)$ resonance, Ph.D. thesis (1995).

Khayat, M., Pion induced proton knockout from polarized ${}^7\text{Li}$ at 240 MeV, Ph.D. thesis (1995).

A. Papers published (or accepted for publication) in refereed journals

Physics research

- 1) Elastic scattering of 160 MeV protons from Be^9 , Ca^{40} , Ni^{58} , Sn^{120} , and Pb^{208} , P. G. Roos and N. S. Wall, Phys. Rev. **140**, B1237 (1965).
- 2) Excitation of single-particle states in Be^8 by the $\text{Be}^9(p,d)\text{Be}^8$ reaction, J. B. Marion, C. A. Ludemann, and P. G. Roos, Phys. Lett. **22**, 172 (1966).
- 3) Quasi-free scattering of 160 MeV protons from nuclei, N. S. Wall and P. G. Roos, Phys. Rev. **150**, 811 (1966).
- 4) Quasi-elastic (He^3,t) scattering from the titanium isotopes, P. G. Roos, C. A. Ludemann, and J. J. Wesolowski, Phys. Lett. **24B**, 656 (1967).
- 5) Symmetry dependence of the optical potential for mass-3 projectiles, R. M. Drisko, P. G. Roos, and R. H. Bassel, Proc. of Int'l Conf. on Nuclear Structure, Tokyo, 1967; Suppl. to J. Phys. Soc. (Japan) **24**, 347 (1967).
- 6) Experimental and theoretical investigation of the $\text{Pb}^{208}(p,t)\text{Pb}^{206}$ reaction at 40 MeV, S. M. Smith, C. Moazed, A. M. Bernstein, and P. G. Roos, Phys. Rev. **169**, 951 (1968).
- 7) Coupled channel and microscopic analysis of the quasi-elastic and quasi-inelastic $\text{Ti}(\text{He}^3,\text{H}^3)$ data, J. J. Wesolowski, E. H. Schwartz, P. G. Roos, and C. A. Ludemann, Phys. Rev. **169**, 878 (1968).
- 8) The $\text{Be}^9(p,p\alpha)\text{He}^8$ reaction at 57 MeV, P. G. Roos, H. G. Pugh, M. Jain, H. D. Holmgren, M. Epstein, and C. A. Ludemann, Phys. Rev. **176**, 1246 (1968).
- 9) Study of $\text{C}^{12}(p,p\alpha)\text{Be}^8$ reaction and excited states of C^{12} , M. Epstein, H. D. Holmgren, M. Jain, H. G. Pugh, P. G. Roos, N. S. Wall, C. D. Goodman, and C. A. Ludemann, Phys. Rev. **178**, 1698 (1969).
- 10) Test of the cluster knockout model using the reaction $\text{Li}^6(p,p\alpha)d$, Hogil Kim, P. G. Roos, Mahavir Jain, and H. D. Holmgren, Phys. Rev. Lett. **22**, 241 (1969).
- 11) Tests of the peripheral model for a cluster knockout reaction, H. G. Pugh, J. W. Watson, D. A. Goldberg, P. G. Roos, D. I. Bonbright, and R. A. J. Riddle, Phys. Rev. Lett. **22**, 408 (1969).
- 12) Level of structure of Zr^{88} studied with the $\text{Zr}^{90}(p,t)$ reaction, J. B. Ball, R. L. Auble, R. M. Drisko, and P. G. Roos, Phys. Rev. **177**, 1699 (1969).
- 13) Study of the $\text{Ca}^{48}(\text{He}^3,p)\text{Sc}^{50}$ reaction, H. Ohnuma, J. R. Erskine, J. A. Nolen, Jr., J. P. Schiffer, and P. G. Roos, Phys. Rev. **177**, 1695 (1969).
- 14) The (p,pt) reaction on the even zirconium isotopes, J. B. Ball, R. L. Auble, and P. G. Roos, Phys. Lett. **29B**, 172 (1969).
- 15) The $(p,p\alpha)$ and $(\alpha,2\alpha)$ reactions on Li^6 and Li^7 at 60 MeV, Mahavir Jain, P. G. Roos, H. G. Pugh, and H. D. Holmgren, Nucl. Phys. **A153**, 49 (1970).

