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CEDAR-Supported Lidar Facilities

Lidar techniques for studying mesospheric chemistry and dynamics are increasingly being applied to CEDAR scientific investigations. Over the past five years, CEDAR has supported a variety of lidar systems at strategic locations throughout the Western Hemisphere. Lidars operate on the same principle as radars except that they transmit optical frequencies, have higher spatial resolution, and receive backscattered signals from neutral species either through Rayleigh/Mie or resonant scattering. This permits measurements in the radar-blind altitudes (25 - 60 km). A comparison of radar and lidar methodologies was presented by Paul Castleberg and Mike Kelley in the February 1994 issue of *The CEDAR Post*.

Lidar systems consist of lasers that produce transmitted pulses at desired frequencies, a telescope for detecting the backscatter return signals, and receiver channels that allow quantitative measurement of the atmospheric properties. Information about currently operating lidars funded by CEDAR is provided in the table on pages 4 and 5. CEDAR lidar systems have been deployed at low, middle and high latitudes. They include two types: Rayleigh/Mie and resonance lidars.

Rayleigh/Mie lidars have the capability of measuring the density, temperature, and motion of the neutral atmosphere, via Rayleigh scattering from air molecules, up to about 80 km altitude depending on the sensitivity of the system. Temperature is determined from the measured air density profile by assuming hydrostatic equilibrium, local thermal equilibrium, and a standard temperature at a selected altitude, usually the highest altitude of the measured range. To determine the line-of-sight wind velocity a narrowband, frequency-stabilized laser is used and the frequency shift between the transmitted and returned light is measured with a Fabry-Perot interferometer (FPI). In practice, the laser frequency and FPI may drift and the required reference of zero-frequency shift can only be determined experimentally by pointing the lidar to the zenith and assuming that the vertical component of the wind is zero. Rayleigh winds determined in this manner with a pointable system are referred to in the table as 2D. Mie scattering from a Rayleigh/Mie lidar allows detection of aerosols and clouds (including Polar Stratospheric Clouds and Noctilucent Clouds). To characterize

(continued on pg. 2)

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Lidar Facilities *(continued from pg. 1)*

these particles more fully, polarization analysis and/or multiple wavelengths are often used. In this case, a broadband receiver is adequate, although a Daystar filter and FPI are required for daytime observation.

Resonant scatter lidars measure the density, temperature, and motion of metallic atoms (in principle, ions as well) in the altitude range from 80 to 105 km altitude. The temperature and motion of the metallic atoms at these altitudes is assumed to be the same as that of the neutral air. The ability to measure winds and temperature with a resonance lidar system requires a tunable narrowband lidar transmitter whose frequency can be tuned to two or three pre-selected values in a matter of a few seconds. In the table, the wind measurement capabilities are referred to as either 1D or 3D. The ability to measure the three-dimensional wind vector requires a system that can be pointed to three different directions in an appropriate time interval, usually a few minutes or less.

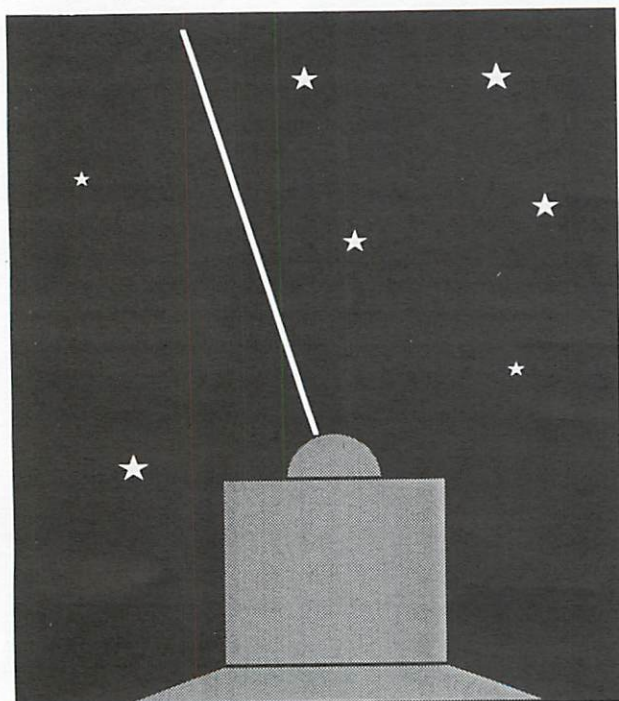
The accompanying table (*see pgs. 4-5*) also contains a list of lidar systems currently under development. In some cases these are new systems, while in other cases they indicate upgrades to existing systems. The new lidar systems generally strive for greater sensitivity, portability, simplicity, reduced cost, or tunability. Two systems based on Alexandrite lasers are currently in development. The Alexandrite systems are tunable to resonant frequencies of several metallic elements of aeronomic interest, including sodium, potassium, iron and calcium. The Alexandrite system does not require the use of dyes which makes it less hazardous and more easily deployed at remote sites.

The network of CEDAR lidars will provide data for both short-term campaigns and long-term climatological studies. Data from lidar systems supported by CEDAR are expected to be submitted to the CEDAR database in a timely fashion. As lidar systems become more portable and their cost decreases, the lidar network will undoubtedly grow to include strategic locations worldwide. For more detailed information about these lidar systems and the data they obtain, please contact the PI's listed in the table.

R. M. Robinson and C. Y. She

Dr. Jirong Yu Receives 1994 Allen Prize

The Optical Society of America (OSA) recently recognized the significance of a CEDAR lidar observation project by awarding the 1994 Allen Prize to Jirong Yu. The Allen Prize is presented each year to a person who, as a graduate student, made outstanding contributions to atmospheric remote sensing through the use of electro-optical instrumentation, for conceiving and developing unique devices or a new measurement technique, or for perceptive analysis of data. Yu was recognized for his Ph.D. research at Colorado State University on the world's first use of a two-frequency, sodium lidar to observe the thermal structure of the midlatitude mesopause. At present Yu is a post doctoral fellow at the University of Illinois.



At the end of each year, OSA publishes a collection of short articles featuring principal advances in the field of optics that year. The Colorado State lidar observation project (sponsored by the NSF CEDAR program) was also recognized in an article entitled "New lidar reveals seasonal temperature variations in a midlatitude mesopause region," published in the December, 1994 issue of the *Optics and Photonics News* (p. 23-24).

