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Education

1972 Agrégé de l'Enseignement Supérieur, University of Louvain, Belgium

1969 Ph.D., University of Louvain, Belgium

1966 Master's degree, University of Louvain, Belgium

University of Wisconsin Positions

1991 Hilldale Professor

1987 Gregory Breit Distinguished Professor

1984 Director of the Institute for Elementary Particle Physics Research

1977 Romnes Faculty Fellow

1977 Professor

1974 Associate Professor

1972 Assistant Professor

1971 Research Associate

Experience

1985 Scientific Associate at CERN, Geneva, Switzerland

1982 Visiting Professor at the University of Durham, UK

1983 Fellow of the Japan Society for the Promotion of Science, University of Tokyo

Nordita Professor at the University of Helsinki

1977-83 Lector at the University of Louvain (Belgium)

1980 Visiting Professor at the University of Hawaii (Honolulu)

1977 Consultant at the Rutherford High Energy Laboratory (Oxford, UK)

1971-83 Chercheur Agrégé of the National Science Foundation (Belgium)

1969-71 Scientific Associate at CERN (Geneva, Switzerland)

1968-69 Research Associate of the National Science Foundation (Belgium)

Summer and Short-Term Positions

2006 Spitzer Lectures at Princeton University
Scientific Associate at CERN, Geneva, Switzerland

1987 Visiting Professor at the University of Durham (UK)
Visitor in Joint Particle Physics & Astrophysics Program at Johns Hopkins University, Baltimore, MD

1987 NSF Japan – US Exchange, University of Tokyo

1985 Visiting Professor at the University of Durham (UK)

1981 Visiting Senior Scientist of the Science Research Council at the

University of Durham (UK)

1980 Visiting Scientist at LRL, University of California-Berkeley

1975 Associate Scientist at the Brookhaven National Laboratory (Upton, NY)

1974-75 Consultant at the Argonne National Laboratory (Chicago, IL)

1974 Consultant at Fermilab (Batavia, IL)

1971 Consultant at the Rutherford High Energy Laboratory (Oxford, UK)

Awards

2006 Helmholtz Award of the Alexander von Humboldt Foundation (Germany)

2005 Doctor of Philosophy Honoris Causa, Uppsala University (Sweden)

2000 "Best American Science Writing 2000" for the essay *Antarctic Dreams*, published in *The Sciences*, New York Academy of Sciences (1999)

1999 University of Wisconsin Sesquicentennial Awards: 3 faculty positions given for AMANDA NSF Project

1998 Korean Research Foundation: Collaborative Research with Foreign Distinguished Scholars

1997 "The Science Coalition" (Washington, DC) award, Great Advances of 1996 for the AMANDA experiment

1995 Fellow of the American Physical Society

Search for high energy neutrinos from gamma ray bursts with the AMANDA detector, IceCube collaboration (to be submitted).

Neutrino flux from cosmic ray accelerators in the Cygnus Spiral Arm of the Galaxy (with L. Anchordoqui, *et al)* (submitted 12/06); astro-ph/0612699.

The search for muon neutrinos from Northern Hemisphere gamma-ray bursts with the

Antarctic Muon and Neutrino Detector Array (AMANDA), IceCube collaboration, (submitted 11/06).

Search for a neutrino signal from high energy neutrino point source in the Northern Hemisphere, integrated in 5 years (2000 to 2004), IceCube collaboration, (submitted 11/06).

Search for neutrino-induced cascades from gamma-ray bursts with AMANDA, IceCube collaboration, (submitted 11/06).

Five years of searches for point sources of astrophysical neutrinos with the AMANDA-II neutrino telescope, IceCube collaboration; astro-ph/0611063 (11/06).

Gamma ray burst neutrinos probing quantum gravity (with M.C. González-García), to be published in J. Cosmo. Astrop. Phys., 2/2007; hep-ph/0611359.

Implications from analyticity constraints used in a Landshoff-Donnachie fit (with M.M. Block), Phys. Rev. D **74** 117501 (2006); hep-ph/0605216.

Probing leptoquark production at IceCube (with L. Anchordoqui, *et al*), Phys. Rev. D **74** 125021 (2006); hep-ph/0609214.

Introduction to the SalSA, a saltdome shower array as a GZK neutrino observatory (with D. Saltzberg, *et al*), Int. J. Mod. Phys. A **21**S1 252 (2006).

AMANDA observations constrain the ultra-high energy neutrino flux (with D. Hooper), Phys. Rev. Lett. **97** 099901 (2006); astro-ph/0605103.

LSI +61 303 as a potential neutrino source on the light of MAGIC results (with D.F. Torres) (submitted to Astron. Astrophys 9/06); astro-ph/0607368.

IceHEP: High-energy physics at the South Pole (with L. Anchordoqui), Annals of Physics **321** 2660 (2006); hep-ph/0510389.

Limits on the high-energy gamma and neutrino fluxes from the SGR 1806-20 giant flare of 27 December 2004 with the AMANDA-II detector, Ice Cube collaboration, Phys. Rev. Lett. **97** 221101 (2006); astro-ph/0607233.

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On the selection of AGN neutrino source candidates for a source stacking analysis with neutrino telescopes, IceCube collaboration, Astropart. Phys. **26** 282-300 (2006); astro-ph/0609534.

Limits on the muon flux from neutralino annihilations at the center of the Earth with AMANDA, IceCube collaboration, Astropart. Phys. **26** 126-139 (2006).

Optical properties of deep glacial ice at the South Pole, AMANDA collaboration, J. Geophys. Res. **111** D13203 DOI:10 1029 / 2005JD006687 (2006).

Astroparticle physics with high energy neutrinos: From AMANDA to IceCube, Eur. Phys. J. C **46** 669-687 (2006); astro-ph/0602132.

Prospects for detecting dark matter with neutrino telescopes in light of recent results from direct detection experiments (with Dan Hooper), Phys. Rev. D **73** 123507 (2006); hep-ph/0510048.

Duality as a robust constraint on the LHC cross section (with M.M. Block), Phys. Rev. D **73** 054022 (2006); hep-ph/0510238.

Limits to the muon flux from neutralino annihilations in the Sun with the AMANDA detector, AMANDA collaboration, Astropart. Phys. **24** 459-466 (2006); astro-ph/0508518.

The IceCube prototype string in AMANDA, AMANDA collaboration, Nuclear Instruments and Methods A **556** 169-181 (2006).

Coincident GRB neutrino flux predictions: Implications for experimental UHE neutrino physics (with J.K. Becker, M. Stamatikos and W. Rohde), Astropart. Phys. **25** 118-128 (2006); astro-ph/0511785.

Search for extraterrestrial point sources of high energy neutrinos with AMANDA-II using data collected in 2000-2002, AMANDA collaboration, Phys. Rev. D **71** 077102 (2005).

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Flux limits on ultra–high-energy neutrinos with AMANDA-B10, AMANDA collaboration, Astropart. Phys. **22** 339-353 (2005).