- 16) A study of the zirconium isotopes with the (p, t) reaction, J. B. Ball, R. L. Auble, and P. G. Roos, Phys. Rev. C **4**, 196 (1971).
- 17) Test of the shell model for Pb^{206} by the $\text{Pb}^{208}(p, t)$ reaction, S. M. Smith, P. G. Roos, A. M. Bernstein, and C. Moazed, Nucl. Phys. **A158**, 497(1970).
- 18) Off-mass-shell effects and nuclear structure in the $\text{Li}^6(\alpha, 2\alpha)d$ reaction, J. W. Watson, H. G. Pugh, P. G. Roos, D. A. Goldberg, D. I. Bonbright, and R. A. J. Riddle, Nucl. Phys. **A172**, 513 (1971).
- 19) Fragmentation of one-hole strength in the $\text{Pb}^{208}(p, d)\text{Pb}^{207}$ reaction by hole-core coupling states, S. M. Smith, P. G. Roos, C. Moazed, and A. M. Bernstein, Nucl. Phys. **A173**, 32 (1971).
- 20) Scattering of 139 MeV alpha particles by ^{58}Ni and ^{208}Pb , D. A. Goldberg, S. M. Smith, H. G. Pugh, P. G. Roos, and N. S. Wall, Phys. Rev. C **7**, 1938 (1973).
- 21) The $(p, 2p)$ reaction on ^2H , ^3He , and ^4He , H. G. Pugh, P. G. Roos, A. A. Cowley, V. K. C. Cheng, and R. Woody, III, Phys. Lett. **46B**, 192 (1973).
- 22) Deuteron stripping to the single particle states of ^{17}O , M. D. Cooper, W. F. Hornyak, and P. G. Roos, Nucl. Phys. **A218**, 249 (1974).
- 23) A comparison of the $^3\text{He}(p, 2p)d$ and the $^3\text{He}(p, pd)p$ reactions, A. A. Cowley, P. G. Roos, H. G. Pugh, V. K. C. Cheng, and R. Woody, III, Nucl. Phys. **A220**, 429 (1974).
- 24) The deuteron breakup reaction induced by protons of 65, 85, and 100 MeV, V. K. C. Cheng and P. G. Roos, Nucl. Phys. **A225**, 397 (1974).
- 25) The $^6\text{Li}(p, 2p)^5\text{He}$ reaction at 100 MeV, Ranjan K. Bhowmik, C. C. Chang, P. G. Roos, and H. D. Holmgren, Nucl. Phys. **A226**, 365 (1974).
- 26) Analysis of the $^4\text{He}(p, 2p)^3\text{H}$ reaction, P. G. Roos, Phys. Rev. C **9**, 2437 (1974).
- 27) Elastic proton scattering from ^3He and ^4He and the $^4\text{He}(p, d)^3\text{He}$ reaction at 85 MeV, L. G. Votta, P. G. Roos, N. S. Chant, and R. Woody, III, Phys. Rev. C **10**, 520 (1974).
- 28) Direct measurement of neutron detector efficiencies, R. A. J. Riddle, G. H. Harrison, P. G. Roos, and M. S. Saltmarsh, Nucl. Instrum. & Methods **121**, 445 (1974).
- 29) $^4\text{He}(p, 2p)^3\text{H}$ and $^4\text{He}(p, pd)^2\text{H}$ reactions at 156 MeV, R. Frascaria, P. G. Roos, M. Morlet, N. Marty, A. Willis, V. Comparat, and N. Fujiwara, Phys. Rev. C **12**, 243 (1975).
- 30) Elastic proton scattering on ^4He at 156 MeV, V. Comparat, R. Frascaria, N. Fujiwara, N. Marty, M. Morlet, P. G. Roos, and A. Willis, Phys. Rev. C **12**, 251 (1975).
- 31) Excitation of deep lying hole states in ^{11}C , ^{15}O , ^{27}Si , and ^{57}Ni with the $(^3\text{He}, \alpha)$ reaction at 216 MeV, E. Gerlic, H. Langevin-Joliot, P. Roos, J. Van de Wiele, J. P. Didelez, and G. Duhamel, Phys. Rev. C **12**, 2106 (1975).
- 32) The (p, d) reaction at 65 MeV, P. G. Roos, S. M. Smith, V. K. C. Cheng, G. Tibell, A. A. Cowley, and R. A. J. Riddle, Nucl. Phys. **A255**, 187 (1975).
- 33) The α - d and τ - t cluster structure of ^6Li , P. G. Roos, D. A. Goldberg, N. S. Chant, R. Woody, III, and W. Reichart, Nucl. Phys. **A257**, 317 (1976).