C. Y. She, Colorado State University

CEDAR/GEM/SUNRISE Space Weather Project

During the 1994 December AGU meeting, a GEM Steering Committee Meeting was held, and attended by Jeff Forbes in his ex-officio capacity as Chairman of the CEDAR Science Steering Committee, and by all the NSF Upper Atmosphere Section program directors. There it was decided, given the new initiative in "space weather" and indeed in the interest of good science, that we ought to examine one or more major solar-terrestrial interaction events as a combined community (encompassing CEDAR/aeronomy, GEM/magnetosphere, and SUNRISE/solar), tracing the event from the sun, through the solar wind and magnetosphere, and into the thermosphere/ionosphere system. We thought the best approach would be a series of joint workshops and AGU sessions, and that coordination of these activities should be accomplished through a steering committee.

An interdisciplinary committee, chaired by Dr. Delores Knipp, was formed:

M. Buonsanto (ionosphere/thermosphere)

D. Knipp (ionosphere/magnetosphere/AMIE)

L. Weiss (solar wind)

J. Hughes (GEM liaison)

J. Forbes (CEDAR liaison)

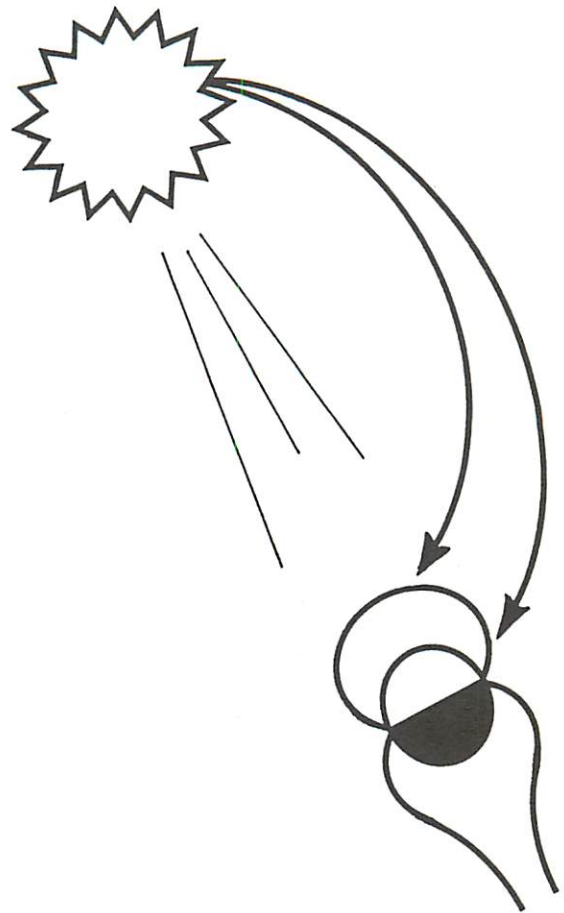
The first charge of this committee was to choose a few solar-terrestrial events that meet the various diverse needs of the scientific groups. One such event from the CEDAR perspective is described in the accompanying piece by Delores Knipp and Michael Buonsanto.

Jeff Forbes and Jeff Hughes

A POSSIBLE NATIONAL SPACE WEATHER-CEDAR STORM STUDY EVENT

The CEDAR community has a unique and challenging opportunity to become immediately involved in the National Space Weather Initiative. A solar wind event on 3-4 Nov 1993 appears to offer the possibility for multi-instrument study of its effects throughout the solar-terrestrial system. The event is likely to be designated as a CEDAR Storm study event. Preliminary information on the event and its effects follows:

Basic Event Description: The event was part of a 27-day, recurring, high speed stream. The shock associated with the event impacted the magnetosphere early on 3 Nov. A high density feature within the stream caused major ionospheric and magnetospheric responses shortly after 2300 UT on 3 Nov 93. A Storm Sudden Commencement has been identified in the World Data Center event listing. Shortly after 2300 UT on 3 Nov 93, sudden increases in solar wind velocity and density were recorded at IMP-8. The Ap maximum for the event was 78 and the DST minimum was -105.



Preliminary Geophysical Results: DMSP ion drift data clearly show the convection enhancement associated with the event. The SAMPEX magnetospheric satellite indicated flux dropouts at $L > 4$ accompanied by energetic particle population enhancements at or near $L=2$. The Millstone Hill Radar saw the ionospheric F region lift at $L < 4$ by nearly 100 km for a short time.

Possible Data Sources to Support This Study: On a preliminary basis we know that IMP-8, SAMPEX and GEOTAIL have some supporting data. Three DMSP satellites with orbits near 840 km have ion drift meter and retarding potential analyzer data (and are likely to have particle data). The Millstone Hill Radar was taking data, although this was not a designated World Day. Three Ionospheric Tomography chains were also operating during the event. The NOAA-12 and FREJA satellites were operating (data quality and availability are to be determined). GOES Geo-Synchronous data are available.

We are looking for ways to make this a truly large-scale study event, possibly modeling all the way from the Sun down to the thermosphere and thereby involving the solar and GEM communities as well. If you wish to be a participant in this study in terms of data provision or modeling, please contact either **Delores Knipp** at knipp@ncar.ucar.edu or **Michael Buonsanto** at mjb@oceanus.haystack.edu. More information will follow in generic CEDAR emailings.

