The Cedar Post

September 1990 No. 11

Gerry Romick Leaves NSF for APL, and Fred Roesler Becomes New NSF Aeronomy Program Director

One of the great strengths of the NSF Aeronomy Program is the active participation of respected scientists in the planning and administration of the overall middle and upper atmosphere research programs of the foundation. The directorship of the Aeronomy Program is a rotating appointment that is typically held for two years. Aeronomy and CEDAR are very fortunate to have benefited from the superb leadership and judgment provided by active researchers who are willing to serve in this position. All of the scientists who have served as director during the past decade continue to be very active in CEDAR and related programs. These individuals include Andy Christensen, Abas Sivjee, Vince Wickwar, Bill Sharp, and Brian Tinsley.

In July, Gerry Romick completed his term as Aeronomy Program director. Probably no one has played a more significant and sustained leadership role in CEDAR than Gerry. In the early 1980s, while still associated with the Geophysical Institute at the University of Alaska, Gerry served as the chairman of the Ground Based Optical Aeronomy Program (GBOA). When CEDAR was formed in 1985, he became the first chairman of the CEDAR Science Steering Committee and editor of the *Cedar Post*. Gerry served as chairman of CSSC until 1988, when he became the Aeronomy Program director. In July he joined the Applied Physics Laboratory at Johns Hopkins University, where he will be developing ground- and space-based instrumentation for airglow studies. We look forward to the continued participation of Gerry and his wife Marsha in CEDAR activities. Thanks, Gerry, for an exceptional record of service.

In August, Fred Roesler from the University of Wisconsin will begin his term as the new Aeronomy Program director. Fred also has had a long association with CEDAR dating back to GBOA days when he served on the interferometry and lidar subcommittees. Fred is a professor of physics at Wisconsin, and his research has concentrated on airglow observations of planetary atmospheres. Fred is well known for his work in Fabry-Perot interferometry, and in recent years some of his instruments have also been used to make daytime lidar observations. Fred should be settled in at NSF by mid-September, just in time to begin processing the next round of CEDAR proposals.

5th Annual CEDAR Workshop Attracts 267 Participants

The 5th Annual CEDAR Workshop was held at Boulder, Colorado, from Tuesday, June 12, through Saturday, June 16, 1990. The annual meeting is sponsored by the National Science Foundation (NSF). This year's participants came from the United States, Puerto Rico, Canada, Sweden, the United Kingdom, Finland, Norway, France, West Germany, and Peru. Of the 267 participants, 107 were students from 27 different institutions, including 2 from outside the United States. Participation in the meeting by most of the students from U.S. institutions was made possible by a travel grant from NSF.

The first session of the meeting was devoted to student introductions and graduate student concerns such as post-graduate employment and research grantsmanship. During the same session Dr. Michael Mendillo presented the second CEDAR Prize Lecture on *The Discovery of a Sodium Magneto-Nebula Around Jupiter* from groundbased imaging spectroscopic observations. The two CEDAR post-docs who are completing their terms this year, Julie Moses and Jean Lilensten, also presented a brief report on their activities.

The meeting was sectioned into morning plenary sessions at the National Institute of Standards and Technology (NIST) and afternoon workshops at NCAR. The morning sessions featured tutorials from various experts in the field that were video-taped, shorter talks on a variety of subjects, and a poster session on Thursday. The tutorial talks this year were given by Peter Stubbe on ionospheric modification, by Larry Lyons on ionosphere/magnetosphere coupling and auroral acceleration processes, by Tom Slanger on aeronomical laboratory work, and by Susan Solomon on polar ozone processes.

