

The University
of Kansas
Department of Physics
and Astronomy
Newsletter

Fall 1983

Physics & Astronomy

High Energy Physics Group

During the past year, the high energy physics group at KU has been working on two major projects. One of these is an experiment being carried out at the Deutsches Elektronen Synchrotron (DESY) in Hamburg, West Germany and the other is a Fermilab experiment. The KU group consists of three faculty members (R. Ammar, R. Davis, and N. Kwak), two post-doctoral research associates (D. Coppage and L. Herder), and three graduate students (D. Day, J. Gress, and S. Kanekal). One of the research associates (L. Herder), who had earlier been a Ph.D. student in the group, left recently to accept a more permanent position elsewhere. Support for this work comes from a National Science Foundation grant at a current annual level of \$140,000 as well as from a three-year KU research improvement award for \$96,000.

The DESY experiment is designed to study elementary particles having a b-quark and produced in electron-positron annihilations. Beams of electrons and positrons are maintained in the DORIS storage ring and are made to collide in two intersection regions. The ARGUS detector is located in the south intersection region and it is able to detect most of the particles emitted in an electron-positron reaction. Tracks produced by charged particles are observed in a system of drift chambers and their momenta determined from the curvature of the tracks in the applied magnetic field. A set of shower counters measures the energy and identifies electrons and photons, while muons are identified as the only particles capable of penetrating the iron in the return yoke of the magnet. The detector was assembled in the summer of 1982; various components of the system, which had been designed and built at a number of different institutions, were brought to DESY and put together to form this 6 million dollar state-of-the-art detector. The participants in this venture include groups from Germany, Russia, Sweden, Canada, and the United States.



Some of the KU group (N. Kwak, D. Coppage, S. Kanekal) in the ARGUS control room at DESY.

The first run with the ARGUS detector took place during the last quarter of 1982. This was primarily a test-run to explore the capabilities of the detector and to optimize its performance. This initial run went extremely well and a large amount of data was taken and is now in the process of being analyzed. More serious running for physics studies started early in 1983 and is expected to continue for at least two years. The data taken will be used to study the upsilon mesons which are bound states of the b-quark and its anti-quark. There are several excited states of the upsilon which may be produced in e^+e^- annihilations. Of particular interest is the fourth upsilon state whose mass is above threshold for the rapid decay into $B\bar{B}$. Each B meson thus produced contains a single b-quark and these studies should therefore provide important information on the properties of the b-quark which is the most recently discovered quark and one about which relatively little is presently known.

The second major project, namely the Fermilab experiment, is designed to study high energy \bar{p} , p, K^+ , and π^\pm interactions using tagged beams incident on the 30-inch hydrogen bubble chamber equipped with a downstream particle

identification system. The bubble chamber exposure was completed in the spring of 1982 and consists of 580,000 pictures taken at momenta of 100 GeV/c and 300 GeV/c with beams of both positive and negative particles. The experiment is being carried out in collaboration with groups from Michigan State, Notre Dame, Duke, Fermilab, and Cambridge University. Some of the bubble chamber film has been taken back to KU where it is now in the process of being analyzed.

The principal physics goal of the Fermilab experiment is to study the annihilation of antiprotons and in particular to make the first direct measurement of the $\bar{p}p$ annihilation cross section in this energy region. Incident beam particles are tagged using an upstream system of Cerenkov counters and proportional wire chambers, while secondaries emerging from the bubble chamber interactions are identified with the help of a number of downstream detectors which include CRISIS, OSIRIS and a neutral particle calorimeter. In addition to the interactions in hydrogen, studies are being made of the interactions of various beam particles in thin foils of gold, silver and magnesium which are located in the upstream end of the bubble chamber.