Delores Knipp and Michael Buonsanto

Currently Operating Lidar Systems

<u>PI</u>	<u>Institution</u>	<u>Lidar Location</u>	<u>Lidar Type</u>	<u>Wavelength</u>
Gardner	U. of Illinois	Illinois/New Mexico	Narrowband Na Res. (3)	589 nm
Papen	U. of Illinois	South Pole	Broadband Na Res. (2) Rayleigh/Mie/Raman (1)	589 nm 1064/532 nm
She	Colorado State U.	Ft. Collins, CO	Narrowband Na Res. (3)	589 nm
Tepley	Cornell U.	Arecibo, P.R.	Rayleigh/Mie (1)	532 nm
Thayer	SRI Internat'l	Kangerlussuaq	Rayleigh/Mie (1)	532 nm
Wickwar/ Meriwether/ Wilkerson	Consortium *	Logan, Utah	Rayleigh/Mie/Raman (1)	532 nm

Lidar Systems under Development

<u>PI</u>	<u>Institution</u>	<u>Lidar Location</u>	<u>Lidar Type</u>	<u>Wavelength</u>
Collins	U. of Alaska	Poker Flat, AK	Broadband Res. (7)	589 nm
Kane	Penn State	TBD	Broadband Res. (5)	Tunable
Moosmuller/She	U. of Nev./CSU	Ft. Collins, CO	Narrowband Na Res. (6)	589 nm
Tepley	Cornell U.	Arecibo, P.R.	Narrowband Res. (4)	Tunable
Wickwar/ Meriwether/ Wilkerson	Consortium *	Logan, Utah	Narrowband Res. (4)	Tunable

- (1) Doubled Yag laser at 1064 nm and/or its second harmonic at 532 nm
 (2) Dye laser pumped doubled Yag laser
 (3) Narrow band CW dye laser amplified by doubled Yag pumped, pulsed dye amplifier
 (4) Alexandrite ring laser tuned to various frequencies to match metal resonances
 by Raman conversion and/or second harmonic generation

Currently Operating Lidar Systems

<u>Scatterer</u>	<u>Measurements</u>	<u>Receiver Type</u>	<u>Comments</u>
Sodium	Temp., 3D winds, Na density	Broadband	Presently at Starfire Optical Range; Previously operated at Haleakala and U. of Illinois
Sodium Air/Aerosols	Na Density Density	Broadband	Funded by NSF Polar Programs; Day/Night Capabilities; 4-channel receiver for aerosol and PSC measurements
Sodium	Temp., 1D winds, Na density	Broadband	
Air/Aerosols	Density, temp., 2D winds	FPI	
Air/Aerosols	Density, temp.	FPI	ANLC detection capability; Day/Night capability
Air/Aerosols	Density, temp.	Broadband	New pointing telescope system under construction

Lidar Systems under Development

<u>Scatterer</u>	<u>Measurements</u>	<u>Receiver Type</u>	<u>Comments</u>
Sodium	Density	FPI	Previously operated at South Pole; Day/Night capabilities; also measures scattering from air/aerosols
Metallics	Density	Broadband	Possible sites: Alaska, Arecibo; Previously operated on NCAR aircraft
Sodium	Temp., 3D winds, Na density	Broadband	Day/Night capabilities
Metallics	Density, temp., 3D winds	Broadband	
Metallics	Density, temp., 3D winds	Broadband	

(5) Excimer-pumped tunable broadband dye laser

(6) Sum-frequency generation of CW laser light at 589 nm followed by a pulsed dye amplifier

(7) Flashlight-pumped dye laser

* Consortium: Utah State University, Clemson University, and University of Maryland

1995 Annual CEDAR Meeting Plans

The international IUGG/IAGA meeting follows the CEDAR Workshop this year, which means that we will not be able to stay in the university dormitories past Thursday night on June 29. If you are staying on for the IUGG/IAGA meeting, your dorm room will probably be moved on Friday, June 30. CEDAR Workshops and registration will start on Sunday afternoon (June 25), with the regular reception at the NCAR Mesa on Sunday evening. The workshops will end on Friday afternoon. Since the university is booked, the morning plenary sessions on Monday, Tuesday, and Thursday will be held at the National Institute of Standards and Technology (NIST), while the workshop sessions will be held concurrently at the NCAR Mesa Lab and at NIST. The two poster sessions are scheduled for late afternoon, Monday and Wednesday, at the Mesa, and the buffet will be held Wednesday, June 28, at the Tree Plaza, NCAR Mesa Lab. There will probably be buses between NIST or the dormitories and the Mesa. Any alcohol at the reception and buffet will come from voluntary contributions sent in with the registration form.

Barbara Emery, NCAR

FY 96 CEDAR Competition

The deadline for submission of proposals for FY 96 CEDAR funding is May 1, 1995. This is a general CEDAR competition for scientific studies based on theory, modeling, and data analysis, as well as instrument development, operation, and upgrades. However, proposers should note that Phase III CEDAR objectives emphasize strong scientific thrusts with existing facilities and instruments. Instructions for proposal submission are contained in the Grant Proposal Guide (NSF Publication 94-2). To expedite the handling of new proposals, we ask that you submit separately an information copy of your proposal directly to Dr. Sunanda Basu, National Science Foundation, Rm. 775, 4201 Wilson Blvd., Arlington, VA 22230.

NOTE: In the past, applications for the CEDAR post-doctoral awards have been solicited with a different deadline from proposals submitted for the normal CEDAR competition, and the selection of CEDAR Post-doctoral awards has been conducted independently of the other proposals. In fact, both types of awards are made using the same funds. To comply with NSF regulations, the proposals recently submitted for CEDAR post-doc awards will be held for evaluation with the proposals submitted for the FY96 CEDAR competition. We will contact all post-doc applicants about any further requirements imposed by this change.

Bob Robinson, NSF

FY 94 CEDAR Research Competition

Below is a list of CEDAR awards granted with FY 94 funds. This CEDAR competition was restricted to instrumentation development and upgrades. Nine awards were made with an average grant size of about \$120K. Results of the FY 95 CEDAR competition will be announced at the next CEDAR Workshop in June, 1995.