A deep high-resolution optical log of dust, ash and stratigraphy in South Pole glacial ice, IceCube Collaboration, Geophys. Res. Lett. **32** L21815 1-4 (2005).

Probing Planck scale physics with IceCube (with Anchordoqui, *et al*), Phys. Rev. **72** 065019 (2005); hep-ph/0506168.

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Physics reach of high-energy and high-statistics IceCube atmospheric neutrino data (with M. C. González-García and M. Maltoni), Phys. Rev. D **71** 093010 (2005); hep-ph/0502223.

High-energy neutrinos from the TeV Blazar 1ES 1959+650 (with D. Hooper), Astropart. Phys. **32** 537 (2005); astro-ph/0502449.

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On factorization, quark counting and vector dominance (with M.M. Block and G. Pancheri), Eur. Phys. Jour. C **23** 329 (2002).

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Observation of high-energy neutrinos using Cerenkov detectors embedded deep in Antarctic ice, AMANDA collaboration, Nature **410** 441-443 (2001).

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Neutrino astronomy: The sun and beyond (with J. Bahcall), Phys. World **9** 9 41-45 (1996).

Ice fishing for neutrinos, Science Spectra **4** 68 (1996).

Signature of γ-ray bursts in neutrino telescopes (with G. Jaczko), Phys. Rev. D **54** 2779 (1996).

Composition of primary cosmic rays beyond the “Knee” from emulsion chamber observations (with J. Bellandi, C.G.S. Costa and C. Salles), Phys. Rev. D **54** 5558 (1996).

The search for neutrino sources beyond the Sun (with S. Barwick and P.B. Price), International Journal of Modern Physics A **11** 19 3393 (1996).

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IceCube: The State of the Art (IceCube collaboration, T. Montaruli, *et al*), *in* Proc. of the Vulcano Workshop 2006: Frontier Objects in Astrophysics and Particle Physics, Vulcano, Italy (May 2006), *ed by* F. Giovannelli and G. Mannocchi, Italian Physical Society, Editrice Compositori, Bologna, Italy (in press); astro-ph/0608140.

From AMANDA to IceCube: Neutrino Astronomy at the South Pole (IceCube collaboration, K. Filimonov, *et al*) *in* Proc. of the 9th Conference on the Interactions of Particle and Nuclear Physics (CIPANP 2006 – in press), Rio Mar Beach, Puerto Rico.

Results from the AMANDA neutrino telescope (IceCube collaboration, J.D. Zornoza, *et al*) *in* Proc. of CRIS06, Catania, Italy (June 2006 – in press).

Review on Neutrino Telescopes (IceCube collaboration, T. Montaruli, *et al*) *in* Proc. of CRIS06, Catania, Italy (June 2006 – in press).

The EHE Neutrino Search Capability of the IceCube Observatory (IceCube collaboration, A. Ishihara, *et al*) *in* Proc. of CRIS2006, Catania, Italy (June 2006 – in press); astro-ph/0611794.

The IceCube Neutrino Telescope (IceCube collaboration, M. Krasberg, *et al*) *in* Proc. of the XII Intl. Conf. on Calorimetry in High Energy Physics (CALOR2006), Chicago, Illinois (June 2006), AIP Conf. Proc. **867** 209-216.

High-Energy Neutrino Astronomy: Towards Kilometer-Scale Neutrino Observatories, *in* Proc. of 11th Marcel Grossman Meeting, Berlin, Germany (July 2006 – in press); hep-ph/0611359.

Upper Limits on Neutrino Fluxes from Point-Like Sources with AMANDA-II (IceCube collaboration, M. Ackermann, *et al) in* Proc. of Multi-Messenger Approach to High Energy Gamma-Ray Sources, 3rd Workshop on the Nature of Unidentified High-Energy Sources, Barcelona, Spain (July 2006 – in press, Astrophysics and Space Science).

Cosmic Neutrinos from Sources of Galactic and Extragalactic Cosmic Rays (IceCube collaboration, F. Halzen, *et al*) *in* Proc. of Multi-Messenger Approach to High Energy Gamma-

Ray Sources, 3rd Workshop on the Nature of Unidentified High-Energy Sources, Barcelona, Spain (July 2006 – in press, Astrophysics and Space Science); astro-ph/0611915.

Neutrino Astronomy with IceCube and AMANDA (IceCube collaboration, G.C. Hill, *et al*) *in* Proc. of Neutrino 2006, Santa Fe, New Mexico (June 2006 – in press); astro-ph/0611773.

The IceCube Neutrino Observatory: Latest Results on the Search for Point Sources and Status of IceCube Construction (IceCube collaboration, T. Castermans and A. Karle, *et al*) *in* Proc. of Astronomy 2006 – IAU XXVIth General Assembly, Prague, Czech Republic (August 2006 – in press).

Neutrino Astronomy and Astrophysics with IceCube and AMANDA (IceCube collaboration, A. Olivas, *et al*) *in* Proc. of ICHEP 06, Moscow, Russia (2006 – in press).

The Search for UHE Neutrinos with AMANDA-II (IceCube collaboration, L. Gerhardt, *et al*) *in* Proc. of SUSY06, Irvine, California (June 2006 – in press).

The IceCube Neutrino Telescope and Its Capability to Search for the EHE Neutrinos (IceCube collaboration, S. Yoshida, *et al*) *in* Proc. of SUSY06, Irvine, California (June 2006 – in press).

Search for Dark Matter with the AMANDA Detector (IceCube collaboration, C. De Clercq, *et al*) *in* Proc. of SUSY06, Irvine, California (June 2006 – in press).

Implications of AMANDA Neutrino Flux Limits (IceCube collaboration, J. Becker, *et al*) *in* Proc. of TeV Particle Astrophysics (TeV II), Madison, Wisconsin (August 2006 – in press, Journal of Physics); astro-ph/0611597.

Tau Neutrinos in IceCube (IceCube collaboration, D.F. Cowen, *et al*) *in* Proc. of TeV II, Madison, Wisconsin (August 2006 – in press, Journal of Physics); astro-ph/0611597.

Ice Cube – First Results (IceCube collaboration, J. Dumm, *et al*) *in* Proc. of TeV II, Madison, Wisconsin (August 2006 – in press, Journal of Physics); astro-ph/0611597.

Air Showers in a Three-Dimensional Array: Recent Data from IceCube/IceTop (IceCube collaboration, X. Bai, *et al*) *in* Proc. of TeV II, Madison, Wisconsin (August 2006 – in press, Journal of Physics); astro-ph/0611597.

Construction status and future of the IceCube neutrino observatory (IceCube collaboration, K. Hanson, *et al*) *in* Proc. of TeV II, Madison, Wisconsin (August 2006 – in press, Journal of Physics); astro-ph/0611597.

Multi-Year Search for a Diffuse Flux of Muon Neutrinos with AMANDA-II (IceCube

collaboration, J. Hodges, *et al*) *in* Proc. of TeV II, Madison, Wisconsin (August 2006 – in press, Journal of Physics); astro-ph/0611597.