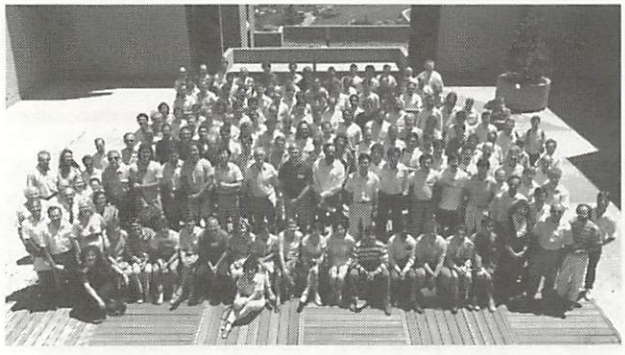
This year about half the posters had students as first authors. In an effort to encourage even more student participation in the future, a "best student poster" award was initiated. The first such CEDAR award was made to Joseph Pingree of Cornell University, who coauthored a poster with Wes Swartz and Don

Farley on *Incoherent Scatter Measurements and Inference of Energy Fluxes in the Equatorial F-Region Ionosphere.*

During each afternoon of the meeting, the participants adjourned to NCAR to attend workshops. This year, there were 25 workshops to choose from, ranging from airborne lidar observations and future campaign organization, to a tutorial on using an extensive numerical computer model created by scientists to retrieve twilight airglow intensity and hence thermospheric composition.

The meeting provided extensive opportunities for detailed discussions of ongoing and new research thrusts and for liberal exchange of ideas. It also provided a venue for closer interactions between students and practicing scientists. On the afternoon of June 14, Barbara Emery encouraged the participants to gather in the NCAR courtyard for group photographs. One photograph was taken of the student participants and one of all the participants. Both are reproduced below.

G. Sivjee and B. Emery



The 1990 CEDAR Workshop attracted 267 participants from more than 50 institutions in the United States, Canada, France, West Germany, Sweden, Finland, United Kingdom, Norway, Peru, and Puerto Rico. On the afternoon of June 14, the CEDAR "crew" gathered in the NCAR courtyard for a group photograph of all attendees (top) and for a special photograph of the student attendees (bottom).

CEDAR 1990 Video Tutorials

We are preparing to place an order to copy the 1990 CEDAR tutorials onto VHS videotape. In the past, we have made one tape on medium speed, so the four hours of tutorials fit on one two-hour videotape. This year, because of changes in duplicating equipment, the tutorials will be copied in standard speed on two tapes. The first tape will be:

- Peter Stubbe, **Review of Ionospheric Modification,**
- Larry Lyons, **Ionosphere/Magnetosphere Coupling and Auroral Acceleration Processes,**

and the second tape will be:

- Tom Slanger, **Aeronomical Laboratory Work,**
- Susan Solomon, **Polar Ozone Processes.**

The price of the two tapes is $35. Speakers will receive complimentary copies. The tutorial videos for 1987, 1988, and 1989 are also available on one tape at medium speed for those interested. Copying charges are $42 for each tape. If you are interested in the video tutorials, please contact Barbara Emery (HAO/NCAR, P. O. Box 3000, Boulder, CO 80307, 303-497-1596, FAX 303-497-1137, emery@ncar.ucar.edu, 9580::"emery@ncar.ucar.edu"

Richard Bills is the First Recipient of the OSA Allen Prize

University of Illinois at Urbana-Champaign graduate student Richard Bills was recently named the first recipient of the Allen Prize by the Optical Society of America. During the past several years, Richard has been quite active in a variety of lidar studies related to the CEDAR Program. The Allen Prize was established by the Optical Society of America through an endowment provided by Robert Allen. It is presented annually "to a person who, while a graduate student, has made outstanding contributions to atmospheric remote sensing using electro-optical instrumentation, especially for conceiving and developing new and unique devices, for the development of a new measurement technique, or for perceptive analysis of remote sensing measurements." He received the award for developing a high-speed data acquisition system for the UIUC CEDAR lidar that led to the first lidar observations of meteor trails in the Na layer, for his discovery of the sporadic Fe layer phenomenon using the CEDAR lidar, and for the codevelopment of a new lidar technique for measuring mesopause region temperature profiles. Richard expects to receive his PhD in electrical engineering next spring.

CEDAR 1990 Workshop Photographs

Fifty copies of the two group photos (one of students and one of everyone) taken at the June 1990 meeting that appear above are available upon request. If you would like an 8" x 10" glossy of one or the other (or both), please contact Barbara Emery (HAO/NCAR, P. O. Box 3000, Boulder, CO 80307, 303-497-1596, FAX 303-497-1137, emery@ncar.ucar.edu, 9580::"emery@ncar.ucar.edu"). Copies were mailed to everyone who attended the meeting.