Japanese Scientist Visits Department; Recalls Field Research at Hiroshima

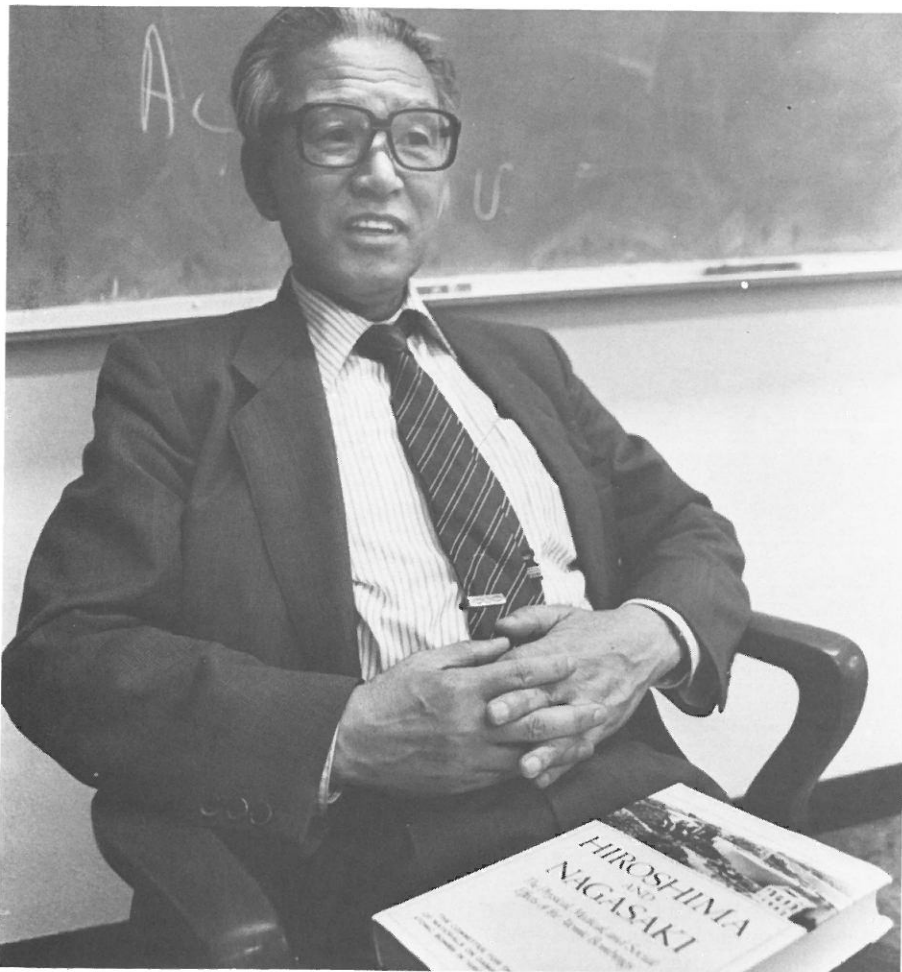


Photo courtesy Lawrence Daily Journal-World
Professor Sakae Shimizu

The department was very fortunate to have as a visitor, professor Sakae Shimizu, recently retired from the Department of Physics, Kyoto University in Japan. He was an instructor in physics at that university in early August of 1945 and he was sent with a group of colleagues to Hiroshima to determine exactly what had happened on August 6. He recalled the trip that he made that day and a further visit he made later on in the summer with a scientific team to determine the nature of the bomb, the extent of the damage, and the nature of the radioactivity associated with the fallout. He also presented a short movie made by a group in Japan which was from official Japanese photographs taken by this and other teams immediately following the Hiroshima and Nagasaki nuclear bomb blasts. Professor Shimizu was invited to visit by Professor J.P. Davidson, chairman of the department. He and Professor Davidson have known each other for

many years, since they met in Oslo, Norway, while Professor Davidson was working at the Joint Establishment for Nuclear Energy Research there. From that time, 1956, until the present, Professor Davidson and Professor Shimizu and their families have exchanged visits to their laboratories and homes. This particular colloquium gave many of the faculty and students a first hand reminder of the grim severity of the damage at Hiroshima in 1945. The talk by Professor Shimizu ended with a statement that "all of us are now standing at a crossroads where we must use either nuclear disarmament or annihilation of our civilization and culture. Everybody all over the world should consider and reflect upon the many aspects of the present nuclear problems in schools and churches, and also in homes in most quiet midnight, to call upon a new era which could be achieved with a revolution in our minds and spirits by introducing a new philosophy on the meaning of life and nature."

The Chairman's Message

This past year was a very difficult one financially for the department, as well as the College of Liberal Arts and Sciences and the University. The state reduced the funds for the University and other state agencies just after the beginning of the fiscal year. This was mentioned in my message of last year. We did manage to survive very well despite the recession of funds, and I want to especially thank each one of you alumni who sent us a contribution, no matter how small, to our Endowment fund. It was these special contributions of yours that have helped us bring many visitors to the campus and carry on other activities that would not have been possible because of the shortage of state funds.

I mentioned last year in our newsletter that we were being joined by two young astronomers, Professors Barbara Anthony-Twarog and Bruce Twarog. These people have already made contributions to the educational programs of the department as well as our research programs. Bruce was invited to present a paper at a prestigious international conference in Holland in June, and on July 1 he was notified that his research will be funded for the next two years by the National Science Foundation. He plans to spend most of August and September at the Interamerican Observatory in Cerro Tololo, Chile. Barbara has, besides teaching and being involved in her research, submitted a very long and detailed proposal to the National Science Foundation for their support of an image processing system to be added to our VAX 11/750 computer. The VAX computer itself was fully paid for by the department on July 1, and therefore is a wholly owned, dedicated facility for research in this department. The people associated with the machine, Professor Armstrong and others, are already at work planning a major expansion and upgrade of this computer. It has become one of the major research tools in this department.