- 34) Quasi-free ($p, p\alpha$) scattering on ^{24}Mg , ^{28}Si , ^{40}Ca and ^{58}Ni at 157 MeV, D. Bachelier, J. L. Boyard, T. Hennino, H. D. Holmgren, J. C. Jourdain, P. Radvanji, P. G. Roos, and M. Roy-Stephan, Nucl. Phys. **A268**, 488 (1976).
- 35) The quasi-elastic knockout of alpha particles from ^{16}O and ^{28}Si by 0.65 and 0.85 GeV alpha particles, N. Chirapatpimol, J. C. Fong, M. M. Gazzaly, G. Igo, A. D. Liberman, R. J. Ridge, S. L. Verback, C. A. Whitten, Jr., D. G. Kovar, V. Perez-Mendez, N. S. Chant, and P. G. Roos, Nucl. Phys. **A268**, 379 (1976).
- 36) Distorted-wave impulse-approximation calculations for quasifree cluster knockout reactions, N. S. Chant and P. G. Roos, Phys. Rev. C **15**, 57 (1977).
- 37) Absolute spectroscopic factors from the ($p, p\alpha$) reaction at 100 MeV on 1- p shell nuclei, P. G. Roos, N. S. Chant, A. A. Cowley, D. A. Goldberg, H. D. Holmgren, and R. Woody, III, Phys. Rev. C **15**, 69 (1977).
- 38) ($p, d^3\text{He}$) reaction as a quasi-free reaction process, A. A. Cowley, P. G. Roos, N. S. Chant, R. Woody, III, H. D. Holmgren, and D. A. Goldberg, Phys. Rev. C **15**, 1650 (1977).
- 39) Is there specific alpha-clustering in nuclei, N. S. Chant, P. G. Roos, and C. W. Wang, Phys. Rev. C **17**, 8 (1978).
- 40) Experimental test of the factorization approximation in the reaction $^{40}\text{Ca}(p, 2p)^{39}\text{K}$ at 148.2 MeV, P. G. Roos, N. S. Chant, D. W. Devins, D. L. Friesel, W. C. Jones, A. C. Attard, R. S. Henderson, I. D. Svalbe, B. M. Spicer, V. C. Officer, and G. G. Shute, Phys. Rev. Lett. **40**, 1439 (1978).
- 41) $^4\text{He}+^4\text{He}$ elastic scattering at 158.2 MeV, A. Nadasen, P. G. Roos, B. G. Glagola, G. J. Mathews, V. E. Viola, Jr., H. G. Pugh, and P. Frisbee, Phys. Rev. C **18**, 2792 (1978).
- 42) Production of $A = 6$ and 7 isotopes in the $\alpha + \alpha$ reactions, B. G. Glagola, G. J. Mathews, H. F. Breuer, V. E. Viola, Jr., P. G. Roos, A. Nadasen, and Sam M. Austin, Phys. Rev. Lett. **41**, 1698 (1978).
- 43) ($\alpha, \alpha p$) quasi-free proton knockout in ^2H , ^6Li , and ^{19}F , A. Nadasen, T. A. Carey, P. G. Roos, N. S. Chant, C. W. Wang, and H. L. Chen, Phys. Rev. C **19**, 2099 (1979).
- 44) Spin-orbit effects in medium energy ($p, 2p$) reactions, N. S. Chant, P. Kitching, P. G. Roos, and L. Antonuk, Phys. Rev. Lett. **43**, 495 (1979).
- 45) $^3\text{He}+^4\text{He}$ elastic scattering at $E_{c.m.} = 60.2$ MeV and 113.1 MeV, P. G. Roos, A. Nadasen, P. E. Frisbee, N. S. Chant, T. A. Carey, M. T. Collins, B. Th. Leeman, and T. Koshel, Phys. Rev. C **21**, 799 (1980).
- 46) The quasi-free ($\alpha, 2\alpha$) reaction induced by 140 MeV alpha particles on ^9Be , ^{12}C , ^{16}O , and ^{20}Ne , C. W. Wang, N. S. Chant, P. G. Roos, A. Nadasen, T. A. Carey, and A. A. Cowley, Phys. Rev. C **21**, 1705 (1980).
- 47) Non-coplanar ($p, p\alpha$) and ($p, d^3\text{He}$) reactions on ^9Be at 101.5 MeV, A. Nadasen, N. S. Chant, P. G. Roos, T. A. Carey, R. Cowen, C. Samanta, and J. Wesick, Phys. Rev. C **22**, 1394 (1980).