Searches for Neutrinos from Gamma-Ray Bursts with AMANDA-II and IceCube (IceCube collaboration, B. Hughey, *et al*) *in* Proc. of TeV II, Madison, Wisconsin (August 2006 – in press, Journal of Physics); astro-ph/0611597.

Neutrino Transient Point Source Search: Use of the Multiwavelength Approach (IceCube collaboration, E. Resconi, *et al*) *in* Proc. of TeV II, Madison, Wisconsin (August 2006 – in press, Journal of Physics); astro-ph/0611597.

High-Energy Gammas from the Giant Flare of SGR 1806-20 of December 2004 in AMANDA (IceCube collaboration, J.D. Zornoza, *et al*) *in* Proc. of TeV II, Madison, Wisconsin (August 2006 – in press, Journal of Physics); astro-ph/0611597.

IceCube: Toward a km^3 Neutrino Telescope (IceCube collaboration, P. Desiati, *et al*) *in* Proc. of the XX European Cosmic Ray Symposium, Lisbon, Portugal (September 2006 – in press); astro-ph/0611603.

The IceCube Neutrino Observatory – Design and Performance (IceCube collaboration, M. Walter, *et al*) *in* Proc. of 10^{th} Topical Seminar on Innovative Particle and Radiation Detectors, Siena, Italy (October 2006 – in press).

IceCube: Performance, Status, and Future (IceCube collaboration, C. Rott, *et al*) *in* Proc. of the XIV Intl. Symposium on Very High Energy Cosmic Ray Interactions (ISVHECRI 2006), Weihai, China (November 2006 – in press); astro-ph/0611726.

The IceCube/IceTop Air Shower Experiment (IceCube collaboration, X. Bai, *et al*) *in* Proc. of ISVHECRI 2006, Weihai, China (November 2006 – in press)

Results Achieved with AMANDA (IceCube collaboration, X.W. Xu, *et al*) *in* Proc. of ISVHECRI 2006, Weihai, China (November 2006 – in press)

IceCube, the World's Largest Dark Matter Detector (IceCube collaboration, H. Landsman, *et al*) *in* Proc. of the 6^{th} Intl. Workshop on the Identification of Dark Matter (IDM 2006), Island of Rhodes, Greece (December 2006 – in press); astro-ph/0612239.

Testing Lorentz Invariance Using Atmospheric Neutrinos and AMANDA-II (IceCube collaboration, J.L. Kelley, *et al*) *in* Proc. of the 1^{st} Workshop on Exotic Physics with Neutrino Telescopes, Uppsala, Sweden (2006), *ed by* C.P. de los Heros, 131-135 (2007).

Exotic Physics with IceCube (IceCube collaboration, David Hardtke, *et al*) *in* Proc. of the 1^{st}

Workshop on Exotic Physics with Neutrino Telescopes, Uppsala, Sweden (2006), *ed by* C.P. de los Heros, 89-93 (2007).

Neutralino Searches with AMANDA and IceCube – Past, Present and Future (IceCube collaboration, D. Hubert, *et al*) *in* Proc. of the 1st Workshop on Exotic Physics with Neutrino Telescopes, Uppsala, Sweden (2006), *ed by* C.P. de los Heros, 39-43 (2007).

First Results from AMANDA Using the TWR System (IceCube collaboration, A. Silvestri, *et al*) *in* Proc. of the Intl. School of Cosmic Ray Astrophysics, 15th Course: "Astrophysics at Ultra-High Energies," (ERICE 2006), Erice, Italy (December 2006 – in press); astro-ph/0701319.

Graduates

M. Chaves, Calculation of Multiple Bremsstrahlung in Gauge Theories (1982).

J.R. Cudell, Experimental Challenges to the Standard Model: A Reevaluation (1987).

C.S. Kim, The Standard Model with Three Generations (1988).

R.S. Fletcher, Effects of Soft Gluons at High Energy Colliders (1990).

Stéphane Keller, Hadronic Structure of the Photon (1991).

Kavoos Deilamian, Spectroscopic Test of the Symmetrization Postulate and Pauli Exclusion Principle (1991).

Mary Louise Stong, Two-Loop Corrections and Top Threshold Effects in Calculation of Observables at *Z* Peak (1993).

Timothy Stelzer, Radiation Patterns in Diffractive and Electroweak Events (1993).

Ricardo Vázquez, Física de Partículas a Altas Energias y Astrofísca (Santiago de Compostella, Spain); On the Precision of Tests of the Quantum Structure of the Standard Model (Madison) (both 1994).

Vijaya Kandahadai, Transparency Measurements of the South Pole Ice: Implications for AMANDA (1995).

Lori Gray, On the Architecture of High Energy Neutrino Telescopes (1996).

John Jacobsen, Simulating the Detection of Muons and Neutrinos in Deep Antarctic Ice (1996).

Igor Liubarski, Corporeal Manifestations in the Antarctic Muon and Neutrino Detector Array (1997).

Kevin Stenson, A Study of D^0 Production from 500 GeV π^-–Nucleon Interactions (1998).

Scott Radeztsky, A Dalitz Analysis of the Decay $D_8^+ \rightarrow \pi^+\pi^-\pi^+$ (1999).

Tyce de Young, Observation of Atmospheric Neutrinos with the Antarctic Muon and Neutrino Detector Array (2001).

Rellen Hardtke, Search for Gamma Ray Bursts with the AMANDA Detector (2002).

Dan Hooper, Astroparticle Physics beyond the Standard Model (2003).

David Steele, Search for Extraterrestrial Point Sources with the AMANDA-II Detector (2003).

Magdalena Gonzalez, Gamma Ray Bursts: Their High Energy Emission as Observed by EGRET (2005).

Melanie Clarke, Search for Gamma Ray Bursts with the AMANDA Detector (2005).

Michael Stamatikos, Probing for Correlated Neutrino Emission from Gamma-Ray Bursts with Antarctic Cherenkov Telescopes: A Theoretical Modeling and Analytical Search Paradigm in the Context of the Fireball Phenomenology (2005).

Current

Aongus O'Murchadha

Vosbergen Conference, Vlieland, Netherlands (1967 and 1968).

International Conference on High Energy Physics, Lund, Sweden (mini-rapporteur, 1969).

Sy68mposium on $\pi\pi$ Scattering, Niels Bohr Institute, Copenhagen, Denmark (1969).

Rencontres de Moriond, Meribel, France (1971).

International Conference on High Energy Physics, Chicago, Illinois (mini-rapporteur, 1973.

Rencontres de Moriond, Meribel, France (1973).

Nimrod Lecture at Rutherford Laboratory, Oxford, England (1973).

International Summer Institute on Particle Interactions at Very High Energies, Louvain, Belgium (1973).

Total Cross Sections and High-p_T Phenomena above ISR Energies, at the 1974 June Meeting of the American Physical Society, Salt Lake City, Utah. Bull. Am Phys. Soc. II **15** 648 (1974).