The Canadian Network for Space Research

The Canadian Network for Space Research is a federally supported network of universities, private companies, and government laboratories with demonstrated excellence in the study of geospace from the lower atmosphere to the magnetosphere. During the four-year program the network will receive $17 million (Canadian) of direct funding to

- **support five science and technology projects,**
- **diffuse new technology and related capability into Canadian industry,**
- **promote communication among participants,**
- **develop appropriately trained human resources.**

The startup date for the network was August 1, 1990.

The scientific leader of the network is Leroy Cogger. He is assisted at the University of Calgary by Dennis Green, the network manager. The five scientific projects and the corresponding project leaders are:

- **The Middle Atmosphere**
  (Bob Lowe, University of Western Ontario),
- **Auroral Processes in the Ionosphere and Magnetosphere**
  (Jim Koehler, University of Saskatchewan),
- **The Polar Environment**
  (Don McEwen, University of Saskatchewan),
- **The Plasma Environment in Space**
  (Gordon Rostoker, University of Alberta),
- **Instrumentation for Space Science**
  (Gordon Shepherd, York University).

Project 1 has the goals of developing state-of-the-art instrumentation for the study of the middle atmosphere, providing a comprehensive set of observations across Canada for the study of the middle atmosphere's response to solar variability, anthropogenic modification and coupling to the lower and upper atmosphere, and developing climatologies of the middle atmospheric composition, temperature, and wind. Primary sites include the Delaware Observatory, located near the University of Western Ontario (airglow imagers, scanning radiometer, lidar and middle-frequency (MF) radar), the University of Saskatoon (Fabry-Perot interferometer and MF radar), and the University of Calgary (Fabry-Perot interferometer and MF radar).

The objectives of Project 2 are to provide an improved model for the energy input from the magnetosphere during magnetic storms and to improve our knowledge of magnetosphere-ionosphere coupling in the polar regions. Techniques will include a new Saskatchewan Polar Phased Array Ionospheric Radar Experiment (SAPPHIRE), a 50 MHz coherent radar to be located in the auroral zone and polar cap, the existing CANOPUS network, an additional receiver for the United States' Millstone Hill incoherent-scatter radar at London, Ontario, and the auroral imagers to be flown on the Freja and Interball satellites.

The acquisition of a comprehensive set of polar observations of the middle and upper atmosphere is the primary goal of Project 3. The lower atmosphere will be probed using balloons, Brewer spectrophotometers, and lidar. The middle and upper atmosphere will be investigated using high-resolution optical interferometry, imaging, and MF, HF, and VHF radar. Possible sites for a polar observatory include Alert, Eureka, Mould Bay, and Resolute.

Project 4 will use recent advances in computing hardware to develop more sophisticated models of the transport of energy within Earth's magnetosphere, auroral acceleration processes (emphasizing the development of wave-particle interaction simulations), and the interaction of spacecraft with the space plasma environment. Many of these intensive numerical calculations will be performed on a Myrias SPS-3 parallel computer to be located at the University of Alberta.

The goals of Project 5 are to develop new techniques for remote-sensing from space, including an optical instrument based on an acousto-optical tunable filter (AOTF), a reflective Michelson interferometer for UV applications, microwave radiometers, calibration facilities, and data acquisition systems for satellite-based VLBI measurements. This project will involve major participation by Canadian industry.

The formation of the network and its potential impact on atmospheric and space sciences in Canada is unprecedented. In addition to developing a variety of novel instruments and deploying them in key geographic locations, the formation of the network will provide an opportunity for many young scientists to acquire valuable experience in aeronomy and space science. At this time positions are available for graduate students, postdoctoral fellows, and research associates. We invite CEDAR scientists interested in collaborating in one of the five projects to contact the project leader.