- 48) Energy dissipation process for 100 MeV protons and the nucleon-nucleon interactions in nuclei, A. A. Cowley, C. C. Chang, H. D. Holmgren, J. D. Silk, D. L. Hendrie, R. W. Koontz, P. G. Roos, C. Samanta, and J. R. Wu, Phys. Rev. Lett. **45**, 1930 (1980).
- 49) Alpha-clustering systematics from the quasifree ($p, p\alpha$) knockout reaction, T. A. Carey, P. G. Roos, N. S. Chant, A. Nadasen, and H. L. Chen, Phys. Rev. C **23**, 576 (1981).
- 50) Energy dependence of the $^{208}\text{Pb}(^4\text{He}, t)$ and $(^4\text{He}, ^3\text{He})$ reaction from 10 to 20 MeV/nucleon, R. Perry, A. Nadasen, D. L. Hendrie, P. G. Roos, and N. S. Chant, Phys. Rev. C **24**, 1471 (1981).
- 51) $^{40}\text{Ca}(p, p\alpha)^{36}\text{Ar}$ reaction in a noncoplanar geometry, A. Nadasen, P. G. Roos, N. S. Chant, A. A. Cowley, C. Samanta, and J. Wesick, Phys. Rev. C **23**, 2353 (1981).
- 52) Distorted wave impulse approximation calculations of the $(\pi^+, 2p)$ reactions in a quasideuteron model, P. G. Roos, L. Rees, and N. S. Chant, Phys. Rev. C **24**, 2647 (1981).
- 53) Production of ^6He , ^6Li , ^7Li and ^7Be in the $\alpha + \alpha$ reaction between 60-160 MeV, B. G. Glagola, V. E. Viola, Jr., H. Breuer, N. S. Chant, P. G. Roos, A. Nadasen, Sam M. Austin, and G. J. Mathews, Phys. Rev. C **25**, 34 (1982).
- 54) Distorted wave analysis of the reaction $^{12}\text{C}(\pi^+, \pi^+p)^{11}\text{B}$, N. S. Chant, L. Rees, and P. G. Roos, Phys. Rev. Lett. **48**, 1784 (1982).
- 55) Deuteron breakup by 140 MeV alpha particles at quasifree scattering conditions, J. M. Lambert, P. A. Treado, P. G. Roos, N. S. Chant, A. Nadasen, I. Slaus, and Y. Koike, Phys. Rev. C **26**, 357 (1982).
- 56) $^{40}\text{Ca}(p, pn)^{39}\text{Ca}$ and $^{48}\text{Ca}(p, pn)^{47}\text{Ca}$ neutron knockout reactions at 149.5 MeV, J. W. Watson, M. Ahmad, D. W. Devins, B. S. Flanders, D. L. Friesel, N. S. Chant, P. G. Roos, and J. Wastell, Phys. Rev. C **26**, 961 (1982).
- 57) Discrepancy between proton- and alpha-induced cluster knockout reactions on ^{16}O , C. Samanta, N. S. Chant, P. G. Roos, A. Nadasen, and A. A. Cowley, Phys. Rev. C **26**, 1379 (1982).
- 58) Distortion effects in $(\pi, \pi p)$ quasifree knockout reactions, L. Rees, N. S. Chant, and P. G. Roos, Phys. Rev. C **26**, 1580 (1982).
- 59) Continuum spectra in the quasifree $(p, 2p)$ scattering, G. Ciangaru, C. C. Chang, H. D. Holmgren, A. Nadasen, P. G. Roos, A. A. Cowley, S. Mills, P. P. Singh, M. K. Saber, and J. R. Hall, Phys. Rev. C **27**, 1360 (1983).
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- 61) Reaction $\pi^+ + d \rightarrow p + p$ at 65 and 140 MeV, B. G. Ritchie, G. S. Blanpied, R. S. Moore, B. M. Preedom, K. Gotow, R. C. Minehart, J. Boswell, G. Das, H. J. Ziock, N. S. Chant, P. G. Roos, W. J. Burger, S. Gilad, and R. P. Redwine, Phys. Rev. C **27**, 1685 (1983).
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- 64) Alpha-particle spectroscopic strengths using the $(p, p\alpha)$ reaction at 101.5 MeV, T. A. Carey, P. G. Roos, N. S. Chant, A. Nadasen, and H. L. Chen, *Phys. Rev. C* **29**, 1273 (1984).
- 65) Three-body approach to the multiple scattering direct reactions: a pragmatic application to the $^{58}\text{Ni}(p, 2p)^{57}\text{Co}$ continuum, G. Ciangaru, C. C. Chang, H. D. Holmgren, A. Nadasen, and P. G. Roos, *Phys. Rev. C* **29**, 1289 (1984).
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- 70) Isospin effect in π^\pm ^{14}C elastic scattering at 50 MeV, C. S. Mishra, B. M. Freedom, B. G. Ritchie, R. S. Moore, M. Blecher, K. Gotow, R. L. Burman, M. V. Hynes, E. Piasetzky, N. S. Chant, P. G. Roos, F. E. Bertrand, T. Sjoreen, F. E. Obenshain, and E. E. Gross, *Phys. Rev. C* **32**, 995 (1985).
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B. Papers presented at scientific meetings

1. Invited papers

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Status of quasifree cluster knockout reactions, Workshop on Quasifree Knockout Reactions, Bloomington, IN, October 31, 1980.

Facilities for a 2 GeV electron accelerator, 2nd Electronuclear Physics Workshop, Williamsburg, VA, September 25-26, 1981.

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Topical interests and future directions in medium energy research, Annual Conference of the South African Institute of Physics, Stellenbosch, South Africa, July 1982.

Clustering aspects of medium and high energy reactions with light ions, 4th International Conference on Clustering Aspects of Nuclear Structure and Nuclear Reactions, Chester, England, July 23-27, 1984.

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Nuclear scattering and reactions with low-energy pions, P. G. Roos, Pion-Nucleus Physics: Future Directions and New Facilities at LAMPF, Los Alamos, August 17-21, 1987.

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3. Contributed papers

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D. Papers submitted but not yet accepted for publication or in preparation

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F. Papers published (in their entirety, not as abstracts) in proceedings of scientific meetings or conferences

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B. A. Raue, P. E. Reimer, J. Reinhold, J. Roche, P. Roos, M. Sarsour, Y. Sato, G. Savage, R. Sawafta, J. P. Schiffer, R. E. Segal, A. Semenov, S. Stepanyan, V. Tadevosian, S. Tajima, L. Tang, B. Terburg, A. Uzzle, S. Wood, H. Yamaguchi, C. Yan (JLab), C. Yan (Kent), L. Yuan, M. Zeier, and B. Zihlmann, in *Proceedings of the 7th International Conference on Hypernuclear and Strange Particle Physics (HYP 2000), Torino, Italy, 23-27 October 2000*, Nucl. Phys. A **691**, 37 (2001).

G. Contracts, grants, and proposals

Co-Principal Investigator (with H. D. Holmgren, W. F. Hornyak, V. Viola, N. S. Wall, and W. Walters) on NSF Cyclotron Contract (\$1,146,000 for calendar year 1977).

Co-Principal Investigator (with N. S. Wall, H. D. Holmgren, N. S. Chant, V. Viola, and W. Walters) on NSF Cyclotron Grant (\$1,250,000 for calendar year 1978).

Co-Principal Investigator (with D. L. Hendrie, H. D. Holmgren, C. C. Chang, N. S. Chant, V. Viola, and W. Walters) on NSF Cyclotron Grant (\$987,000 for calendar 1979).

Principal Investigator (with D. L. Hendrie, H. D. Holmgren, N. S. Chant, C. C. Chang, V. Viola, and W. Walters) on NSF Cyclotron Grant (\$500,000 for January-June 1980).