ANL Summer Study on Polarized Proton Experiments and Beams (1974).

Canadian Physical Society, Montreal, Quebec (1975).

Probing the New Particles with Hadron Beams, International Conference on Production of Particles with New Quantum Numbers, University of Wisconsin, Madison (1976).

Conference on Charm, University of Leuven, Belgium (1977).

Cosener's House Meeting on New Accelerators, Abingdon, Oxford, England (1978).

Sixth International Workshop on Weak Interactions, Ames, Iowa (1978).

Meeting of the American Physical Society, Blacksburg, Virginia (1979).

US – Japan Seminar on Cosmic Ray Physics, University of Delaware (1979).

Workshop on a Central Detector Facility for the Fermilab $\bar{p}p$ Collider, Fermilab (1981).

XXIst Cracow School of Theoretical Physics (1981).

Second Topical Workshop on Forward Collider Physics, Madison, Wisconsin (1982).

Workshop on Very High Energy Interactions in Cosmic Rays, University of Pennsylvania (1982).

British Forum on High Energy Physics (1982).

Workshop on ISABELLE Experiments, Brookhaven (1982).

Annual Symposium on Theoretical Physics, Rutherford Appleton Laboratory, Oxford, England (1982).

Japanese Physical Society Meeting (1982).

Tsukuba Workshop on $\bar{p}p$ Colliders, Tsukuba University, Japan (1983).

Meeting of the Physical Society of Finland (1983).

CDF Forward Components Workshop, University of Wisconsin, Madison (1984).

Oregon Workshop on Super High Energy Physics, Eugene, Oregon (1984).

Wisconsin Association of Physics and Science Teachers, Madison, Wisconsin (1985).

8th International Conference on Ultra-Relativistic Nucleus-Nucleus Collisions, Lawrence Berkeley Laboratory (1986).

VIth Astrophysics Meeting on Accretion Processes in Astrophysics, Les Arcs, France (1986).

Lewis Center for Physics: Workshop on Binary X-ray Sources, Princeton, New Jersey (1986).

Neutrino Masses and Neutrino Astrophysics, Ashland, Wisconsin (1987).

From Colliders to Supercolliders, Madison, Wisconsin (1987).

Landelijk Seminarie, NIKHEF, Amsterdam, Netherlands (1987).

INFN-Eloisatron Project International Workshop on Very High Energy Proton-Proton Physics, Erice, Italy (1987).

Aspen Winter Physics Conference on Elementary Particle Physics (1988).

QCD in Astrophysics, Fermilab (1988).

TeV Physics, Johns Hopkins Workshops on Current Problems in Particle Physics (1988).

Snowmass 88, Aspen, Colorado (1988).

APS Meeting of the Division of Particles and Fields, Storrs, Connecticut (1988).

Fifth International Symposium on Very High Energy Cosmic Ray Interactions, Lodz, Poland (1988).

Beyond the Standard Model, Iowa State University, Ames (1989).

Symposium on Collider Phenomenology, Argonne National Laboratory, Illinois (1989).

Astrophysics and Particle Physics, San Miniato, Italy (1989).

21st International Cosmic Ray Conference, Adelaide, Australia (1989).

Z Phenomenology Symposium, Madison, Wisconsin (1990).

Polarized Collider Workshop, Penn State University (1990).

International Conference on High Energy Gamma-Ray Astronomy, University of Michigan, Ann Arbor (1990).

Astrophysical Aspects of the Most Energetic Cosmic Rays, Kofu, Yamanashi, Japan (1990).

Symposium for the 60th Birthday of R.J.N. Phillips, Rutherford Appleton Laboratory, Oxford, England (1990).

SSC Physics Symposium, University of Wisconsin, Madison (1990).

APS Division of Particles and Fields, Vancouver, Canada (1991).

22nd International Cosmic Ray Conference, Dublin (1991).

The Many Aspects of Neutrino Physics, Fermilab (1991).

SSC Full Acceptance Detector Organizational Meeting, Stanford (1992).

Second Gleb Wataghin Summer School on High Energy Phenomenology, State University of Campinas, Brazil (1992).

International Symposium on Neutrino Telescopes for the 400th Anniversary of Galileo, appointed by the Serenissima Republic of Venice, Italy (1992).

Gordon Research Conference, Proctor Academy, Andover, New Hampshire (1992).

SSC Physics Symposium, University of Wisconsin, Madison (1992).

CDF Workshop on Forward Physics, Fermilab (1992).

Workshop on Small-*x* and Diffractive Physics at the Tevatron, Fermilab (1992).

DAPHNE and Other Topics in Particle Physics, Frascati, Italy (1992).

Dertig Jaar Instituut Theoretische Fysica te Leuven, Belgium (1992).

American Physical Society Meeting, Astrophysics Division, Washington, DC (1992).

SSC Physics Symposium, University of Wisconsin, Madison (1993).

Workshop on Physics at Current Accelerators and the Supercollider, Argonne National Laboratory (1993).

Escuela Latino Americana de Fisica, Mar del Plata, Argentina (1993).
Summer Symposium on Physics at the CERN Large Hadron Collider and Astroparticle Physics, Uto, Sweden (1993).

TAUP 93: Theory and Phenomenology in Astroparticle and Underground Physics, Gran Sasso, Italy (1993).

XXIII International Symposium on Multiparticle Dynamics, Aspen, Colorado (1993).

New Physics at New Facilities, Case Western Reserve University, Cleveland (1993).

Aspen Winter Conference, “Particle Physics before the Year 2000,” Aspen, Colorado (1994).

JPL/Caltech Neutrino Astrophysics Technology Workshop, Pasadena, California (1994).

Workshop on Gamma-Gamma Colliders, Lawrence Berkeley Laboratory, Berkeley, California (1994).

International Symposium on Very High Energy Cosmic Ray Interactions, Waseda University, Tokyo, Japan (1994).

APS Division of Particles and Fields Meeting, Albuquerque, New Mexico (1994).

Cosmic Rays: Physics and Astrophysics (with T. Gaisser, *et al*.), National Academy of Sciences, research briefings, NAS/NRC, Washington, DC (1994).

CAM 94 Physics Meeting, Cancun, Mexico (1994).

LBL Meeting on Physics and Simulation Issues for km^3 Neutrino Astronomy, Berkeley, California (1995).

Arkansas Space Grant Consortium (1995).

Antarctic Experimenters Meeting, NSF, Washington, DC (1995).

TAUP 95: IV^{th} International Workshop on Theoretical and Phenomenological Aspects of

Underground Physics, Toledo, Spain (1995).

WIN 95: XVth Workshop on Weak Interactions and Neutrinos, Talloires, France (1995).

Topics in the Weak Interaction, Vanderbilt University, Nashville, Tennessee (1996).

US Meeting on Future Prospects for Kilometer-Scale Neutrino Detectors, Jet Propulsion National Laboratory, Pasadena, California (1996).