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Department of Physics and Astronomy
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FY91 CEDAR Proposal Deadline is November 1, 1990

One of the major goals of the CEDAR Program is the development of world-class facilities and instruments to study the composition, structure, and dynamics of the middle and upper atmosphere. Although much progress has been made during the past five years, the community must continue to pursue aggressively the development of the Class I instruments that will be required to address the key research problems into the next centuery. To be considered for funding under the CEDAR Program for the 1991 fiscal year, complete research proposals must be received at NSF on or before November 1, 1990. This is a firm deadline. Proposals received after November 1 will not be considered for funding under the CEDAR initiative during FY91.

Hardware Ranch/Bear Lake Observatory

Following discussions at Utah State University (USU), members of the Center for Atmospheric and Space Sciences (CASS) and the Space Dynamics Laboratory (SDL) concluded that a set of advanced instruments, both optical and radio, existed that could form the nucleus of a mid-latitude observatory for studying the middle and upper atmosphere. Soon after, a decision was made by USU to establish such a mid-latitude observatory near the university. The advantages for this decision were many: the altitude, weather, rural location, and low level of pollution in the mountains near USU are all conducive to good optical observations, and the rural location is especially good for radio observations. Further, research conducted there would complement observations taken during campaign programs elsewhere in the world as well as existing theoretical programs. Finally, an observatory near the university would greatly facilitate student participation.

The first site seriously considered was at a location called Hardware Ranch, 25 miles from USU. However, because it is served by better power and communications facilities, the first observing site actually established (see photo) was near Bear Lake, 38 miles from USU (41.935 N, 111.422 W, 1990 m, 502 Λ). With the support of the university, the site was upgraded, and a trailer was moved there and refurbished in 1989. The first instrument began making regular observations in September 1989. Although the observatory was initially called the Hardware Ranch Observatory, it is now more appropriately called Bear Lake Observatory.

The Bear Lake Observatory also met a goal of the broader upper atmospheric community to establish a mid-latitude observatory. Much attention in the recent past has focused on the auroral and the equatorial regions. Now, however, the growing awareness that coupling exists between the auroral and between low, middle, and upper atmospheres has made study of the mid latitudes increasingly important. Furthermore, the feasibility has been significantly increased with the improved capabilities of individual, advanced instruments and with the even greater capabilities achieved by clustering several such instruments to observe several geophysical parameters.

Starting with a good mid-latitude location and the initial clustering of USU-provided instruments, we felt a first-class observatory could be developed to perform significant studies of the middle and upper atmosphere once we enlisted the participation of the upper atmospheric community.

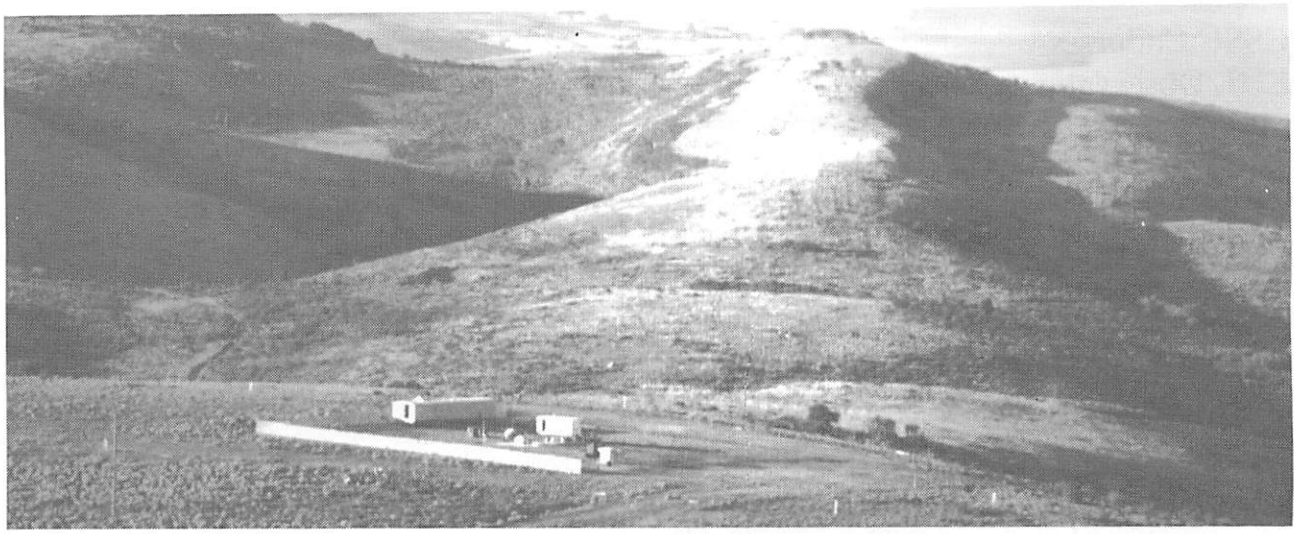
Our approach is both instrument and science oriented and takes into account the need to minimize costs and support participating scientists from other institutions in addition to USU. Already noted is our major intent of clustering advanced instruments to obtain a multifaceted view of the region or phenomenon being studied. These instruments can be either optical or radio, passive or active. Our other major intent is to operate daily, which maximizes the possibility of obtaining data during special geophysical events as well as the number of nights of optical observations with clear skies. It would also create an extended mid-latitude data set made up of many related observations. This database would be good for studies of both the climatology and the weather.