Proposals recommended for funding:

Ben Balsley - University of Colorado

Modification of Jicamarca for Continuous, Low-Power Operation: The JULIA System

Timothy Killeen - University of Michigan

A Complement of Optical Instruments for the Polar Cap Observatory

Michael Mendillo - Boston University

Optical Tomographic Imaging Facility

Hans Moosmuller - University of Nevada

Approaching "Ultimate" Lidar for Temperature and Wind Measurements in the Mesopause Region

Chiao-Yao She - Colorado State University

Approaching "Ultimate" Lidar for Temperature and Wind Measurements in the Mesopause Region

Gulamabas Sivjee - Embry-Riddle University

Class I Imaging Spectroscopic Facility for Optical Remote Sensing of Airglow and Auroral Processes in the Polar Middle Atmosphere and Thermosphere

FY94 CEDAR Competition Results (New Technology Initiative)

Number of proposals submitted: 33

Total requested for FY94: \$6M

Total funds available: \$1.1M

Number of proposals recommended: 9

Michael Taylor - Utah State University

A Two-Dimensional Temperature Mapper for Short Period Mesospheric Gravity Wave Measurements

Vincent Wickwar - Utah State University

Resonance Lidar to Study the Upper Mesosphere and Lower Thermosphere

Supplements to existing awards

Craig Tepley - Resonance Lidar Studies at the Arecibo Observatory

(Supplement to Cooperative Agreement to National Astronomy and Ionosphere Center, Cornell University, PI: Paul Goldsmith)

Bob Robinson, NSF

1995 Annual CEDAR Meeting Workshop Requests

As in previous years, a significant fraction of the Annual CEDAR Meeting, June 26-30, 1995, will be devoted to workshops. At the 1994 meeting we had approximately 30 individual workshops distributed over five afternoons with attendance ranging from several tens to over a hundred people, depending on the topic.

Those wishing to organize a workshop at the 1995 Annual CEDAR Meeting should make a request as soon as possible but no later than March 31, 1995. Please submit a workshop title and a brief summary of the workshop topic to:

M. F. Larsen
Dept. of Physics
Clemson University
Clemson, SC 29634

The material can be submitted via e-mail to mlarsen@hubcap.clemson.edu or by fax to 1-803-656-0805. I can be reached by phone at 1-803-656-5309 if there are questions that require an immediate reply.

If you held a similar workshop last year and can provide an estimate of the expected attendance based on past experience it would be helpful in the preliminary planning phase. Information provided by the workshop organizers about potential conflicts with other workshops would also be appreciated.

M.F. Larsen, Clemson University

Imaging Riometer at Kilpisjarvi, Finland

We have recently commissioned an imaging riometer at Kilpisjarvi, Finland, not far from EISCAT. I would therefore like to be included in future CEDAR campaigns. The data will give details on the auroral absorption in time and space, related to the structure and dynamics of energetic electron precipitation.

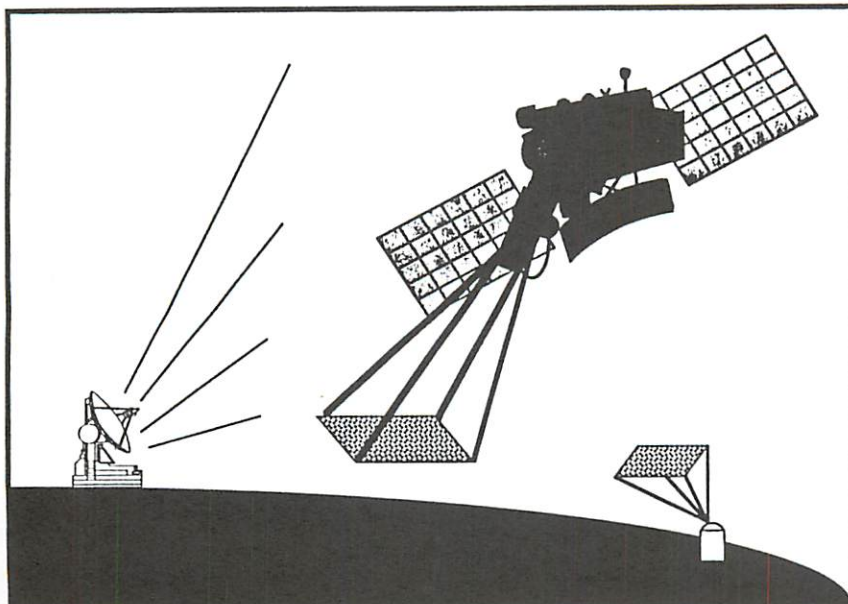
John Hargreaves, University of Lancaster
Hargreaves@lancaster.ac.uk

MSX SPIRIT III Launch Update

The Midcourse Space Experiment (MSX) SPIRIT III sensor (see *STEP International*, Vol. 3, No. 10, October 1993 and *The Journal of Spacecraft and Rockets*, October 1994) is currently scheduled for launch on May 20, 1995.

MSX is a U.S. Ballistic Missile Defense Organization (BMDO) project that offers major opportunities for detailed investigation of the composition and dynamics of the Earth's middle and upper atmosphere. The MSX Program Manager is Lt. Col. Bruce Guilmain; the technical director is John Mill; and the principal investigators for the atmospheric background experiments are Robert O'Neil (Air Force Phillips Laboratory) and Gerry Romick (Applied Physics Laboratory). The spacecraft features an advanced set of multi-spectral imagers capable of gathering data on atmospheric phenomena in limb and nadir pointing modes. MSX will be launched into a high-inclination (99.16 degrees), sun-synchronous orbit at 898 km. The operational lifetime for UV, visible, and other instruments, is estimated to be 5 years.

There had been an ongoing effort to coordinate MSX observations with ground-based observations from such programs as the Geospace Environment Modeling (GEM) and Coupling, Energetics, and Dynamics of Atmospheric Regions (CEDAR). The atmospheric measurements, coordinated with ground-based sensors, will now concentrate on high-latitude noctilucent cloud/polar mesospheric clouds measurements, Southern Hemisphere auroral measurements, and mid- and low-latitude airglow measurements. High-latitude Northern Hemisphere auroral-Joule heating measurements will take place during the winter of 1995/1996.



In light of the rescheduled launch date from November 1994 to May 1995, we would like to receive updated/additional information concerning ground-based observations. Please send the following information so that we can plan sites and times of conjunctions for joint satellite/ground-based observations: name, address, telephone number, e-mail address, topic of interest, plans for 1995-1999, instruments and locations (if applicable), and other involvement (e.g., data analysis, modeling, theory). Information should be sent to Mike Taylor at e-mail: taylor@zeus.sdl.usu.edu; phone: (801) 797-3919; FAX: (801) 797-4044.

Mike Taylor, Utah State U.

New Program Director for Solar-Terrestrial Research at NSF

DESIGN COMPETITION for CEDAR T-Shirts and Mugs

CEDAR T-shirts and Mugs will be available for sale at the June 1995 CEDAR Workshop, with a completely new CEDAR design, yet to be determined.