We also learned during the year that Steven Hawley (B.S. 1973) will fly on the space shuttle next spring. We hope to have Professor Shawl watch the takeoff of that shuttle and talk to Steve. In our next newsletter, we hope that there will be an article about Steve's shuttle flight. We also hope to have Steve and his wife, Sally Ride, visit the University and the department sometime after his flight.

The year has indeed been a busy one; we passed a very extensive and thorough review of our engineering physics program by the Accrediting Board of Engineering and Technology last fall. Late this spring all of our programs were reviewed by the Board of Regents of the

state of Kansas. I believe we did very well in this Regents' review but we have not heard of the outcome. We also passed with flying colors, a five-year review of our graduate programs. This review was also mandated by the Board of Regents and the administration of the University.

Our faculty are still busy developing new courses, new programs, and continuing their research programs. We continue to graduate very qualified young men and women in the profession and we are most pleased to hear from each and every one of you, where you are, what you are doing, and what your accomplishments are. We also again extend to each of you an invitation to visit the department and see our activities when you are in the Lawrence, Kansas area.

J.P. Davidson
Chairman

Faculty Publications

Professors Ammar, Davis, Kwak, Stump, Dr. Coppage and Dana Day (RA) "Study of the $\nu_d \rightarrow \mu^-$ PPs," Phys. Rev. D26 537 (1982), with others.

Professor Anthony-Twarog, "The H β Distance Scale for B Stars: The Orion Association, Astron. J. 87, 1213 (1982).

Professor Armstrong, "Association Between Magnetic Field Fluctuations and Energetic Particle Bursts in the Earth's Magnetotail," J. Geophysical Res. 87, 8315 (1982) with A.T.Y. Lui and S.M. Krimigis; "Two-Component Proton Spectra in the Inner Saturnian Magnetosphere," Geophysical Res. Lett. 9, 1143 (1982) with S.M. Krimigis; "Laboratory Studies of Charged Particle Erosion of SO₂ Ice and Applications to the Frosts of Io," Ap. J. 259, 920 (1982) with others; "The Acceleration of Charged Particles in Interplanetary Shock Waves," Space Sci. Rev. 32, 185 (1982) with Dr. R.B. Decker (Ph.D. 1979) and M.E. Perses.

Professor Beard, "The Tailward Magnetopause Field Beyond 10R_E," J. Geophysical Res., 87, 2533 (1982) with Dean Hirschi (RA) and Keith Propp (Ph.D. 1983).

Professor Bord (adjunct), "The Spectroscopic Orbit of WRA977 (=X-Ray Source 4U 1223-62)," Pub. Astro. Soc. Pac. 94, 541 (1982) with J.B. Hutchings, D. Crampton and A.P. Cowley; "An Application of the Method of Wavelength Coincidence Statistics to the Ultraviolet Spectrum of κ Cancri," Ap. J. 258, 674 (1982) with **Professor Davidson**.

Dr. Buecher (previous post-doc), "Core Energy and Peierls Stress of Edge Dislocations in NaCl," Phys. Stat. Solidi 114 B, 1 (1982). Dr. Buecher is now at California State University, Fresno.

Professor Davidson, "A Search for Medium Z Elements in the Ultraviolet Spectrum of κ Cancri," Astron. Astrophys. III, 362 (1982) with **Professor Bord**.

Professor Enoch, "Numerical Simulation of a Disk-Shaped Electron Accelerating Electrostatic Probe," J. Appl. Phys. 54, 621 (1983) with Joseph Nonnast (Ph.D. 1982).

Professor Prosser, "Search for Structure in the Fusion of ¹⁶O + ²⁴Mg," Phys. Rev. C26, 2022 (1982), with Robert Racca (Ph.D. 1982) and others; "Prompt Compound Nuclear K X-rays in Fusion Reactions Induced by a Heavy Projectile," Phys. Lett. 119B, 307 (1982) with Robert Racca and others.

Professor Sapp, "Ground State of the Particle in a Box," Am. J. Phys. 50, 1159 (1982).

Professor Shawl, "Image-Tube Radial Velocities of Selected Globular Clusters," IAU Colloquium No. 68. p. 193 ff., with J.E. Hesser and James E. Meyer (RA); "The Determination of Globular Cluster Axial Ratio, Orientation and Center," *Ibid*, p. 191 ff, with others; "Instructor's Manual to Accompany the Dynamic Universe," West Publishing Company, New York, 1983; "An Optical Study of the Magnetic Field in M31," Ap. J. 253, 86 (1982) with P.G. Martin.

Professor Twarog, "NGC 752 and Main Sequence Bimodality," Ap. J. 267, 207 (1983); "Primary Nucleosynthesis in the Galactic Disk," Ap. J. 261, 636 (1982) with J.C. Wheeler. Professor Twarog won second prize in the McDonald Observatory News 1982 science writing contest for his article "Stellar Populations."