To minimize operating costs, we think it essential that instruments operated daily should be automated; it would be even more convenient if they could be monitored from the observatory headquarters on campus and from the participating scientists' home institutions. For our part, we would help install the instruments and learn how to operate them in their automated mode. Our plan calls for visiting the observatory about once a week to check on operations and retrieve data. Naturally, should a problem be indicated, a visit would be made sooner. The problem would be either solved or the participating scientist contacted. To further our intention of making daily observations, we will also operate a number of instruments to monitor weather and auroral conditions. These support data will make it possible to determine when the scientific observations are reliable and to facilitate their interpretation.

Clustering a set of instruments makes possible a certain synergism. Facilitating this synergy can be achieved by reducing the data from the automated instruments to geophysical variables and by making the set of reduced data available to participating scientists and students. This data reduction will be done in collaboration with the scientists providing the instruments and the reduced data sent to the CEDAR database. Use of the data will follow the CEDAR database rules of the road. Instrumental synergy and the resulting science will be promoted through organized campaigns, CEDAR workshops, observatory workshops, and network access to the data.

The mid-latitude location of the observatory, combined with existing or prospective instruments, suggests an examination of certain research areas, the foremost being the study of the dynamics of the upper mesosphere and lower thermosphere. This primary area of scientific investigation involves many aspects of atmospheric waver—ranging from long-period planetary waves to short-period gravity waves—that serve to couple the atmosphere vertically. Observations are needed of winds, waves, temperatures, and densities in this region as well as in regions lower in the stratosphere and mesosphere.

Currently, observations are being made in the region with an extremely sensitive Fabry-Perot interferometer. Line-of-sight winds are being determined from OH observations at 8453 nm, from approximately 86 km, with a precision of 1m/s in 4 minutes. The interpretation of these observations will be extended shortly to temperatures. This work is the collaborative effort of USU [V.B. Wickwar], University College London (UCL) [D. Rees], and University of Western Ontario (UWO) [R. J. Sica]. A new Michelson interferometer is at USU and is being prepared to observe rotational temperatures and intensities between 1.0 and 1.67 μm. This is the collaborative effort of USU [P. Espy] and Embry Riddle Aeronautical University [G. G. Sivjee]. Several efforts are underway to extend Fabry-Perot observations to other emissions, i.e., to other altitudes near the mesopause; to determine the spatial distribution of emitting structures; and to determine the vertical structure of temperature, density, wind, and turbulence from the stratosphere to the lower thermosphere. Many of the objectives of these observations fit closely with the goals of the CEDAR Lower-Thermosphere Coupling Study (LTCS) and the Solar Terrestrial Energy Program (STEP) Mesosphere Lower-Thermosphere Coupling Study (MLTCSD).



BEAR LAKE OBSERVATORY. In the center of the picture is the observatory's fenced compound. The instruments are in the long trailer, with the Fabry-Perot's dome at the near end. A geodesy group from Germany is set up in the middle of the compound for August 1990. A pole for the HF sounder's transmit antenna is visible to the left of the compound. The north end of Bear Lake is visible in the upper right-hand corner.