Principal Investigator (with D. L. Hendrie, H. D. Holmgren, N. S. Chant, H. Breuer, and C. C. Chang) on NSF/DOE Nuclear Physics Research/Cyclotron proposal (\$1,461,950 for July 1980-June 1983).

Co-Principal Investigator (with N. S. Chant) on NSF Grant A New Magnetic Spectrometer System for Intermediate Energy Physics at the Indiana Cyclotron Facility (\$363,171 for September 1, 1981-August 31, 1985).

Principal Investigator (with N. S. Chant, C. C. Chang, H. D. Holmgren, and H. F. Breuer) on NSF Experimental Nuclear Physics Research Program Grant (\$1,160,000 for 1981-1983).

Co-Principal Investigator (with H. Breuer, N. S. Chant, H. D. Holmgren, C. C. Chang, and A. C. Mignerey) on NSF Grant for Replacement of the Nuclear Physics Data Analysis Computer System (\$111,220 for September 1, 1982-August 30, 1984).

Principal Investigator (with H. Breuer, N. S. Chant, H. D. Holmgren, and C. C. Chang) on NSF Experimental Nuclear Physics Research Program Grant (\$1,450,000 for 1984-1986).

Principal Investigator (with H. Breuer, C. C. Chang, N. S. Chant, H. D. Holmgren, and J. J. Kelly) on NSF Experimental Nuclear Physics Research Program Grant (\$1,855,000 for 1987-89).

Principal Investigator (with H. Breuer, C. C. Chang, N. S. Chant, H. D. Holmgren, and J. J. Kelly) on NSF Grant for Replacement of the Nuclear Physics Data Analysis Computer System (\$105,000 for July 15, 1989-Dec. 31, 1990).

Principal Investigator (with H. Breuer, C. C. Chang, N. S. Chant, H. D. Holmgren, and J. J. Kelly) on NSF Experimental Nuclear Physics Research Program Grant (\$1,950,000 for 1990-92).

Principal Investigator (with H. Breuer, C. C. Chang, N. S. Chant, H. D. Holmgren, and J. J. Kelly) on National Science Foundation Grant PHY-8918491 Amendment No. 01 (Experimental Nuclear Physics Research Program) (Jan. 1, 1990-June 30, 1991; \$19,350).

Principal Investigator (with H. Breuer, C. C. Chang, N. S. Chant, H. D. Holmgren, and J. J. Kelly) on National Science Foundation Grant PHY-8918491 Amendment No. 03 (Experimental Nuclear Physics Research Program) (Jan. 1, 1991-June 30, 1992; \$17,500).

Principal Investigator (with H. Breuer, C. C. Chang, N. S. Chant, H. D. Holmgren, and J. J. Kelly) on National Science Foundation Grant PHY-8918491 Proposed Amendment (Experimental Nuclear Physics Research Program) (June 30, 1992-June 30, 1993; \$50,000).

NSF Grant PHY-9220690 for Experimental Nuclear Physics Research Program (\$1,950,000 for 1993-95), P. G. Roos, N. S. Chant, C. C. Chang, H. Breuer, H. D. Holmgren, and J. J. Kelly.

REU Supplement to NSF Grant PHY-9220690 (Research Experiences for Undergraduates) for Experimental Nuclear Physics Research Program (\$4,000 for 1993; \$4,000 for 1994; \$4,000 for 1995), P. G. Roos, N. S. Chant, C. C. Chang, H. Breuer, H. D. Holmgren, and J. J. Kelly.

Career Advancement Award Supplement to PHY-9220690 (in support of Dr. E. Beise), (\$50,000 for 1993-95), P. G. Roos, N. S. Chant, C. C. Chant, J. J. Kelly, H. Breuer, and E. J. Beise.

Co-Principal Investigator: National Science Foundation Grant PHY-9513924 (Experimental Nuclear Physics Research Program, 1996-98) (\$650,000 for 1996; \$600,000 for 1997; \$600,000 for 1998), N. S. Chant, E. J. Beise, C. C. Chang, H. Breuer, J. J. Kelly, and P. G. Roos.

REU Supplement to NSF Grant PHY-9513924 (Research Experiences for Undergraduates) for Experimental Nuclear Physics Research Program (\$4,000 for 1996-98), N. S. Chant, E. J. Beise, C. C. Chang, H. Breuer, J. J. Kelly, and P. G. Roos.

Principal Investigator: Jefferson Lab Contract for "Fabrication of Jefferson Lab Scattering Chamber Cover," 8/28/97-11/28/97 (\$11,000).

Principal Investigator: Jefferson Lab Contract for "Fabrication of Jefferson Lab Hall C Polarized Target Scattering Chamber," 1/1/98-4/1/98 (\$33,900).

Principal Investigator: National Science Foundation Grant PHY-9971819, Experimental Nuclear Physics Research Program, 1999-2002 (\$1,907,346), with N. S. Chant, E. J. Beise, H. Breuer, C. C. Chang, and J. J. Kelly.

REU Supplement to NSF Grant PHY-9971819 (Research Experiences for Undergraduates) for Experimental Nuclear Physics Research Program (\$31,000), N. S. Chant, E. J. Beise, C. C. Chang, H. Breuer, J. J. Kelly, and P. G. Roos.