If you would like to enter a candidate design into the competition, forward it to
Prof. John Sahr
Dept. of Electrical Engineering
Building FT-10
Seattle, WA 98195
FAX: 206-543-3842
email:
jdsahr@ee.washington.edu
Designs may have
two to four colors.
Deadline is April 1, 1995.

The new Program Director for Solar-Terrestrial Research at NSF is David Sime. He arrived in April 1994 from HAO, where he had been in the coronal and interplanetary physics section, working on observation and interpretation of the structure and evolution of the solar corona. Since his graduate school days at UCSD, he has been involved in interplanetary scintillations, radi-, visible-, and x-ray observations of the sun and corona, and the relationship of the interplanetary medium to the Sun and to the Earth. He spent a year at ETH in Zurich and subsequently has participated in various phases of several NASA missions. His experience includes instrument development for both ground-base and orbiting platforms as well as being the project scientist for the Mauna Loa Solar Observatory.

CORRECTION

Dr. Cassandra Fesen's address:
Dept. of Physics & Astronomy
6127 Wilder
Dartmouth College
Hanover, NH 03755-3528
Phone: 603-646-3629

Nominations Requested for the 1995 CEDAR Prize Lecture

The CEDAR Prize Lecture was established in 1989 to recognize outstanding scientific contributions to the CEDAR Program. Selection is based upon a research paper either presented, submitted, or published during the past year. The candidate will present a special 30-minute lecture at the 1995 CEDAR Meeting. Previous CEDAR prize lecturers are:

- 1989 - Art Richmond, *Assimilative Mapping of Ionospheric Electrodynamics*
- 1990 - Michael Mendillo, *The Discovery of a Sodium Magneto-Nebula around Jupiter*
- 1991 - Craig Heinselman, *Sondrestrom MUSCOX - Capabilities and New Results*
- 1992 - Colin Hines, *The Doppler Spreading Theory of Gravity Wave Spectra*
- 1993 - John Cho, *Radar Scattering from the Coldest Place in Our Atmosphere: Polar Mesosphere Summer Echoes*
- 1994 - Raymond Roble, *Modeling the Circulation, Temperature, and Compositional Structure of the Upper Atmosphere (30-500 Km)*

Nominations for this year should be submitted by **April 1** to:

Dr. Jeffrey Forbes
Department of Aerospace Engineering Sciences
University of Colorado
Boulder, CO 80309-0429
Phone: (303) 492-4359; Fax: (303) 492-7881
e-mail: forbes@zeke.colorado.edu

Barbara Emery, NCAR

CEDAR Post-doctoral Awards

We congratulate two recent graduates who were selected to receive CEDAR post-doctoral awards for two years: **Dr. Wei Deng** and **Dr. Susan Nossal**.

Dr. Wei Deng received his Ph.D. in Atmospheric Science from the University of Michigan in April, 1994. His thesis advisor was Dr. Timothy Killeen, and his graduate research focused on thermospheric modeling and high latitude electrodynamics. Dr. Deng will perform his CEDAR post-doctoral research at MIT Haystack Observatory where he will study lower thermosphere dynamics using data from the Millstone Hill Incoherent Scatter Radar.

Dr. Susan Nossal received her Ph.D. from the University of Wisconsin in May, 1994. Her advisor was Dr. Fred Roesler and her thesis work involved Fabry-Perot observations of geocoronal hydrogen Balmer-alpha emissions. She will perform her post-doctoral research at Arecibo Observatory and at the National Center of Atmospheric Research, where she will study the atmospheric hydrogen cycle with emphasis on long-term effects such as the dependence on greenhouse gas concentrations.

Bob Robinson, NSF

CEDAR Chips

CEDAR, GEM Science Steering Committees Linked
Jeffrey Hughes, Chair, GEM Science Steering Committee (GSSC), accepted an invitation from the CEDAR Science Steering Committee (CSSC) to serve as an ex-officio member. Jeffrey Forbes, Chair of the CSSC, accepted an invitation to serve as an ex-officio member of the GSSC. The purpose of these appointments is to facilitate communications and collaborations between the CEDAR and GEM communities. An initial result of this "connection" is the joint CEDAR/GEM Space Weather Project, described in the article by Dr. Delores Knipp (*see pg. 3*).

Lower Thermosphere Coupling Study Lives On
The Lower Thermosphere Coupling Study (LTCS) Project of the CEDAR Program is now coordinated by Dr. Cassandra Fesen (fesen@tides.dartmouth.edu) and Dr. Roberta Johnson (rjohnson@sprla.sprl.umich.edu). One of their first initiatives was organizing the workshop on the January 20-30, 1993, "10-day campaign." Some preliminary results and future projects to emerge from this highly successful workshop are described in this issue of the Post (*see pg. 10*).

Graduate Student Fellowships to Work with the CEDAR Database

Again this year, there is an opportunity available for two graduate students to work intensively with the CEDAR Database around the time of the 1995 CEDAR Workshop. We anticipate that they would arrive a week early on Sunday, June 18, work on workstations with Database personnel before the Workshop, and attend the Workshop the following week. Recipients will have their dormitory rooms paid for the entire time, and receive an extra \$26/day for the extra time they are in Boulder. The NCAR shuttle service can get them from campus to Foothills or the Mesa Lab. Only students with some significant database project will be considered, and students will be selected from different institutions in order to spread their knowledge around. A sample application form follows. Please include this information in your application. The selection committee will consist of some members of the CEDAR Steering Committee and some members of the CEDAR Database. Applications are due in by **April 30**, and the selection will be made by **May 9**. Applications can be mailed, FAXed, or e-mailed to Dr. Barbara Emery at the address

listed on the registration form (*pg. 13*). If e-mailed, the advisor approval and statement of support can be sent in separately via e-mail or otherwise.

Sample Application to Use the CEDAR Database June 19-30, 1995

Name:
Institution Address:
E-mail Address:
Graduate Advisor:
Expected degree and date of graduation:
Expected CEDAR Database project:
(i.e., Need data from instruments or models....
Need to select parameters....
Project about
Expected benefits)
Advisor approval and statement of support.