The second area of scientific interest extends the studies of dynamics into the thermosphere. Here, investigations involve the upward propagation of tides into the thermosphere and the propagation of effects arising from magnetic activity from high to mid latitudes. Occasionally, thermospheric winds are now determined with Fabry-Perot observations of $O(^1D)$ emission at 630 nm, from approximately 250 km. We intend to extend the interpretation to the neutral temperature. As with the work in the upper mesophere and lower thermosphere, this is the collaborative work of USU, UCL, and UWO.

Electron densities below the F-layer peak can be determined using a recently upgraded NOAA digital sounder, work that is presently being carried out by USU [F. T. Berkey and G. S. Stiles]. Once the height of the F-layer is determined from the sounder, it can be used to examine thermospheric dynamics. This work will also be pursued by USU [K. L. Miller]. Efforts to follow up on this thermospheric work will enable us to make simultaneous determinations of winds in both the mesopause region and the thermosphere and to obtain more complete information about electron densities.

Many aspects of this kind of observation fit closely with the CEDAR and STEP Coupling and Dynamics of the Ionosphere-Thermosphere System (CADITS) program. Furthermore, studies ranging from the upper mesosphere to the lower thermosphere take advantage of complementary Fabry-Perot interferometer and MF radar observations in the western part of North America, e.g., Fairbanks, Calgary, and Saskatoon, to provide latitude information.

The third area of scientific interest is the ground-based determination of the neutral composition. Initially, this is apt to take place during special campaigns, which will include twilight intensity observations of several optical emissions as well as nighttime observations of the intensities of the $O(^1D)$ emission at 630 nm and the $N(^2D)$ emission at 520 nm, both of which originate from dissociative recombination.

These nighttime intensity observations will be coupled with two other kinds of observations: HF-sounder observations from which the bottomside electron density can be derived and Fabry-Perot observations from which the thermospheric neutral temperature can be derived. The first campaign is scheduled close to the 1991 spring equinox, with intensity observations to be made by the University of Arizona [A. L. Broadfoot and K. R. Kendall]. The HF-sounder and Fabry-Perot work will be by the same groups, respectively, as for thermospheric dynamics.

The time period for these observations will be centered on the CADITS and SUNDIAL campaign in the spring of 1991. Other twilight observing groups are invited to join in this campaign or subsequent ones; the following campaign is scheduled for January 1992. Several modelers will be involved with the data interpretation, including S. Soloman of the University of Colorado and R. Link of the University of California, Berkeley.

Beyond these three major areas of investigation—all of which support any CEDAR efforts and campaigns—several other campaigns have been carried out by University of Alaska scientists [E. Wescott and H. Nielsen] and USU scientists [F. T. Berkey and G. S. Stiles] in conjunction with the ACTIVE satellite. Future ones are planned for the UARS satellite.

To conclude: we have established the Bear Lake Observatory, observations are being carried out, and the first scientific paper is in press. This coming year will see the development of our data-reduction capability and the installation of more instruments. Still, the observatory is in its formative stages. Recognizing this, we request that those investigators who have an instrument that would strengthen its capabilities, have experiments they would like to see performed there, or who simply wish to participate in the research, please contact the authors.

Vincent B. Wickwar and Kay D. Baker
Utah State University
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CSSC Endorses EHL Observatory Concept

During the past two years an international group of researchers, under the leadership of Mike Kelley from Cornell, has been exploring the scientific merits of developing a new state-of-the-art atmospheric observatory at extra-high latitudes in the northern hemisphere. The centerpiece of the observatory is a large radar facility designed to study processes in the troposphere up into the magnetosphere. The observatory is envisioned to also include many of the Class I optical instruments currently being developed under the CEDAR initiative. An intensive workshop was held last fall at Cornell to clarify the scientific rationale for the observatory and to determine the technology challenges involved in building the facility. A detailed report on the EHL observatory has been prepared, and copies can be obtained from Mike Kelley. The EHL observatory was discussed by the CEDAR Science Steering Committee at the June workshop. To the right is a letter drafted by the committee to Dr. Gene Bierly, director of the Atmospheric Science Division at NSF, which enthusiastically endorses the EHL observatory concept.