Principal Investigator: Jefferson National Accelerator Facility Contract SURA 00 Q004 (Support of Mark Jones) (\$27,093 for 1999), P. G. Roos.

Principal Investigator: National Science Foundation Grant PHY-0140010, Experimental Nuclear Physics Research Program, 2002-05 (\$1,541,667), P. G. Roos, E. J. Beise, H. Breuer, C. C. Chang, and J. J. Kelly.

Proposed REU Supplement to NSF Grant PHY-0140010 (Research Experiences for Undergraduates) for Experimental Nuclear Physics Research Program (\$11,000), P. G. Roos, E. J. Beise, C. C. Chang, H. Breuer, J. J. Kelly.

Philip G. Roos

Courses Taught at the University of Maryland

1971	Fall	Physics 410	Elements of Theoretical Physics	(4)
		Physics 899	Doctoral Thesis Research	(3)
1972	Spring	Physics 411	Elements of Theoretical Physics	(4)
		Physics 499B	Special Problems in Physics	(3)
		Physics 899	Doctoral Thesis Research	(3)
1972	Fall	Physics 410	Elements of Theoretical Physics	(4)
1973	Spring	Physics 411	Elements of Theoretical Physics	(4)
1973	Fall	Sabbatical Leave		
1974	Spring	Sabbatical Leave		
1974	Fall	Physics 410	Elements of Theoretical Physics	(4)
		Physics 748	Experimental Nuclear Physics Seminar	(1)
1975	Spring	Physics 411	Elements of Theoretical Physics	(4)
		Physics 748	Experimental Nuclear Physics Seminar	(1)
1975	Fall	Physics 161	General Physics	(3)
		Physics 799	Masters Thesis Research	(1)
1976	Spring	Physics 262	General Physics	(4)
		Physics 798	Special Problems in Advanced Physics	(3)
		Physics 799	Masters Thesis Research	(1)
1976	Fall	Physics 161	General Physics	(3)
		Physics 399	Special Problems in Physics	(1)
		Physics 799	Masters Thesis Research	(1)
		Physics 899	Doctoral Thesis Research	(3)
1977	Spring	Physics 161	General Physics	(3)
		Physics 899	Doctoral Thesis Research	(3)
1977	Fall	Physics 262	General Physics	(4)
		Physics 899	Doctoral Thesis Research	(6)
1978	Spring	Physics 263	General Physics	(4)
		Physics 899	Doctoral Thesis Research	(8)
		Physics 899	Doctoral Thesis Research	(6)

Courses Taught at the University of Maryland (continued)

1978	Fall	Physics 262	General Physics	(4)
		Physics 899	Doctoral Thesis Research	(1)
		Physics 899	Doctoral Thesis Research	(6)
1979	Spring	Physics 263	General Physics	(4)
		Physics 798	Special Problems in Advanced Physics	(3)
		Physics 899	Doctoral Thesis Research	(1)
		Physics 899	Doctoral Thesis Research	(6)
1979	Fall	Physics 741	Nuclear Physics: Survey	(3)
		Physics 899	Doctoral Thesis Research	(1)
		Physics 899	Doctoral Thesis Research	(3)
1980	Spring	Physics 742	Nuclear Physics: Survey	(3)
		Physics 798	Special Problems in Advanced Physics	(1)
		Physics 798	Special Problems in Advanced Physics	(3)
		Physics 899	Doctoral Thesis Research	(3)
1980	Fall	Physics 741	Nuclear Physics: Survey	(3)
		Physics 899	Doctoral Thesis Research	(3)
		Physics 899	Doctoral Thesis Research	(1)
1981	Spring	Physics 742	Nuclear Physics: Survey	(3)
		Physics 899	Doctoral Thesis Research	(3)
		Physics 899	Doctoral Thesis Research	(1)
1981	Fall	Physics 161	General Physics	(3)
		Physics 899	Doctoral Thesis Research	(7)
		Physics 899	Doctoral Thesis Research	(1)
1982	Spring	Physics 262	General Physics	(4)
		Physics 299	Special Problems in Physics	(1)
		Physics 899	Doctoral Thesis Research	(5)
1982	Fall	Sabbatical Leave		
1983	Spring	Sabbatical Leave		
1983	Fall	Physics 117	Introduction to Physics	(4)
		Physics 748	Experimental Nuclear Physics Seminar	(1)
1984	Spring	Physics 117	Introduction to Physics	(3)
		Physics 748	Experimental Nuclear Physics Seminar	(1)
		Physics 798	Special Problems in Advanced Physics	(3)

Courses Taught at the University of Maryland (continued)