International Symposium on the Occasion of the Retirement of Martin Block from Northwestern University, Evanston, Illinois (1996).

Nordita/Uppsala Astroparticle Workshop on High Energy Neutrino Astronomy, Uppsala, Sweden (1996).

Workshop on High Energy Neutrino Astronomy, Aspen Center for Physics Summer Program, Aspen, Colorado (1996).

IV Gleb Wataghin School on High Energy Phenomenology, Campinas, Brazil (1996).

International Workshop, “New Worlds in Astroparticle Physics,” Algarve, Portugal (1996).

XXI School on Theoretical Physics, Silesia, Poland (1996).

Third Workshop on Small-x and Diffractive Physics, Argonne National Laboratory (1996).

HEPAP Subpanel on Planning for the Future of US High Energy Physics, Stanford Linear Accelerator Center (1997).

Symposio en Honor de José Adem, Cinvestav, Mexico (1997).

ADM60-FEST: Topical Issues in Deep Inelastic Scattering, Durham, England (1997).

Vietnam School on Cosmic Ray Physics, Hanoi, Vietnam (1997).

Aspen Winter Conference on Particle Physics, Aspen, Colorado (1998).

Aspen Rotary Club, Aspen, Colorado (1998).

IceCube Neutrino Detector Workshop, University of California, Irvine (1998).

Workshop on Perspectives of High-Energy Particle Astrophysics: Physics at Cosmic Accelerators, Burg Liebenzell, Germany (1998).

TASI-98, Boulder, Colorado (1998).

South African Institute of Physics Conference (SAIP98), Cape Town, South Africa (1998).

Erice Summer School, Palermo, Italy (1998).

Aspen Winter Conference on Particle Physics, “Advances in Particle Physics: Recent Results and Open Questions,” Aspen, Colorado (1999).

Fred Reines Memorial Symposium, University of California, Irvine (1999).

Gamma Ray Burst Workshop, Institute for Theoretical Physics, University of California, Santa Barbara (1999).

Workshop on Particle Astrophysics with High Energy Neutrinos, Arlington, Virginia (1999).

National Academy Decadel Review, Atlanta, Georgia (1999).

Inner-Outer Space, Fermilab (1999).

Neutrino Summer, CERN, Switzerland (1999).
Low Energy Neutrino Workshop, INP, University of Washington, Seattle (1999).

New Perspectives, Fermilab (1999).

QCD (Multiparticle Production), Brown University, Providence, Rhode Island (1999).

OWL/Airwatch Workshop, University of California, Los Angeles (1999).

7th Course: Current Topics in Astrofundamental Physics, International School of Astrophysics “D. Chalonge,” Erice, Italy (1999).

American Astronomical Society, Atlanta, Georgia (2000).

Aspen Summer Workshop: Neutrinos with Mass (2000).

Scandinavian Summer School, Niels Bohr Institute, Copenhagen, Denmark (2000).

Nederlandse Natuurkundige Vereniging, Amsterdam, Netherlands (2000).

Snowmass 2001: The Future of Particle Physics.

Green Bay Retired Men’s Club (2001).

18th International Workshop on Weak Interactions and Neutrinos, Christchurch, New Zealand (2002).

Aspen Winter Conference on Ultra–High-Energy Particles from Space, Aspen, Colorado (2002).

Aspen Winter Conference on High Energy Particle Physics, Aspen, Colorado (2002).

Michaelfest, Liverpool, England (2002).

Symposium on Neutrinos and Particle Astrophysics, Beijing, China (2002).

School on Neutrino Physics and Astrophysics (NEUPAST), Trieste, Italy (2002).

Lion's Club, Madison, Wisconsin (2002).

Symposium on Neutrino Astronomy for High School Teachers, Antwerp, Belgium (2002).

10th International Workshop on Neutrino Telescopes, Venice, Italy (2003).

VERITAS Collaboration Meeting, Adler Planetarium, Chicago, Illinois (2003).

International Workshop on Ultra–High-Energy Neutrino Telescopes, Chiba University, Chiba, Japan (2003).

127th National Meeting on the American Association of Physics Teachers, Madison, Wisconsin (2003).

Nijmegen 03: International Summer School on Particle and Nuclear Astrophysics, Nijmegen, Netherlands (2003).

COSMO 03: International Workshop on Particle Physics and the Universe, Ambleside, England (2003).

NSF Symposium, "The Universe from the Ground Up," Ground-Based Astronomy in the 21st Century, Washington, DC (2003).

Kavli-CERCA Conference on the Future of Cosmology, Case Western Reserve University, Cleveland, Ohio (2003).

Teachers Experiencing Antarctica and the Arctic (TEA), Polar Science Seminar, Crystal Lake, Illinois (2003).

219th Reunion of the Nederlandse Astronomen Club, University of Nijmegen, Netherlands (2003).

6th RESCUE International Symposium, Frontier in Astroparticle Physics and Cosmology, University of Tokyo, Tokyo, Japan (2003).

42nd Junior Science, Engineering and Humanities Symposium, Madison, Wisconsin (2004).

3rd International Workshop on Ultra High Energy Cosmic Rays, Leeds, England (2004).

International WE-Heraeus Summer School, “Physics with Cosmic Accelerators,” Bad Honnef, Germany (2004).

International Saltdome Shower Array Workshop (SalSA 2005), SLAC, Stanford, California (2005).

Annual Meeting of the German Physical Society, “Einstein and the Year of Physics,” Berlin, Germany (2005).

Midwest Regional Polar Science Workshop, St. Benedictine University, Lisle, Illinois (2005).

XXII International Symposium on Lepton-Proton Interactions at High Energy, Uppsala, Sweden (2005).

TeV Particle Astrophysics Workshop, Fermilab, Batavia, Illinois (2005).

LHC Summer School, Maria Laach, Germany (2005).

Madrid Neutrino Mini-Workshop, “What is the Neutrino,” Universidad Autonoma, Madrid, Spain (2005).

Joint Annual Conference of the National Society of Black Physicists and the National Society of Hispanic Physicists, San Jose, California (2006).

Be-Poles, Brussels, Belgium (2006).
Science@Poles, joint meeting of Italian, French and US polar programs. Embassy of Italy, Washington, DC (2006).

The Multi-Messenger Approach to High-Energy Gamma-Ray Sources, Barcelona, Spain (2006).

Eleventh Marcel Grossman Meeting on General Relativity, Berlin, Germany (2006).

PASCOS 2006, Ohio State University (2006).

German School of Particle Astrophysics, Erlangen, Germany (lecturer – 2006).

CHIPP Workshop on Neutrino Physics, Bern, Switzerland (2006).

XXIII Texas Symposium on Relativistic Astrophysics – Texas in Melbourne, Australia (2006).

Colliders to Cosmic Rays 2007, Granlibakken, Tahoe City, California (intro. lecture – 2007).

XII International Workshop on Neutrino Telescopes, Venice, Italy (2007).