June 18, 1990

Dr. E. W. Bierly
Division of Atmospheric Sciences
NSF
1800 G Street, N.W.
Washington, D.C. 20550

Dear Gene,

Studies conducted under the NSF Coupling, Energetics and Dynamics of Atmospheric Regions (CEDAR) program indicate that a major limitation in our understanding of the structure and dynamics of the earth's upper atmosphere is the paucity of plasma and neutral observations in the polar cap. The energy deposited in this region plays the key role in coupling the solar wind with the earth's magnetosphere, ionosphere, and thermosphere. Furthermore, observations in the polar cap are crucial for timely monitoring of global change effects in the middle and lower atmosphere.

To rectify this deficiency in our observational program an ad-hoc group of scientists led by Professor Michael Kelley of Cornell University has proposed the development of an observatory in the polar cap which would include modern optical and radar instruments. Such a facility would be complemented by the on-going efforts of Canadian scientists in the Arctic Circle. A Polar Cap Observatory would also serve to complete the chain of observatories presently supported under the NSF Upper Atmosphere Facilities Program, and would be the apex of several other chains at other longitudes.

Development of the Polar Cap Observatory will help return U.S. ground-based instrumentation technology to a more competitive position in the international community and will vastly increase educational opportunities for students in the atmospheric sciences into the next century. A report describing the science rationale for the Polar Cap Observatory and a conceptual development plan has been prepared under the leadership of Professor Kelley. The report will be transmitted to you by Professor Kelley in the near future.

The CEDAR Science Steering Committee strongly endorses the Polar Cap Observatory concept.

Sincerely,

Chester S. Gardner
Chairman, CEDAR Science Steering Committee

6th Annual CEDAR Workshop Scheduled for 17–21 June, 1991

The 6th Annual CEDAR Workshop will be held at the National Institute of Standards and Technology (NIST) and at the National Center for Atmospheric Research (NCAR) in Boulder, Colorado, from Monday, June 17, through Friday, June 21, 1991. The workshop committee will be chaired by Bela Fejer and also includes Roger Smith, Odile de la Beaujardiere, and Barbara Emery. Specific information about the 6th CEDAR Workshop will be distributed by the committee in December; agenda and housing information will be included in the spring issue of the *Cedar Post*. The format will be similar to past years with tutorials, a poster session, and workshops. Students receiving NSF travel support are expected to arrive in Boulder on Saturday, June 15, to obtain less expensive air fares.

CEDAR T-Shirts

There are still some T-shirts left from the fifth CEDAR workshop in June 1990. They are blue, one small and two medium. The price is $8 each. Contact Nelly de Maldonado (University of Michigan, Space Physics Research Laboratory, 2455 Hayward, Ann Arbor, MI 48109-2143, 313-747-3425, FAX 313-763-0437, sprla::nelly) if you want one.

Student Travel Opportunities

NSF plans to make student travel funds available to the atmospheric facilities at Jicamarca, Peru, and Sondrestrom, Greenland. Students (and other researchers) associated with an approved research project are already eligible for travel subsidies to go to the Arecibo Observatory in Arecibo, Puerto Rico.

Under this new plan, a student must submit a one-page description of the research he or she plans to carry out to either:

(1) Dr. Donald Farley of Cornell University if the research is to be done at Jicamarca; or (2) Dr. John Kelly of SRI if the research is to be done at Sondrestrom. If the research is approved, travel arrangements and associated expenses will be covered by either Cornell or SRI up to $2,000 per student per trip.

The funds for this effort should be in place by January 1, 1991.

FY90 CEDAR Awards

Nineteen new projects totaling $1.5 million were funded under the CEDAR initiative for the 1990 fiscal year. The titles and coinvestigators of the new projects are listed below.