Barbara Emery, NCAR

The January 1993 10-Day Campaign: Workshop Summary

A workshop focusing on the January 1993 10-day World Day campaign was held in Boulder, Colorado on January 8-10, 1995. Forty participants attended some or all of the workshop, which was funded by the National Science Foundation. The workshop benefited immensely from the large proportion of non-U.S. attendees: eight scientists from Canada, Europe, and Japan participated in the proceedings.

The workshop began Sunday afternoon at the Boulderado Hotel with presentations of data obtained during the campaign. The sessions continued on Monday and Tuesday at the NCAR Foothills Laboratory. Following reports from modeling groups interested in supporting the data analysis, the participants identified five major areas of scientific interest and broke into working groups to discuss how best to facilitate studies in these areas. The five working groups that evolved from the workshop discussions are listed below, along with their selected study topics and participating scientists:

- (1) **the planetary waves and tidal waves working group.** Study areas: global specification of planetary waves and tides during the 10-day campaign; tidal variability; vertical winds; electron density profiles; E-region ion-neutral collision frequencies and neutral densities; global response to disturbances during the campaign. Participants include: J. Salah, W. Deng, R. Johnson, R. Clark, C. Meek, W. Ward, T. Virdi, S. Palo, R. Roble, C. Fesen, J. Forbes, Q. Zhou, J. Lilensten, S. Franke, D. McEwen, J. Scali, M. Hagan, J. Chang, D. Rigglin, I. Azeem.
- (2) **gravity wave working group.** Study areas: tidal ion layers/gravity wave interactions; sporadic E and gravity wave influence and/or interaction; short period waves and turbulence. Participants include M. Hickey, M. Taylor, M. Kelley, P. Franke, T. Nakamura, J. Lilensten, W. Swartz, Q. Zhou, W. Ward, and C. Miller.
- (3) **disturbances.** Study areas: positive storm phase in electron densities at Millstone Hill on 26 January; comparisons of hmax and 300-km electron densities, neutral and ion winds, neutral and ion densities. Models to be exercised are the NCAR TIMGCM, TIEGCM and AMIE models, the SEL CTIM and the UAH FLIP model, and possibly the USU TDIM. Participants include B. Emery, P. Collis, M. Buonsanto, M. Codrescu, W. Swartz, A. Aylward, and C. Fesen.
- (4) **electrodynamics.** Study areas: improved specification of high latitude convection; specification of neutral winds and ion drifts at mid- to low latitudes; specification of field-aligned fluxes and vertical fluxes of heat and mass, including knowledge of density, temperature, and velocity. Participants include: R. Heelis, J. Scali, M. Buonsanto, C. Miller, T. Virdi, B. Fejer, D. Melendez, C. Fesen, G. Crowley, R. Roble, T. Fuller-Rowell, M. Codrescu, and A. Aylward.
- (5) **high latitude neutral structure.** Emphasis on neutral density cells at high latitudes; altitudes of interest range from 120-350 km. Study areas: validate mechanisms and morphology of high latitude neutral density cells, involving analysis of wind, temperature, and green line emission observations; investigate cell dependence on IMF By and Bz; validate the TIEGCM. Participants include: G. Crowley, A. Aylward, J. Lilensten, W. Ward, D. McEwen, J. Schoendorf, M. Codrescu, M. Buonsanto, J. Thayer, B. Emery, and R. Roble.

Each group identified specific tasks to be accomplished and will provide progress reports at the annual CEDAR meeting in June. The working groups are most definitely not static, either in membership or in topics to be investigated. Undoubtedly new science questions will be added as the studies progress. Each group would gladly welcome additional participants and encourages interested persons to contact anyone in the group to discuss possible contributions, collaborations or additional science projects.

Cassandra Fesen, Dartmouth College

CEDAR Database Committee

At the November 3, 1994, meeting of the CEDAR Science Steering Committee, the CEDAR Database Committee was formed with Dr. John Holt, MIT Haystack Observatory, as its first chair. The full membership of the committee includes:

Dr. John Holt (Chair)
MIT Haystack Observatory

Dr. Craig Rasmussen
University of Michigan

Dr. Yadunath Zambre
SRI International

Dr. Barbara Emery
High Altitude Observatory
NCAR

Dr. Denis Alcayde
CFSR

Dr. James Willett
NASA

Tony van Eykan
Dr. ~~Jürgen Rotger~~
EISCAT

Dr. Ulf Von Zahn
Universitat Bonn

The committee is advisory to the CSSC, and has been charged to make recommendations in the following areas:

- * Data Format
- * Education/Public Interface
- * Centralized vs. Distributed
- * Rules of the Road
- * Utilization Assessment
- * Operations and Resources
- * Connection with TIMED, ALOMAR, and other Databases
- * Connection with Upper Atmosphere Research Collaboratory (UARC) and MOSAIC
- * Data Archiving

Jeffrey Forbes, University of Colorado

Graduate Students and Travel Grants for CEDAR 1995

All students from U.S. or foreign institutions who attend the CEDAR meeting will have their registration fees waived. A list of students, their interests, and graduation dates will be distributed at the meeting, and a bulletin board provided for job or general announcements. Students will introduce themselves to the community during the first plenary session on Monday morning. An e-mail address is very helpful to have since many announcements will be sent first via e-mail.

NSF has provided money for travel and per diem for students from U.S. institutions or students from foreign universities who will be visiting a U.S. institution during the summer and so will have a U.S. sponsor. Preference will be given to graduate students, but involved undergraduates are also welcome. Applications for travel funds must be received by **April 15**. This year, NCAR will pay the dormitory fees rather than a per diem for those students who stay at the dorms. Students who stay at the dorms will not have to pay their bill upon arrival, and therefore do not receive a per diem payment. Students who stay in hotels will receive their per diem payment after the workshop. **ALL students must make their own lodging arrangements**, but a list of dorm reservations will be sent to NCAR. Per diem (which includes meals, lodging and miscellaneous) is currently set at \$20 per day, or \$140 for 7 nights stayover. If there are extra funds, the per diem could increase up to \$25/day. (The per diem really only covers cheap lodging. Hopefully, the universities can help their students in this area.)