The Violent Universe winder school, Les Houches, France (lecturer – 2007).

30th International Cosmic Ray Conference, Medina, Mexico (highlight talk - 2007).

Ultra-High–Energy Cosmic Rays, Neutrinos and Photons, Penn State (2007).

Dark Side of the Universe 2007 Workshop (DSU07), U. of Minnesota (2007).

TAUP 2007, Sendai, Japan.

Colloquium and Seminar Talks

1966 – 1967
University of Leiden

1969 – 1970
CERN
E.T.H., Zurich
U. of Liège, Belgium

1970 – 1971
Duality for Pedestrians, lectures delivered at the Belgian-Dutch Summer School and the CERN Academic Program
E.T.H., Zurich
Rutherford Laboratory
U. of Durham
U. of Birmingham
Westfield College, London
U. of Nice
1971 – 1972
U. of Wisconsin (colloquium)
Northwestern U.
Michigan State U.
Arizona State U. (colloquium)
CERN

Rutherford Laboratory
Case Western Reserve U.
Fermilab
U. of Minnesota.

1972 – 1973
U. of Illinois
Fermi Institute, U. of Chicago
Argonne National Laboratory
Rutherford Laboratory
Model Independent Features of Diffraction, lectures delivered at the Summer Institute on Particle Interactions, Louvain, Belgium
Argonne National Laboratory

1974 – 1975
Louisiana State U. (colloquium)
McGill U.
U. of Wisconsin (colloquium)
U. of Indiana

1976 – 1977
Rutherford Laboratory (Nimrod Lecture)
U. of Liverpool (colloquium)
Imperial College
U. of Oxford
U. of Durham
U. of Birmingham
U. of Southampton
U. of Cambridge, D.A.T.M.P.
Cavendish Laboratory, Cambridge
U. College, London
Westfield College, London
U. of Leuven
U. of Mons
U. of Antwerp
U. of Wuppertal
U. of Bielefeld
U. of Liverpool (high-energy physics seminar)

1977 – 1978
Iowa State U.
U. of Toronto
Fermilab

U. of Chicago
Ohio State U.
McGill U.

1978 – 1979
U. of Delaware (colloquium)
U. of Louvain-la-Neuve
U. of Paris-Sud
Rutherford Laboratory
U. of Hawaii
Mathematics Department, U. of Wisconsin

1979 – 1980
Duke U. (seminar and colloquium)
Fermilab
DESY
U. of Zaragoza
U. of Madrid
U. of Barcelona
U. of Hawaii
U. of Oregon
U. of California – Berkeley
U. of Washington – Seattle

1980 – 1981
Fermilab
Johns Hopkins U. (colloquium)
Argonne National Laboratory (colloquium)
U. of Louvain
U. of Liège
Rice U. (colloquium)
Texas A & M (colloquium)
U. of Wisconsin – Madison (colloquium)
U. of Wisconsin – Parkside (colloquium)
U. of Wisconsin – Madison (lecture for high school students visiting campus)
Rutherford Laboratory
U. of Durham
U. of Liverpool

1981 – 1982
U. of Michigan
U. of Guelph (colloquium)
Purdue U. (nuclear physics and theory seminars)

U. of California
U. of Hawaii (colloquium)
U. of Arizona
Argonne National Laboratory

1982 – 1983
Rutherford Laboratory
U. of Cambridge
U. of Durham
U. of Leuven
U. of Brussels
U. of Arizona (colloquium)
U. of Liverpool
U. of Leeds (colloquium)
U. College, London
U. of Tokyo
Waseda U., Tokyo
U. of Tokyo, Institute for Nuclear Study
U. of Tokyo (nuclear physics seminar)
Hiroshima U.
U. of Bristol (colloquium)
Imperial College
U. of Southampton
KEK – Tsukuba
Tokyo Metropolitan U.
Tokyo Metropolitan U. (experimental seminar)
U. of Tokyo, Komaba
Kyoto U.
Kyoto U., Research Institute for Fundamental Research
Kobe U.
Osaka City U.
U. of Helsinki
Yuvaskula U., Finland
Nordita, Copenhagen.

1983 – 1984
Duke U. (colloquium)
Carnegie-Mellon U.
U. of Durham

1984 – 1985
Interagency Colloquium, Washington, DC

Northwestern U. (colloquium)
U. of Wisconsin – Madison (mathematics department)
U. of Oregon
Fermilab
U. of Durham
U. of Manchester
Westfield College, London
Cavendish Laboratory, Cambridge

1985 – 1986
McGill U. (seminar and colloquium)
Duke U. (colloquium)

U. of Tokyo, Institute for Nuclear Study
Tokyo Metropolitan U.

1987 – 1988
U. of British Columbia (colloquium)
Rice U. (colloquium)
Argonne National Laboratory (colloquium)
U. of Kansas
Johns Hopkins U.
McGill U.
Rutgers U.
Harvard U.
U. of Wisconsin – Platteville (public lecture)
U. of Durham

1988 – 1989
Penn State U. (colloquium)
Northwestern U. (colloquium)
Louisiana State U. (colloquium)
U. of Michigan
Los Alamos National Laboratory (colloquium)
Fermilab
McGill U.

1989 – 1990
U. of California, Riverside (colloquium)

1990 – 1991
Fermilab
U. of Guelph (colloquium)
KEK – Tsukuba

U. of Iowa (colloquium)
Purdue U.
U. of Hawaii

1991 – 1992

The New Astronomy, lectures at the IInd Gleb Wataghin Summer School, São Paolo, Brazil
Northwestern U. (colloquium)
Rice U. (colloquium)
Florida State U. (colloquium)
U. of Utah (colloquium)
Fermilab (colloquium)
Indiana U. (colloquium)
Ohio U. (colloquium)
U. of Chicago
U. of Hawaii

1992 – 1993
U. of Leuven (colloquium)
U. of Liège (colloquium)
Nagoya U. (colloquium)
U. of New Mexico (colloquium)
U. of Louvain-la-Neuve
Brookhaven National Laboratory
U. of Hawaii.

1993 – 1994
U. of Cincinnati (colloquium)
U. of Michigan
California Institute of Technology
U. of Santiago de Compostella
Stanford Linear Accelerator Center (SLAC) (colloquium)
University of Wisconsin – River Falls ($\Sigma\Pi\Sigma$ colloquium)
National Science Foundation (colloquium)

1994 – 1995
U. of Pittsburgh (colloquium)
Lawrence Radiation Laboratory, Berkeley (colloquium)
U. of California, Berkeley
Ecole Polytechnique, Paris
Argonne National Laboratory (colloquium)
Fermilab

Carleton U., Ottawa
McGill U.
Iowa State U. (colloquium)
U. of Arkansas, Little Rock
U. of Arkansas, Pine Bluff (public lecture)
California Institute of Technology
U. of Hawaii (colloquium)
U. of Florida (colloquium)
Los Alamos National Laboratory (colloquium)
Los Alamos National Laboratory (astrophysics seminar)

1995 – 1996
DESY-Zeuthen (colloquium)
DESY-Hamburg (colloquium)
State U. of New York, Buffalo (colloquium)
Johns Hopkins U. (particle physics seminar and colloquium)
Rice U. (colloquium)
New Mexico State U. (astronomy seminar and colloquium)
Fermilab (colloquium)
Northwestern U. (colloquium)
Columbia U.
U. of Stockholm (colloquium)
U. of Guelph (colloquium)
Argonne National Laboratory
U. of North Carolina
Duke U

Electroweak Interactions: Loop for Cyclists, lectures presented at the IVth Gleb Wataghin School on High-Energy Phenomenology, UNICAMP, Campinas, Brazil, hep-ph/9701228.