Professor Unruh, "Optical Measurements of the Substructure of BGO," *Proceedings of the International Workshop on Bismuth Germanate*, Ed. C.N. Holens, (Princeton University, 1982).

Student Publications

Robert Desko (RA) and Professor Bord (adjunct) "The Quantum Bouncer Revisited," Am. J. Phys. 51, 82 (1983).

Claude Laird (RA) and **Professors Zeller and Armstrong**, "Solar Activity and Nitrate Deposition in South Pole Snow," Geophysical Res. Lett. 9, 1195 (1982).

News from Home—

Conferences Attended, Talks Given

Professors Ammar and Davis attended the fall meeting of the APS Division of Particles and Fields at the University of Maryland, College Park, October 28-30.

Professor Anthony-Twarog gave a talk entitled "How Stars Die," to the Astronomical Society of Kansas City January 22; she also gave colloquia entitled "The H β Distance Scale for B Stars and the Orion Association" at the University of Minnesota, Minneapolis, January 28, 1983; "The Galactic Distance Scale," at Benedictine College, Atchison, February 21; "How Stars Die: What We Know and Why We Care," at Emporia State University, April 8; "Whence White Dwarfs—Statistical and Photometric Studies in Open Clusters," at Iowa State University, Ames, May 13.

Professor Armstrong spoke at the dedication ceremony June 10, 1982, at the University of Iowa, Iowa City, which renamed the Physics Research Center Van Allen Hall. He also participated in a panel discussion and presented a special lecture on the future of space exploration for Space Week activities here at KU in July 1982, and also lectured during the same week at Washburn University in Topeka and at Wichita State University. He presented a paper with **Chris Brungardt (RA)** and **Jim Meyer (RA)** entitled "Satellite Observations of Interplanetary and Polar Cap Solar Particle Fluxes from 1963 to the Present," at the Second International Symposium on Solar-Terrestrial Influences on Weather and Climate at Boulder, Colorado August 2-6, 1982. Professor Armstrong also gave a colloquium at the University of Calgary, Alberta, Canada, entitled "Voyager Observations of Saturn's Magnetosphere" October 4. He and **Mark Paonessa (RA)** presented a paper on Saturn at the Conference on Saturn at the University of Arizona, Tucson, May 11-15, 1983, and at this same conference presented with S.M. Krimigis (Johns Hopkins Applied Physics Lab) a paper entitled "Observations of Low Energy Ions Inside the Orbit of Mimas by Voyager-2." Professor Armstrong had his sabbatical leave request approved for the 1983-84 academic year. He will spend his leave in Lawrence and on travel to APL and JPL.

Professor Beard is a MASUA Honor Lecturer in Physics this academic year. He gave a colloquium entitled "The Physical Behavior of Comets and Ionized Gas Tails" at the University of Oklahoma, Norman, September 29 and at Oklahoma State University September

30. These were MASUA Honor Lectures. He also attended the winter meeting of the American Geophysical Union in San Francisco December 7-15, 1982, and presented a paper with **Keith Propp** (RA) entitled "Particle Dynamics in the Geomagnetic Tail." Professor Beard gave a talk on Cometary Atmospheres at the NASA Planetary Atmospheres Principal Investigators meeting in Ann Arbor, Michigan, April 20-23, 1983, and presented a paper on Saturn's Magnetic Field at the Conference on Saturn at the University of Arizona, Tucson, May 11-15. Professor Beard and **Terry Whelan** (RA) presented a paper entitled "Observable Effects of Comet Atmospheric Phenomena" at the spring meeting of the American Geophysical Union in Philadelphia May 31-June 4. He also presented a paper with B.E. Goldstein (Jet Propulsion Laboratory) entitled "Erosion of the Dayside Magnetosphere: Roles of a Normal Flux Component at the Magnetopause and of Inward Motion of the Plasma Sheet."

Professor Bearnse spent January 10-14 at the Los Alamos National Laboratory.

Professor Culvahouse gave a paper entitled "Phonon Bottlenecking and Interference Effects in Two-Phonon Spin-Lattice Relaxation" at the Midwest Solid State Conference, October 22-23.

Professor Davis had his sabbatical leave request approved for the academic year 1983-84 and will be at DESY in West Germany.

Professors **McKay** and **Munczek**, Dr. **Numirovsky** (post-doc) and **Pahol Sanganetra** (RA), attended the Workshop on "Nn-Perturbative QCD" at Oklahoma State University, Stillwater, March 7-9, 1983. Professor McKay presented a paper entitled "Scalars and Pseudoscalars in Non-Linear Chiral Dynamics Based on QCD."

Professor Munczek presented a paper entitled "Effective Quark Propagators and QQ Bound States in QCD" at the workshop at Oklahoma State University in March.