1984	Fall	Physics 395	Advanced Experiments	(3)
		Physics 798	Special Problems in Advanced Physics	(3)
1985	Spring	Physics 117	Introduction to Physics	(4)
		Physics 748	Experimental Nuclear Physics Seminar	(1)
		Physics 798	Special Problems in Advanced Physics	(1)
		Physics 798	Special Problems in Advanced Physics	(3)
1985	Fall	Physics 395	Advanced Experiments	(6)
		Physics 798	Special Problems in Advanced Physics	(3)
		Physics 748	Experimental Nuclear Physics Seminar	(1)
1986	Spring	Physics 405	Intermediate Physics	(3)
		Physics 748	Experimental Nuclear Physics Seminar	(1)
		Physics 899	Doctoral Thesis Research	(3)
1986	Fall	Physics 395	Advanced Experiments	(6)
		Physics 899	Doctoral Thesis Research	(3)
		Physics 799	Masters Thesis Research	(6)
1987	Spring		General Research Board Semester Research Award	
		Physics 899	Doctoral Thesis Research	(14)
		Physics 299	Special Problems in Physics	(3)
		Physics 748	Experimental Nuclear Physics Seminar	(1)
		Physics 799	Masters Thesis Research	(6)
1987	Fall	Physics 395	Advanced Experiments	(3)
		Physics 899	Doctoral Thesis Research	(6)
		Physics 499B	Special Problems in Physics	(3)
1988	Spring	Physics 621	Graduate Lab	(3)
		Physics 899	Doctoral Thesis Research	(9)
		Physics 429	Atomic & Nuclear Physics Lab	(3)
		Physics 398A	Independent Studies Seminar	(1)
		Physics 748	Experimental Nuclear Physics Seminar	(1)
1988	Fall	Physics 395	Advanced Experiments	(3)
		Physics 899	Doctoral Thesis Research	(6)
1989	Spring	Physics 117	Introduction to Physics	(4)
		Physics 899	Doctoral Thesis Research	(4)
		Physics 748	Experimental Nuclear Physics Seminar	(1)
1989	Fall	Physics 899	Doctoral Thesis Research	(4)
		Sabbatical Leave		
1990	Spring	Sabbatical Leave		

Courses Taught at the University of Maryland (continued)

1990	Fall	Physics 422	Modern Physics	(4)
		Physics 899	Doctoral Thesis Research	(2)
1991	Spring	Physics 421	Modern Physics	(3)
		Physics 798	Special Problems in Advanced Physics	(1)
		Physics 748	Experimental Nuclear Physics Seminar	(1)
1991	Fall	Physics 421	Modern Physics	(3)
		Physics 899	Doctoral Thesis Research	(3)
1992	Spring	Physics 422	Modern Physics	(4)
		Physics 899	Doctoral Thesis Research	(3)
1992	Fall	Physics 421	Modern Physics	(3)
		Physics 899	Doctoral Thesis Research	(3)
1993	Spring	Physics 422	Modern Physics	(4)
		Physics 389	Undergraduate Thesis Research	(3)
		Physics 748	Experimental Nuclear Physics Seminar	(1)
		Physics 899	Doctoral Thesis Research	(8)
1993	Fall	Physics 395	Advanced Experiments	(3)
		Physics 899	Doctoral Thesis Research	(8)
1994	Spring	Physics 621	Graduate Lab	(3)
		Physics 899	Doctoral Thesis Research	(3)
		Physics 429	Atomic & Nuclear Physics Lab	(3)
		Physics 499B	Special Problems in Physics	(3)
		Physics 748	Experimental Nuclear Seminar	(1)
1994	Fall	Physics 395	Advanced Experiments	(3)
		Physics 899	Doctoral Thesis Research	(4)
1995	Spring	Physics 429	Atomic & Nuclear Physics Lab	(3)
		Physics 621	Graduate Lab	(3)
		Physics 798	Special Problems in Advanced Physics	(3)
		Physics 748	Nuclear Physics Seminar	(1)
		Physics 899	Doctoral Thesis Research	(3)
1995	Fall	Physics 395	Advanced Experiments	(3)
		Physics 748	Nuclear Physics Seminar	(1)
		Physics 798	Special Problems in Advanced Physics	(3)
1996	Spring	Physics 429	Atomic & Nuclear Physics Lab	(3)
		Physics 621	Graduate Lab	(3)
		Physics 798	Special Problems in Advanced Physics	(3)
		Physics 748	Nuclear Physics Seminar	(1)

Courses Taught at the University of Maryland (continued)

1996	Fall	Physics 395	Advanced Experiments	(3)
		Physics 748	Nuclear Physics Seminar	(1)
1997	Spring	Sabbatical		
1997	Fall	Physics 395	Advanced Experiments	(3)
		Physics 748	Nuclear Physics Seminar	(1)
1998	Spring	Physics 275	Experimental Physics I: Mechanics, Heat and Fields	(2)
		Physics 748	Nuclear Physics Seminar	(1)
1998	Fall	Physics 275	Experimental Physics I	(2)
		Physics 748	Nuclear Physics Seminar	(1)
1999	Spring	Physics 748	Nuclear Physics Seminar	(1)
1999	Fall	Physics 401	Quantum Physics I	(2)
		Physics 748	Nuclear Physics Seminar	(1)
2000	Spring	Physics 263A	General Physics	
		Physics 748	Nuclear Physics Seminar	(1)
2000	Fall	Physics 401	Quantum Physics I	(4)
		Physics 748	Nuclear Physics Seminar	(1)
2001	Spring	Physics 429	Atomic & Nuclear Physics Lab	(3)
		Physics 621	Graduate Lab	(3)
2001	Fall	Research at Jefferson Lab		
2002	Spring	Physics 262A	General Physics/Lab	(0)
		Physics 263A	General Physics/Lab	(0)
2002	Fall	Physics 262A	General Physics/Lab	(0)
		Physics 263A	General Physics/Lab	(0)