1997
Case Western Reserve U. (colloquium)
Penn State U.
U. of California, San Diego (colloquium)
CINVESTAV, Mexico City
UNAM, Mexico City (colloquium)
U. of Illinois, Urbana-Champaign
U. of Indiana (colloquium)
Wayne State U. (colloquium)

1998
Ohio State U. (colloquium)
Michigan State U. (colloquium)
Space Place, UW–Madison

Uppsala U.
Jefferson National Laboratory, Newport News, VA
Seoul National U.
Korean Institute for Advanced Studies
Yonsei U., Seoul
NASA Goddard Space Flight Center (colloquium)
McGill U. (colloquium)
Columbia U. (colloquium)

1999
SLAC (experimental physics seminar)
California Institute of Technology (experimental physics seminar)
U. of California, Berkeley (LBNL research progress meeting)
CERN (laboratory colloquium)
Argonne National Laboratory (theory seminar)
Clark Atlanta U. (seminar)
Stanford U. (colloquium)
Uppsala U. (public lecture)
CERN (theory seminar)
U. of Washington, Institute for Nuclear Physics (seminar)
U. of Chicago, Enrico Fermi Institute for Nuclear Physics (seminar)
U. of California. Los Angeles (experimental physics seminar)
Iowa State U. (colloquium)
U. of Utrecht (experimental physics seminar)

26th International Cosmic Ray Conference: Symposium on the Observation of Extremely High Energy Particles and Neutrinos, and Symposium for Gaurang Yodh, Salt Lake City, Utah.

2000
U. of Illinois, Chicago (colloquium)
U. of Kentucky (colloquium)
Oxford U. (Cherwell-Symon Memorial Lecture 2000)
U. of Vienna (colloquium)
U. of Brussels (public lecture)
Aspen Center for Physics
Stanford U. (colloquium)
Argonne National Laboratory (Dept. of Physics colloquium)
U. of Illinois (high-energy physics seminar)

2001
Naval Research Laboratory, Washington, DC (colloquium)

U. of Alabama (colloquium)
Fermilab (colloquium)
Massachusetts Institute of Technology (colloquium)
U. of Wuppertal (public lecture)

2002
National Taiwan U. (colloquium)
Michigan State U. (colloquium)
Princeton U. (colloquium)
Oklahoma State U. (colloquium)
Durham U., England (colloquium)
Imperial College, London
National Research Council
U. of Wisconsin roundtable talk

2003
Carnegie Mellon U. (colloquium)
U. of California, Los Angeles (colloquium)
Max Planck Institute, Munich (colloquium)
U. of Rome (colloquium)
Katholieke Universiteit, Leuven (colloquium)
WARF Trustees, Madison (after dinner talk)
Science Visitors Board, Madison (after dinner talk)
Melbourne U. (colloquium)
U. of Chicago (colloquium)
Atmospheric and Oceanographic Sciences, Madison (colloquium)
Toronto U. (colloquium)
Perimeter Institute, Waterloo, Ontario (colloquium)

2004
U. of Dortmund (colloquium)
DESY – Zeuthen (colloquium)
U. of Minnesota (colloquium)
U. of Florida (colloquium)
Rutgers U. (colloquium)
Fermilab (wine and cheese colloquium)
SLAC (high-energy experimental physics seminar)

2005
Kavili Institute, Santa Barbara
Rotary Club, Madison
Oxford U. (public lecture)
Argonne National Laboratory (colloquium)
U. of Connecticut (colloquium)
U. of Groningen (colloquium)

U. of Amsterdam (colloquium)
U. of Utrecht (colloquium)
Illinois Institute of Technology, Chicago (colloquium)
U. of Illinois (colloquium)
Vanderbilt U. (colloquium)

2006

Perimeter Institute (colloquium)
Guelph U. (colloquium)
U. of Waterloo (colloquium)
Syracuse U. (colloquium)
Southern U., Baton Rouge (public lecture)
DESY – Hamburg (Jentschke lecture)
Princeton U (Spitzer lectures)
Annual Meeting of Wisconsin Orthopedic Surgeons
Princeton U. (colloquium)
CERN (colloquium)
Pisa U. (colloquium)

2007

Notre Dame U. (colloquium)
Ohio U. (colloquium)
Weizman Institute, Israel (First John Bahcall Memorial Lecture)

Service

2007 Comité d'Evaluation du CPPM à Marseille, France (chair)
Canada Foundation for Innovation (CFI) review of Cryopit at SNOLab, Ottawa (chair)
Max Planck Institute Scientific Council (member).

2005 NSF Review of proposals submitted for NUSEL (National Underground
Science and Engineering Laboratory)
Sudbury Neutrino Detector Advisory Committee

2004 Ad Hoc Advisory Committee, Cosmic Ray Group, U. of Utah (chair)

2003 Sudbury Neutrino Detector Advisory Committee

2001 Member of SAGENAP, Washington, DC
Keck Advisory Committee, U. of California – Berkeley

NASA Review of Astrophysics Proposals, Washington, DC
NSF Review Panel
NUSEL
Ad Hoc Advisory Committee, Cosmic Ray Group, U. of Utah (chair)
Sudbury Neutrino Detector Advisory Committee
Keck Advisory Committee, U. of California - Riverside

2000 Ad Hoc Advisory Committee, Cosmic Ray Group, U. of Utah (chair)
Sudbury Neutrino Detector Advisory Committee
Keck Advisory Committee, U. of California - Riverside

1999 Sudbury Neutrino Detector Advisory Committee
Keck Advisory Committee, U. of California - Riverside

1998 Ad Hoc Advisory Committee, Cosmic Ray Group, U. of Utah (chair)
Keck Advisory Committee, U. of California - Riverside

1996 Ad Hoc Advisory Committee, Cosmic Ray Group, U. of Utah
Review of the Auger Project, Fermilab (chair)

1995 Visiting Committee, Bartol Research Institute

1994 California Institute of Technology (Jet Propulsion Laboratory)
Neutrino Astronomical Observatory (member of Local Working Group)
DOE Committee Review of Lawrence Radiation Laboratory, Berkeley
Blue Ribbon Panel on South Pole Station Redevelopment
National Research Council, Committee on Cosmic Rays
Visiting Committee, Bartol Research Institute