Professor Prosser attended the fall meeting of the American Physical Society Division of Nuclear Physics at the University of Massachusetts, Amherst, October 14-16. He also attended the meeting of the American Physical Society in Baltimore, April 18-21, attended an APS short course on "The Arms Race" and co-authored a paper entitled "Search for Incomplete Fusion in $^{28}\text{Si} + ^{12}\text{C}$, ^{24}Mg , ^{27}Al , ^{23}Si , ^{40}Ca and $^{16}\text{O} + ^{24}\text{Mg}$, ^{28}Si , ^{40}Ca ."

Professor Sapp gave a paper entitled "Phase Diagrams for Some Spin Glasses; Experimental versus Theory" at the Midwest Solid State Conference, October 22-23. He also attended the annual meeting of the AOK section of the American Association of Physics Teachers at Emporia State University, November 12 and 13.

Professor Shawl attended the International Astronomical Union General Assembly in Patras, Greece, with **Professor Bord** (adjunct), August 17-26, 1982. Professor Shawl presented a paper entitled, "Radial Velocities from Integrated Light Observations of Globular Cluster H-Alpha Absorption Lines" (with J.E. Hesser). Professor Shawl spent a week at the Steward Observatory and Kitt Peak National Observatory near Tucson, Arizona. He also spent two weeks at the Dominion Astrophysical Observatory in Victoria, British Columbia during the Christmas break, and again in May. Professor Shawl was the Harlow Shapley Lecturer for the American Astronomical Society at Simpson College in Indianola, Iowa April 21-22.

The late Professor Stranathan has been included in the American Institute of Physics' "list of eminent American Physicists." Many of his papers are available to scholars in the Spencer Library Archives.

Professor Twarog gave a colloquium at the University of Arkansas, Fayetteville, entitled "Bimodal Rotation on the Main Sequence" on September 24. Professor Twarog has been appointed to the Time Assignment Committee of Cerro Tololo Interamerican Observatory. He also received the Trumpler Award given every second year by the Astronomical Society of the Pacific for the best dissertation during the past two years. Professor Twarog's winning of the Trumpler Prize is mentioned on pages 81-82 in the November issue of *Physics Today*. He gave a talk entitled "Chemical Evolution of the Galaxy" to the Astronomical Society of Kansas City on January 22; he also gave a colloquium entitled "NGC 722 and Main Sequence Bimodality" at the University of Minnesota, Minneapolis, January 27. Professor Twarog also gave a talk "uvby Photometry in Disk Clusters" at Michigan State University, East Lansing, May 11.

Professr Unruh attended the International Workshop on Bismuth Germanate, Princeton, November 9-13. He gave two invited papers entitled, "Optical Investigation of BGO Substructure," and "Light Scattering from Precipitates in Doped MgO."

Professor Wiseman gave a talk to the Topeka Rotary Club entitled "The Relative Risks of Nuclear Power," January 20. He also attended the annual meeting of the AOK section of the American Association of Physics Teachers at Emporia State University, November 12 and 13. Professor Wiseman attended the 1983 Symposium on the Participation of Women and Minorities in Engineering at the Crown Center, Kansas, City, Missouri, March 4 where he gave a presentation on our engineering physics program.

News from Home—

Local Meetings and Conferences

The following members of the Department gave papers at the MASUA Theoretical Physics Conference, Saturday, October 9:

Dana Day (RA), "Experimental Tests of CVC and PCAC in ν Reactions,"

Dr. Nemirovsky (post-doc), "From QCD to the Bosonic Spectrum,"

Professor Wong, "Superfluid Helium and the Question of Bose-Einstein Condensation."

Professors Bord (adjunct), **Davidson**, **Friauf**, **Sapp**, **Shawl**, **Robert Curry** (Director of Laboratories), **Joseph Gress** (RA) and **James Meyer** (RA) attended the annual meeting of the Kansas Academy of Sciences, at Benedictine College, Atchison, on March 4. Professor Davidson chaired the first session of contributed physics papers while Joe Gress presented a paper entitled "The Anti-proton-Proton Annihilation Cross Section"; Bob Curry, a paper entitled "The Rubens Flame Tube"; Professor Shawl, a paper entitled "The Determination of Globular Cluster Axial Ratio, Orientation, and Center Coordinates"; Jim Meyer, a paper entitled "A Search for Close Companions to Long Period Variable Stars"; Professor Bord, a paper entitled "Search for Twice Ionized Argon (ArIII) in α^2 Canum Venaticorum"; and Professor Sapp, a paper entitled "Density of States Models for the Magnetic Heat Capacity of Spin Glass Materials."

The Society of Physics Students Zone 9 meeting was held March 11 and 12. Featured speakers were: Professor Dennis K. Ross, Iowa State, "Relativity and Cosmology," Jim Serati, McDonnell-Douglas Aircraft Company, St. Louis, "Electrophoresis Operations in Space: A New Era Dawns," Frederick P. Ostby, Director, National Severe Storm Forecast Center, Kansas City, "Severe Storm Forecasting at the National Severe Storm

Forecast Center," and Professor Armstrong, "Voyager Observations of Saturnian Hot Plasma and Radiation Belts: Sources, Losses and Transport."