Philip G. Roos

Departmental Services at the University of Maryland

- 1971-72 Elementary Course Committee
Graduate Committee in Physics
Graduate Advising Committee
- 1972-73 Graduate Committee in Physics
Graduate Curriculum Committee
Chairman, Graduate Advising Committee
Department Radiation Safety Chairman
- 1973-74 Sabbatical Leave
- 1974-75 Graduate Advising Committee
Teacher Education and School Relations Committee
- 1975-76 Undergraduate Advising Committee
Appointment, Promotions, and Tenure Committee
Graduate Admissions Committee
- 1976-77 Chairman, Graduate Entrance Committee
Appointments, Promotions, and Tenure Committee
Undergraduate Advising Committee
Graduate Committee
Cyclotron Radiation Safety Committee
- 1977-78 Graduate Entrance Committee
Appointments, Promotion, and Tenure Committee
Physics Council
Cyclotron Radiation Safety Committee
Chairman, Engineering Course Sequence
- 1978-79 Physics Council
Executive Committee of Physics Council
Graduate Admissions
Committee on the Physics Department Community
Course Group Leader for PHYS 161, 262, 263
Cyclotron Radiation Safety Committee
Deputy Director, Cyclotron Laboratory
- 1979-80 Chairman, Graduate Entrance Committee
Graduate Committee
Committee on the Physics Department Community
Deputy Director, Cyclotron Laboratory

Departmental Services at the University of Maryland (continued)

- 1980-81 Co-Chairman, Physics Salary Committee
Graduate Entrance Committee
Task Force for Decommissioning the Cyclotron
Course Group Leader (Other Grad Courses)
- 1981-82 Chairman, Physics Faculty Salary Advisory Committee
Committee Reviewing Salaries of Female Faculty (Division)
Subcommittee writing guidelines for Research Scientist position
- 1982-83 Sabbatical Leave
- 1983-84 Graduate Entrance Committee
Graduate Advising Committee
- 1984-85 General Committee on Graduate Education in Physics
Chairman, Graduate Entrance Committee
Graduate Advising Committee
PLUM Advisory Board
UM rep., Oak Ridge Associated Universities (University)
- 1985-86 Graduate Admissions Committee
Graduate Advising Committee
PLUM Advisory Board
Research Committee
Advisory Committee for SURA (University)
UM rep., Oak Ridge Associated Universities (University)
Advanced Laboratories Sub-Group on Phys 395/429/485
- 1986-87 Chairman, Appointments, Promotions, and Tenure Review Committee
Expanded Qualifying Examination Committee
- 1987-88 Chairman, Appointments, Promotions, and Tenure Review Committee
Service Courses' Labs Committee
- 1988-89 Undergraduate Service Courses' Laboratories Committee
- 1989-90 Sabbatical Leave
- 1990-91 Departmental Faculty Salary Advisory Committee
General Committee on Graduate Education
Chairman, Graduate Admissions
Chairman, Department Faculty Assembly
University Graduate Council

Departmental Services at the University of Maryland (continued)

- 1991-92 Chairman, Departmental Faculty Salary Advisory Committee
General Committee on Graduate Education
Chairman, Graduate Admissions
Chairman, Department Faculty Assembly
Chairman, Computer Systems and Network Manager Search Committee
Lecture Course Group Leader for Upper Level (300-400) Courses
University Graduate Council
- 1992-93 University Graduate Council
Physics Department Review Committee
Chairman, Physics Graduate Admissions
Appointments, Promotions, and Tenure Review Committee
General Committee on Graduate Education
Lecture Course Group Leader for Upper Level (300-400) Physics Courses
- 1993-94 Chairman, Appointments, Promotions, and Tenure Review Committee
Priorities Committee
Physics Graduate Admissions
Undergraduate Service Courses' Laboratories Committee
- 1994-95 Chairman, CMPS Appointments, Promotions, and Tenure Review Committee
Graduate Fellowship Committee
Physics Priorities Committee
Physics Shops Committee
Cosmic Ray/Astrophysics Faculty Search Committee
- 1995-96 CMPS Appointments, Promotions, and Tenture Review Committee
UMCP Graduate Fellowship Committee
UMCP Athletic Council
Physics Priorities Committee
Physics Graduate Education Committee
Graduate Lab Course Committee
- 1996-97 Chairman, Physics Graduate Lab Committee
Sabbatical, Spring 1997
- 1997-98 Physics Faculty Salary Advisory Committee
Physics Graduate Admissions, Fellowship Chair
Ad Hoc Search Committee for High-Energy Experiment

Departmental Services at the University of Maryland (continued)

- 1998-99 Physics Faculty Salary Advisory Committee, Chairman
 Priorities Committee
 Physics Graduate Admissions, Fellowship Chair
- 1999-2000 Priorities Committee
 Physics Graduate Admissions
- 2000-2001 Priorities Committee
 Physics Council
 Physics Graduate Admissions
 Chair, Physics Graduate Committee on Arbitrary and Capricious Grading
 Physics Graduate Laboratory Committee
- 2001-2002 Physics Council
 Campus APT Appeals Committee
 Physics Graduate Admissions
 Physics Graduate Committee on Arbitrary and Capricious Grading
 Physics Graduate Labs
 Physics Faculty Awards Nomination Committee