1993 Ad Hoc Advisory Committee, Cosmic Ray Group, U. of Utah
DOE Committee Review of Lawrence Radiation Laboratory, Berkeley
Visiting Committee, Bartol Research Institute

1992 Visiting Committee, Bartol Research Institute

1991 Visiting Committee, U. of Utah, Department of Physics

1989 Space Station Attached Payloads Review Panel

1988 NSF Review of Science and Technology Centers; NSF Review of U. of
Utah's Fly's Eye Facility

1987 DOE Committee Review of Argonne National Laboratory

NSF Committee Review of U. of Chicago

1986 Panel Review of the Research and Technology Grants of the NASA Astrophysics Program

1984 DOE Committee Review of Brookhaven National Laboratory

University Committees

2005 Committee on Honorary Degrees

2003 Campus Research Computing Committee

1999 – 2003 Council of the Space Science and Engineering Center

1995 - Committee on Vilas, Hilldale and Bascom Selections

1992 – 1993 Computer Sciences L & S Review Committee (chair)
Committee on Vilas, Hilldale and Bascom Selections

Courses Taught

Academic Year	Course # (Fall)	Course # (Spring)
1972 – 73		731
1973 – 74	732	107
1974 – 75	107	103
1975 – 76	104	103
1976 – 77	104	
1977 – 78	107	202
1978 – 79	208	
1979 – 80	202	170 (U of Hawaii)
1980 – 81	801	
1981 – 82	109	735
1982 – 83		
1983 – 84	109	735
1984 – 85	107	109
1985 – 86	109	103
1986 – 87		735

1987 – 88	109	505
1988 – 89	109	109
1989 – 90	109	801
1990 – 91	735	109
1991 – 92		735
1992 – 93	835	109
1993 – 94	835	109
1994 – 95	835	835
1995 – 96	801	109
1996 – 97	109	109
1997 – 98	109	109
1998 – 99	801	
1999 – 2000	109	
2003 – 04		107
2004 – 05	805	109
2006 – 07	109	

Grants and Contracts since 1980

National Science Foundation	*(IceCube)*	$ 52,000,000	2006
		48,000,000	2005
National Science Foundation	*(GLOW Project, M. Livny, PI – CS Department)*	1,186,405	2004
National Science Foundation	*(IceCube)*	42,000,000	2003 - 04
		24,700,000	2002 - 03
		15,000,000	2001 - 02
National Science Foundation	*(AMANDA, shared with B. Morse)*	1,246,000	2004 - 06
		800,000	2003 - 04
		750,000	2002 - 03
		850,000	2001 - 02
		850,000	2000 - 01

National Science Foundation	*(AMANDA, shared with B. Morse)*	2,785,682	1997 - 2000
		628,600	1996 - 97
National Science Foundation (Academic Research Infrastructure)	*(AMANDA, shared with B. Morse)*	950,000	1995 - 99
National Science Foundation	*(GASP, shared with B. Morse)*	50,234	1994 - 95
National Science Foundation	*(AMANDA, shared with B. Morse)*	450,000	1994
National Science Foundation	*(GASP, shared with B. Morse)*	65,060	1994
National Science Foundation	*(AMANDA, shared with B. Morse)*	490,938	1993
National Science Foundation	*(GASP, shared with B. Morse)*	617,350	1992 - 95
National Science Foundation	*(AMANDA, shared with B. Morse)*	321,654	1992
National Science Foundation[1]		50,000	1990
Comite Conjunto Hispano-Norteamericano para la Cooperación Cultural y Educativa		4,500	1993
Polar Ice Coring Office (PICO)	*(AMANDA, shared with B. Morse)*	130,205	1993
University of Alaska, Fairbanks		12,290	1993
Wallenberg Foundation, Sweden	*(AMANDA, shared with B. Morse)*	238,156	1993
Berkeley Particle Astrophysics Center	*(shared with B. Price, et al.)*	80,000	1993 - 94
		100,000	1992 - 93
Department of Energy	*(shared with V. Barger, T. Han & F. Petriello)*	514,571	2006 - 07
Department of Energy	*(shared with Barger & Han)*	471,000	2005 - 06
Department of Energy	*(shared with Barger, Han & M.G. Olsson)*	485,000	2004 - 05
Department of Energy	*(shared with Barger, Han, Olsson & D. Zeppenfeld)*	665,000	2003 - 04
		685,000	2002 - 03

	700,000	2001 - 02

[1] Exploratory grant “Muon and Neutrino Detection in South Pole Ice,” shared with B. Price, et al.,
U of California, Berkeley.

Department of Energy Graduate Fellowship	$56,590	1998 - 2001
Department of Energy *(shared with Barger, Han, Olsson & Zeppenfeld)*	760,000	2000 - 01
	800,000	1999 - 2000
	785,000	1998 - 99
Department of Energy *(shared with Barger, Olsson & Zeppenfeld)*	725,000	1997 - 98
	620,000	1996 - 97
	646,000	1995 - 96
	680,000	1995
Department of Energy *(shared with Barger & Olsson)*	725,000	1994
	755,000	1993
	705,000	1992
	806,000	1991
	750,000	1990
	750,000	1989
	685,000	1988
	615,000	1987
	535,000	1985 - 86
	425,000	1984 - 85
	355,000	1983 - 84
	320,000	1982 - 83
	290,000	1981 - 82
	227,000	1980 - 81
National Science Foundation *(shared with Barger, Han, & Zeppenfeld; also S. Pakvasa & X. Tata, U of Hawaii)* (US – Brazil Cooperative Research)	17,050	1998 - 2001
National Science Foundation *(shared with Barger & Zeppenfeld; also P. Langacker, U of PA, & Pakvasa & Tata, U of Hawaii)* (US – Japan Cooperative Research)	30,000	1995 - 98
National Science Foundation *(shared with Barger & Zeppenfeld)* (US – Brazil Cooperative Research)	10,000	1992 - 94

Texas National Research Laboratory Commission	100,000	1993 - 94
	100,000	1992 - 93
(shared with Barger, Olsson & Zeppenfeld)	130,000	1991 - 92
Hilldale Professorship	25,000	2006 - 07
	25,000	2005 - 06
	25,000	2004 - 05
	25,000	2003 - 04
	25,000	2002 - 03
	25,000	2001 - 02
	25,000	2000 - 01
	25,000	1999 - 2000
	25,000	1998 - 99
	25,000	1997 - 98
	25,000	1996 - 97
	25,000	1995 - 96
	25,000	1994 - 95
	20,000	1993 - 94
	20,000	1992 - 93
	20,000	1991 - 92
University Houses Professorship	$65,000	1987 - 97
Graduate School *(shared with V. Barger)*	500,000	1986 -
	175,000	1984 -
Graduate School (Academic Research Infrastructure)	700,000	1995 - 99
Graduate School	25,000	1991 - 92
	31,000	1985 - 86
	5,000	1984 - 85
	15,700	1983 - 84

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