Professors Anthony-Twarog, Bord (adjunct), **Davidson, Shawl, Twarog** and **Jim Meyer** (RA) attended the 13th Mid-American Regional Astrophysics Conference at Linda Hall Library, Kansas City, March 25-26. Professor Anthony-Twarog presented a paper entitled "Extended Survey for White Dwarfs in Praesepe"; Professor Bord, "A Search for Twice Ionized Argon (ArIII) in α^2 Canum Venaticorum"; Professor Shawl, "The Determination of Globular Cluster Axial Ratio, Orientation and Center Coordinates"; Professor Twarog, "PDS Photometry in the Old Disk Cluster, NGC 188" and Jim Meyer, "A Search for Close Companions to Long-Period Variable Stars."

News from Home—

Graduate Students and Post-doctoral Research Associates

Edwin Bell (RA) presented a paper with Professor Armstrong and Mark Paonessa entitled "Energetic Charged Particle Absorption at Europa," at the American Geophysical Union spring meeting May 31-June 4, in Philadelphia.

Scott Brandon (RA) and **Ramona Rusk** (RA) presented the annual report of the University's work on the Interaction of Plasmas and Insulators at the NASA Lewis Research Center in Cleveland, Ohio on August 9, 1982.

Pat Briggs (Ph.D. 1982) presented a paper with **Professor Armstrong** at the spring meeting of the American Geophysical Union in May, in Philadelphia entitled "Sector Ion Clouds."

Rebecca Chaky (Ph.D. 1982) presented a paper with **Joey Nonnast** (Ph.D. 1982) and **Professor Enoch** at the International Symposium on Space-craft Materials in Space Environments June 3-11 in Toulouse, France, entitled "Numerical Simulation of a Conducting Disk Partially Covered with an Insulator Interacting with a Plasma."

Frank Kutcho (Ph.D. 1983) presented a paper with **Professor Armstrong** entitled "Particle Trajectory Modeling of Magnetotail Bursts" at the American Geophysical Union spring meeting in May, in Philadelphia.



Claude Laird (RA) presented a paper entitled "Solar Activity and Nitrate Deposition in South Pole Snow" at the 2nd International Symposium on Solar-Terrestrial Influences on Weather and Climate in Boulder, Colorado August 2-6, 1982.

Gul Tariq (RA) presented a paper with **Professor Armstrong** at the American Geophysical Union meeting in May entitled "A Mechanism for Charged Particle Acceleration and Redistribution in the Jovian Magnetosphere at Ganymede."

Visiting Speakers

George Reid, from the National Oceanic and Atmospheric Administration spoke on "Solar Radiation and the Tropical Atmosphere," on September 27.

Bernard L. Cohen, University of Pittsburgh, in Pennsylvania, gave a special colloquium entitled "Long Term Waste Problems from Electricity Production" on September 30.

David Golden, University of Oklahoma, Norman, gave a talk entitled "Electron-Photon Angular Correlation," October 18.

Jim McGuire, Kansas State University, spoke on "Second Born Approximation for Electron Capture," November 1.

Donald J. Williams, from Johns Hopkins University, gave a talk entitled "Energetic Particle Beams in the Earth's Magnetotail," January 25.

E.G. Schmidt, University of Nebraska, Lincoln, gave a talk entitled "Chromospheres of Cepheid Variable Stars," January 31.

Tom J. Gray, Kansas State, spoke on "Physics of Recoil Ions," February 21.

Laura P. Bautz, Director, Astronomy Division, National Science Foundation, Washington, D.C., gave a colloquium entitled "The NSF Outlook in Physics and Astronomy," March 24.

David Alexander, Wichita State University, gave a talk entitled "Microcomputers in Physics and Astronomy Education," March 28.

Jay Jellison, Oak Ridge National Laboratory, spoke on "Optical Properties of Silicon and Applications to Pulsed-Laser Annealing," April 11.

Caty Pilachowski, from Kitt Peak National Observatory, Tucson, Arizona, gave a talk entitled "Globular Star Clusters and the Early Galaxy," April 18.

Jerome Niebaum, Director of the Academic Computer Center here at KU, gave a colloquium entitled "Computing Technology: Thence and Hence," April 20.

Sakae Shimizu, Institute for Chemical Research, Kyoto University, Japan, gave a special colloquium entitled "Message from Hiroshima: Recollections and Reflections of a Nuclear Physicist 38 Years After," May 24.

Degrees Awarded—

Ph.D, M.S., and Seniors graduated

The following students received the degrees indicated at graduation ceremonies on Sunday, May 15. Their plans, where known, are noted:

B.A. Physics

Stephen Robinson
Steven Sneller

B.S. Astronomy

Richard Dyson, Bartol Research, will spend next year (all of it) in the Antarctic. Brett Goodrich, Kitt Peak National Observatory.