Professional Travel in Denver will make airline reservations for students travelling from cities where the government rate to Denver is cheaper than the early reservation, Saturday night stayover rate. At the moment, these cities are: Baltimore, Boston, Cincinnati, Dallas, Dayton, Detroit, Houston, Huntsville, Los Angeles, Orlando, Salt Lake City, San Francisco, Seattle,

Spokane, and Tucson. If you are flying from one of these cities, contact the Groups Department of Professional Travel at (800) 333-6338 or (303) 488-0570, FAX: (303) 488-0505 to make airline reservations **after May 1**. Students travelling from other cities are responsible for getting their own tickets for a Saturday night stayover (June 24, unless they are staying for IUGG/IAGA) and will be reimbursed after the workshop. If you must stay over a Saturday night, Professional Travel can get your tickets if you prefer, but we would like you to pay for them if you cancel. Government tickets can be cancelled with no penalty. If you find a cheaper Saturday night fare than the one listed, NCAR will pocket the difference to spend on other things. Students are **not required** to stay the whole period, and Saturday night stayover tickets can be altered for about \$30, to be paid by those students who change their schedules. However, the dormitory package is from Sunday night through Thursday night, with possible extensions of time only at the beginning. Hence, if you only plan to come for part of the workshop, stay at a hotel instead.

Students who drive will receive \$0.28/mile or the equivalent airfare, whichever is smaller. If the average airfare is significantly smaller than the listed value at the end of May, students who drive will get the higher value.

Last year 155 students had their registration fees waived and 138 received travel assistance. The *Application for Student Financial Support* on the back of the registration form requires the signature of the research advisor. This form should be received by **April 15** to be considered for support, but all students should fill it out in order to be included on the list of students, their interests, and their advisors, which will be available at the meeting. Please send these forms to Dr. Barbara Emery at the address shown on the registration form (see pg. 13). This form can be e-mailed if your advisor sends a separate e-mail confirmation as well.

Barbara Emery, NCAR

CALL FOR POSTER PAPERS

There are two poster sessions scheduled between 4-6 PM on Monday and Wednesday at the Mesa. Poster space is 4 feet tall by 3.5 feet wide. Prizes are awarded for the best student posters. Last year there were about 75 posters, 57 of which were presented by students. Please indicate on the registration form if you plan to submit a poster, and send a title and list of authors to: Dr. Jeffrey Thayer, SRI International, 333 Ravenswood Ave., Menlo Park, CA 94025. Phone: (415) 859-3557. FAX: (415) 322-2318, e-mail: jeff_thayer@qm.sri.com. Please indicate whether or not the first author is a student.

Boulder Lodging and Local Transportation Information

1995 Tenth Summer CEDAR Workshop
June 25-30, 1995

The facilities listed below have blocked rooms for workshop participants between the nights of June 24-June 30, 1995. Reservations must be accompanied by a credit card charge number or a deposit for the first night's lodging; Visa, MasterCard, American Express, and Discover credit cards are accepted at most of the hotels. Cancellations must be made before 4:00 PM on the arrival day to avoid being charged for the first night's lodging. The blocks of rooms at special workshop rates are only being held until the dates indicated below and they may fill up early. **MAKE ALL RESERVATIONS AS SOON AS POSSIBLE AND SPECIFICALLY MENTION THE CEDAR WORKSHOP HOSTED BY NCAR.** (If using a Travel Agent, have them identify you in the same manner.) Participating hotels and rates for June 24-June 30, 1995 are:

Hotel	Single*	Double*	Deadline	No. of Rooms
Days Inn 5397 S. Boulder Road Boulder, CO 80303 (303) 499-4422; Fax: (303) 494-0269	\$74	\$79 (Up to 4 People)	May 24	65
Holiday Inn of Boulder 800 - 28th Street Boulder, CO 80303 (303) 443-3322 or 1-800-465-4329	\$73	\$73	May 24	35
Courtyard by Marriott 4710 Pearl East Circle Boulder, CO 80301 (303) 440-4700 or 1-800-321-2211; Fax: (303) 440-8975	\$94	\$104	May 26	40
Homewood Suites 4950 Baseline Road Boulder, CO 80303 (303) 499-9922 or 1-800-225-5466; Fax: (303) 499-6702	\$119 for a Suite w/Kitchen (will accommodate 3-4 people)		May 24	10

RESERVE ROOMS BEFORE DEADLINES TO ASSURE LOWER RATES

All hotels have comfortable accommodations and all of them, except the Courtyard, can provide shuttle service to local meetings if requested by individuals *in advance* (based on availability). The Days Inn and Homewood Suites provide free continental breakfasts with lodging. Homewood Suites also has a free social hour Monday through Thursday. Checkout times are 12:00 noon. All hotels have swimming pools. We were unable to book blocks of rooms at the Broker Inn or the Clarion again this year, but some individual rooms may be available.

*Hotel rates do not include 9.65% sales tax.

UNIVERSITY OF COLORADO DORMITORY ROOMS AND MEALS

	Single	Double	No. of Rooms
Main Campus Conference Housing Area 142 Cheyenne-Arapaho Hall Boulder, CO 80310 Fax: (303) 492-4646	~\$150	~\$120 (per person)	70(S), 65(D)

[NOTE: FOR EMERGENCIES ONLY: (303) 492-6885 (Suzy Campbell or her secretary)]
e-mail: campbell%eagle@vaxf.colorado.edu

NO PHONE-IN RESERVATIONS ACCEPTED. PLEASE SEND THE REGISTRATION FORM PROVIDED HEREIN TO THE MAIN CAMPUS CONFERENCE HOUSING AREA. Rates for the campus package include a dormitory room from 6/25 to 6/29 and breakfast every day from 6/26 to 6/30. The exact rates are not available yet. Early arrivals (6/24) will pay an extra ~\$25/night (single) or ~\$20/night (double, per person). **NO LATE DEPARTURES ARE POSSIBLE** due to the 5000 people expected for the IUGG/IAGA meeting that starts the following week. If you plan to stay for IUGG/IAGA, make sure you ask for a dormitory room for that period separately through the IUGG registration procedure. You will have to move your dorm room on Friday, June 30. Have only ONE individual in charge of each group from each university. CU accepts VISA and MasterCard. Please check in at Hallett Hall. Parking permits for a week can be obtained from campus police. Students receiving travel funds will not have to pay for their dorms upon arrival, but NCAR will pay this bill in lieu of per diem.