Sunspot Maximum High Latitude Plasma Structure (HLPS) Campaigns
Co-PIs: S. Basu and C. Valladares

Proposal to Continue Upgrading the Facilities at the Jicamarca Radio Observatory
PI: D. Farley

CEDAR Postdoctoral Fellowship
PI: D. Farley

Interferometer Measurements at the Magnetic Equator in Peru
PI: B. Fejer

CEDAR Studies of the Dynamics and Coupling of the Mid-Latitude Thermosphere and Ionosphere
PI: J. Foster

CEDAR Analysis of Coupled Mid-Latitude Upper Atmospheric Regions During Geomagnetic Storms
Co-PIs: J. Foster and M. Buonsanto

Coordinated Analysis of the Thermosphere
Co-PIs: J. Foster and M. Hagan

CEDAR Optical Facility at Millstone Hill
Co-PIs: J. Foster and D. Sipler

Na Temperature Lidar Development and Operation
PI: C. Gardner

Development of a Next-Generation CEDAR Data Acquisition and Analysis System
Co-PIs: J. Holt and D. Tetenbaum

Mid-Latitude Long-Term Mesospheric and Lower Thermospheric Dynamics Measurements Using a Fabry-Perot Interferometer
Co-PIs: T. Killeen and R. Niciejewski

Coordination of Wags-4 Campaign: Planning, Observation, and Data Analysis
Co-PIs: C. Liu and R. Hunsucker

Aeronomical Spectroscopy in the Ultraviolet at Söndre Strömfjord, Greenland
Co-PIs: R. Niciejewski and S. Solomon

Plasma Line at Sondrestrom
Co-PIs: Showen and J. Vickrey

Joint Radar and Optical Investigations of Auroral Processes Over Söndre Strömfjord
PI: G. Sivjee

Auroral Emissions Modeling
PI: S. Solomon

ALTAIR Radar Investigations of Equatorial Electrodynamics and Plasma Structure
PI: R. Tsunoda

An Intensive Study of the Dynamics of the Low-Latitude Mesosphere Using Measurements of the Aida Campaign: Analysis and Theory
Co-PIs: R. Walterscheid and G. Adams

Hardware Ranch Observatory—A Mid-Latitude CEDAR Facility for Studies of the Middle and Upper Atmosphere Using Optical and Radio Techniques
PI: V. Wickwar

New CEDAR Science Steering Committee Members Begin Three-Year Terms

The CEDAR Program was initiated in 1985 as the successor to the Ground Based Optical Aeronomy Program (GBOA) and is now part of the NSF Global Change Program. Its general mission is to promote collaborative research programs and to facilitate the development of modern observational capabilities to investigate the composition, dynamics, and coupling mechanisms of the middle and upper atmosphere. Coordination of the CEDAR Program and the organization of the annual workshop is the responsibility of the CEDAR Science Steering Committee. The CSSC includes nine scientists who serve staggered three-year terms. The NSF program directors for aeronomy and for upper atmosphere facilities serve as ex officio members. At the conclusion of this year's workshop Mike Mendillo, Joe Salah, and Tim Killeen completed their terms on the committee. All three provided exceptional leadership for which we are very appreciative. Their collective insight, wisdom, and experience have been very important in helping shape the CEDAR Program during the past three years. We would like to extend a special thanks to Tim Killeen for his outstanding service as CSSC chairman during the past two years.

The CEDAR Program is fortunate to have well-qualified replacements for Mike, Joe, and Tim. Odile de la Beaujardiere from SRI International, Mike Kelley from Cornell University, and Roger Smith from the University of Alaska are the new CSSC members who began their terms in June at the annual workshop. Listed below and on the back page are the names and addresses of the CSSC members for 1990–91.

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NSF/CEDAR Postdoctoral Fellowship Application Deadline

Applications for CEDAR Postdoctoral Fellowships are due at NSF on February 1, 1991. Fellowships are available for CEDAR-related studies to be conducted at the NCAR High Altitude Observatory and for studies to be conducted at other research laboratories in the United States and Puerto Rico that are involved in CEDAR activities. Application information can be obtained from Drs. Richard Behnke (202-357-7390) and Fred Roesler (202-357-7619) at the National Science Foundation, 1800 G Street, N.W.,Washington, D.C. 20550.

The Cedar Post is published quarterly and mailed to more than 800 scientists worldwide.
C. S. Gardner, Editor. Sharon Michelove, Associate Editor. R. Maul, Designer.

The Cedar Post

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Address correction requested.