Jim Meyer, Graduate School, San Diego State.

Merle Reinhart, Graduate School, University of Indiana.

B.S. Engineering Physics

Robert Dees
Dennis McConnell
Doug Tunison, Summer RA at Oak Ridge National Laboratory; fall graduate school, University of Wisconsin with RA.

B.S. Physics

Dian Curran, summer RA, KU; fall, University of Iowa with TA.

Chris Paquette, U.S. Navy Reactor Branch in Washington, D.C.

Robert Shaw

Saeid Zoonematkermani, has a Faculty Fellowship to attend Columbia University, New York City, in the fall.

M.S. Physics

Ed Bell will remain at KU in the doctoral program.

Suttiruch Chanhom

Franz Heider

Aroon Phaholvech

Ph.D. Physics

Frank Kutchko, teaching at the University of Missouri, Kansas City.

Adolfo Nemirowsky, has received a post-doctoral position at the James Frank Institute of the University of Chicago. He will be working with Professor Karl Freed.

Lee Herder, is working for the Kaman Sciences Corporation in Colorado Springs, CO.

Departmental Awards

Saeid Zoonematkermani was selected as the 1982-83 **Stranthan awardee**.

The following students were received into **Sigma Pi Sigma** October 20:

Joy Julius Christian

James Andrew Norcross

Jurgen Charles Scott

Anne Frances Sheehan

Joseph Charles Shields

Di Min Wang

Teaching Assistant Awards

Michael Holmes

Dennis McConnell

Saeid Zoonematkermani

Graduation with Distinction and Highest Distinction

Christopher Paquette

Pat Conroy Memorial Scholarship

James Norcross

N. Wyman Storer Award for Service in Astronomy

Award: Merle Reinhart

Certificate: Richard Dyson

James Meyer

Outstanding Senior in Physics and Astronomy

Award: Douglas Tunison

Honorable Mention:

Dennis McConnell

Christopher Paquette

Saeid Zoonematkermani

Outstanding Senior in Engineering Physics

Award: Douglas Tunison

Honorable Mention: Dennis McConnell

Professor Davidson has been elected vice-president of the KU Chapter of Phi Beta Kappa.

Joseph Shields has received an Undergraduate Research Award.

General Research Fund Awards

Professor Anthony-Twarog, "Spectroscopic Search for Lithium in the Galactic Disk Stellar Population" (New Faculty Research Fund) \$2.25k, and "An Examination of the Photometric Subdwarf Candidates in the Hyades Cluster," \$2.3k.

Professor Armstrong, "Numerical Simulation and Laboratory Measurements of Electrostatic Effects in Dust Accretion" \$2.7k.

Professor Munzcek, "Direct Interaction of Leptons with Nuclear Matter," \$4.6k.

Professor Sapp, "Magnetic Phase Diagram and Anisotropy of Spin Glass Materials" \$5.4k.

Professor Stump, "Wave Motions in the Atmosphere" \$4.7k.

Professor Twarog, "Automated Stellar Photometry of NGC188" (New Faculty Research Fund) \$2.25k, and "Delineation of the Halo-Disk Transition in the Galaxy" \$4.5k.

Professor Unruh, "Numerical Simulation and Laboratory Measurements of Electrostatic Effects in Dust Accretion" \$5.4k.

Outside Funding

Professor Ammar (P.I.) with **Professors Davis and Kwak** (Co. P.I.'s), "Elementary Particles at High Energies," (NSF) \$140.k.

Professor Armstrong, "Studies of Solar and Magnetospheric Particles," (Applied Physics Lab, Johns Hopkins University) \$46.6k; "Voyager Mission Operations" (APL/JHU) \$15.0k; "International Solar Polar Missions" (APL/JHU) \$8.3k; "Jupiter Data Analysis" (APL/JHU) \$26.0k; "Voyager Mission Operations" (APL/JHU) \$33.7k; "Galileo Energetic Particles Detector (EPD) Experiment" (APL/JHU) \$7.7k.

Professor Beard, "To Model the Magnetic Field of Jupiter" (NASA) \$25.0k; "Cometary Atmospheres" (NASA) \$22.0k.

Professor Davidson, "Junior Science and Humanities Symposium," (Academy of Applied Science) \$10.8k.

Professors Enoch (P.I.) and **Armstrong** (Co-P.I.) "Self Consistent Numerical Simulation of Plasma-Insulator Interactions" (NASA) \$69.0k.

Professor Goldhammer, "Shell Model Calculations in the Op-Shell," (NSF) \$40.2k.

Professors Munczek and **McKay**, "Gauge Model Study of CP and Parity Violation: Questions of Right Handed Coupling and Hadron Stability" (DOE) \$37.0k.