GROUND TRANSPORTATION (Airport). The Rocky Mt. Supercoach (303/499-1951, ~\$15.00) and the Boulder Airporter (303/321-3222, ~\$13.00) will take reservations for direct transportation between Denver International Airport, the hotels, and the University. Their schedules are staggered so you may find one more convenient for your arrival/departure.

DAY CARE. For child care while you attend the Workshop, Children's World at 5377 Manhattan Cir. in Boulder will accept children on a drop-in basis (based on space availability). They also offer summer field-trip programs. If you're interested, please call Children's World at (303) 494-3694. Many other daycare facilities are listed in the Boulder telephone directory under "Child Care."

Registration Form
1995 Tenth Summer NSF CEDAR Workshop
June 25-30, 1995

National Institute of Standards and Technology – NIST
National Center for Atmospheric Research – NCAR

1. PLEASE PRINT

Name: _____

Institution: _____

Address: _____

Telephone: (_____) _____ Fax: (_____) _____

E-mail: _____ Citizenship: _____

Are you a: Student () Tutorial Speaker () Neither ()

NOTE: Students registering after **May 31** will be charged a \$5.00 late fee. Students wanting travel funds should register **before April 15**.

2. I plan to present a poster at the meeting _____. **NOTE:** Students will be given preference if there are space limitations. Send title and author list to Dr. Jeffrey Thayer (jeff_thayer@qm.sri.com) by **May 31** to be considered. Please be sure to indicate whether or not the first author is a student.

3. I plan to attend the reception at NCAR (Mesa) on Sunday, June 25 (additional \$10, free for students and tutorial speakers) _____.

4. I plan to attend the buffet at NCAR on Wednesday, June 28 (additional \$15, free for students and tutorial speakers) _____.

5. **FEES:** The regular total fee for the CEDAR Workshop is \$85. It could be more or less depending on attendance at the reception and buffet. **ALL FEES ARE WAIVED FOR STUDENTS AND TUTORIAL SPEAKERS. Fees for guests are not waived, nor are late assessments.** [Any alcohol at the reception and buffet will be funded strictly out of voluntary contributions (g) below. Any extra amount will be gratefully accepted.] **Foreign registrants are not assessed the late fee of \$15, provided they register by May 31; they may wait to pay their fees at the meeting.**

(a) Regular registration \$60.00 (register by **May 31**) _____

(b) Registration for Retirees \$20.00 (register by **May 31**) _____

(c) Reception \$10.00 _____

(d) Guests for reception \$10.00/ea or \$5.00/child _____

(e) NCAR buffet \$15.00 _____

(f) Guests for NCAR buffet \$15.00/ea or \$7.50/child _____

(g) Voluntary contribution for alcohol at reception/buffet _____

(h) Late fee if registering after May 31 \$15.00 _____

(i) Late fee FOR STUDENTS registering after May 31 \$5.00 _____

TOTAL FEES _____

NOTE: If registration payment is not enclosed with this form, please be certain that checks sent separately identify you and the workshop. Checks for the workshop should be made payable to NCAR. NCAR does not accept VISA or MasterCard. Foreign registrants may pay on arrival provided they mail their registration forms in early. Please send correspondence to: Barbara Emery, HAO/NCAR, P.O. Box 3000, Boulder, CO 80307-3000; Phone: (303) 497-1596; Fax: (303) 497-1589; Internet: emery@ncar.ucar.edu; SPAN: 9580::"emery@ncar.ucar.edu".

STUDENTS Please complete BOTH sides of this registration form.

Application for Student Financial Support to Attend the Annual CEDAR Meeting

All students are eligible to receive a registration fee waiver, including those from non-U.S. institutions. Travel funds and per diem funds are also available for students from U.S. institutions. All students must fill out this application form, which provides input for the list of students and their interests, made available at the meeting. Application deadline is **April 15, 1995**. See the write-up about travel grants for more information.

PLEASE PRINT

Name: _____

University Address: _____

Phone: (____) _____ Fax: (____) _____ E-mail: (____) _____

Mailing Address (if different): _____

Expected Degree and Date of Graduation: _____

Advisor(s) and Phone Number: _____

Research Interests: _____

Instruments, Models, or Data Used: _____

Advisor's Signature of Student Status:

I confirm that the applicant is a () graduate () undergraduate student at my university or research laboratory and is working on a research project related to the CEDAR Program.

Signature of Research Advisor: _____

1995 CEDAR Workshop forms: send completed forms for registration and request for funding (all students should fill this out) to: emery@ncar.ucar.edu
Send CU housing application to: campbell%eagle@vaxf.colorado.edu

PLEASE COMPLETE THE INFORMATION REQUESTED BELOW AND SEND TO THE ADDRESS
INDICATED AT THE BOTTOM OF THIS FORM.

15



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The Cedar Post is published quarterly and mailed to more than 1400 scientists worldwide.

J. M. Forbes, Editor.

P. Gassaway, Production Manager.

CEDAR Chips

Citation Reference Library

One of the onerous chores in finishing up a paper is compiling a list of cited references. The AGU has made this job considerably easier by producing two sets of literature citations for papers in its various journals. A total of more than 20,000 citations can be retrieved for the years between 1988 and 1994. This list will be continuously updated monthly, so it will be possible to keep up with the increase in AGU journal citations.

Obviously, however, not all papers that we might want to cite will be found in this library. Hence, the thought that comes to mind is building a CEDAR literature citation library accessible by e-mail, gopher, ftp, or mosaic as the means of retrieval. Presumably, the CEDAR database archives would be responsible for the maintenance of such a library. We envision

getting it started by donation of the various individual libraries that we all maintain. It should be a simple programming job to sort out the duplications that may exist and to place the citations in the appropriate format. The AGU library comes in the form of two disk files on floppies; I propose the CEDAR literature citation library be circulated in the same way. The AGU library provides the citation retrieval software, which is the same as ENDNOTE but deactivated so that this software can only be used for retrieval. Addition of citations would require purchase of this software from the vendor.

This is an example of one way that the CEDAR database might become more useful for those of us in the CEDAR community.

John Meriwether, Clemson Univ.