Professor Prosser, "Fusion Measurements in Light and Medium Mass Heavy-Ion Reactions," (DOE) \$51.0k.

Professor Shawl, "Studies of Fundamental Properties of Globular Clusters in the Milky Way Galaxy" (NSF) \$47.5k.

Professor Unruh, "Gas Plasma Display Evaluation" (King Radio Corp.) \$1.10k.

News from Alumni

Bruce R. Barrett (B.S. Physics 1961) has returned to the University of Arizona's Physics Department after a six month stay at the Institute for Theoretical Physics of the University of California, Santa Barbara. He has received a grant from the International Division of the NSF to do research in theoretical nuclear physics at the University of Melbourne, Australia from May 15 to July 15. He is also organizing (with Professor Tom Kuo, of SUNY Stony Brook) an International Summer School on Nuclear Physics in the People's Republic of China for July 25-August 3. His home address is 628 North Norris Avenue, Tucson, Arizona 85719 while his university's is Bldg. 81, Tucson 85721.

Samuel E. Bland (B.S. Physics 1976) is working for Analysis and Technology in North Stonington, Connecticut. His home address is 10 Highview Terrace, Ledyard, CT 06339.

Richard L. Boudrie (Ph.D. 1976) is group leader of EPICS and HRS project lending LEPS at Los Alamos National Laboratory. He recently published, "Inelastic Scattering of 162-MeV Pions by ^{14}N ," Phys. Rev. C27, 1134 (1983) with others.

Robert Bunch (Ph.D. 1981) was recently married to Anne Lawson in Vinland. He is still at San Diego State University in Southern California.

William Dean (B.S. Physics, B.A. Astronomy, 1976) is a graduate student in astronomy and a teaching assistant at the University of Texas, Austin. His dissertation research involves the theory of gravity wave radiation.

Tom Faddis (B.S. Engineering Physics 1982) is working for Gumper Industries in Albuquerque, New Mexico.

Henry Glotfelty (Ph.D. 1978) is still at the Physics Department, Samford University, Birmingham, Alabama 35220.

Martin C. Gutzwiller (Ph.D. 1953) at IBM, Yorktown, presented a paper at the March meeting of the APS in Los Angeles, March 23-25.

Dean Halderson (Ph.D. 1974) recently published "Stretched Excitations and the Spin-Dependent Part of the Pion-Nuclear Interaction," Phys. Rev. C27, 1636 (1983) with others. He is in the Physics Department of Western Michigan University, Kalamazoo.

Steven A. Hawley (B.A. Physics and Astronomy 1973) has been selected as the fourth crewman for Shuttle 12 mission. He recently married Dr. Sally K. Ride, an astronaut assigned to fly Mission 7.



The new sixteen foot Ash Dome and wall cylinder houses the 6-inch Clark refractor. Installation was completed in early June, five years after the old structure was condemned as unsafe. This Ash dome is fully electrical.

Robert Johnson (B.S. 1980) is currently a graduate student in the Physics Department at Stanford University.

Tom Laming (B.S. Physics 1981) is now a graduate student at MIT. His home address is 129 Pembroke, Apt. 1, Boston, MA 02118.

The death of Henry Peter Leet (B.S. Engineering Physics 1955) was recently reported. His estate has provided funds for an award to an outstanding engineering physics student.

Robert A. Racca (Ph.D. 1982) is working at Mission Research, Colorado Springs.

Carlton Roos (former GTA) is in medical school at Vanderbilt University, Memphis, Tennessee.

Don Shirk (Ph.D. 1975) is currently working with X-5—Diagnostic Physics Division, Los Alamos National Laboratory, Los Alamos, New Mexico.

John T. Tarvin (Ph.D. 1977) is now an assistant professor in the biophysics section of the Physics Department of the University of Mississippi, University, Mississippi 38677.

Elizabeth Wainwright (M.S. 1978) just finished her Ph.D. in Geophysics at Texas A&M and is starting to work for Chevron Geosciences in Houston.

Among our 1982 graduating seniors, **Chris Brungardt** will attend graduate school in astronomy at Pennsylvania State University, State College; **Thomas Faddis** is looking for an engineering job; **Gloria Manney** will enter the graduate physics program at Iowa State University, Ames; **Earl Prather** is working for Western Electric in Kansas City; **Brad Roth** is going to graduate school at Vanderbilt University in Nashville, Tennessee, to study biophysics; **John Riggs** will attend Navy flight school; **Gholam Rezvani** will enter our graduate physics program; **Karen Roth** will enter the graduate engineering physics program at Oklahoma University, Norman, in the spring of 1983; **Roger Spohn** is looking for a R&D position; **Elizabeth Simon** will attend graduate school to study atmospheric sciences; **Jeff Winger** will also attend Iowa State University at Ames in their graduate program in physics.