EOS IN THE NEWS

Hope for Snow?

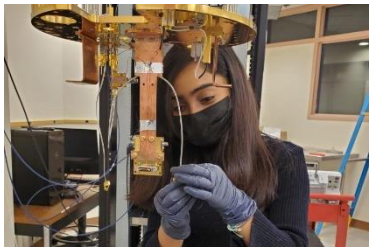
Reducing carbon dioxide emissions now could still preserve cold-weather benefits, according to new research from Elizabeth Burakowski, Alix Contosta, and Danielle Grogan

A Striking Discovery

Chris Sterpka is the first author of a new paper that reveals how lightning actually starts

Team USA Battles Climate Change

Elizabeth Burakowski is featured in a podcast where she talks about Winter Olympians who are sounding the alarm on climate change



Research Snapshot: Space Rays

Adrika Dasgupta and Fabian Kislat are testing different detector designs to learn how elements form during supernova explosions in space

A Town That Saved a Mountain, and a Mountain That Saved a Town

Elizabeth Burakowski discusses climate and snowsports in this N.Y. Times story

From the Sea to the Stars

Fabian Kislat and Atsushi Matsuoka have received NSF EPSCoR Track 4 grants to understand carbon cycling in the ocean and X-rays in space

---

Passings: Professor Robert Harriss

UNH mourns influential figure in early growth of EOS

KUDOS AND CONGRATS

Congrats to Jennifer Jacobs who is the co-author of a book that won the 2021 Atmospheric Science Librarians International (ASLI) Choice Award! The book is titled, "Downscaling Techniques for High-Resolution Climate Projections: From Global Change to Local Impacts." Way to go, Jennifer!

Larry Mayer has been elected as a member of the Norwegian Scientific Academy for Polar Research, whose strategic vision is to “advance state-of-the-art polar for sustainable development and the benefit of humanity.” Mayer joins 172 other members from 18 countries in the Academy. Congratulations, Larry!

SEMINAR

The small- and large- scale magnetic reconfigurations linked to the interrelated activity complexes involving coronal holes, filaments, ARs and CMEs
Speaker: Dr. Lela Taliashvili, Director Ad-Hoc, Central American branch of the Latin American Center for Physics (CLAF-CA), and Professor of Physics, University of Costa Rica
Feb. 9, 3-4 p.m.
Part of the Space Science Center Seminar Series

EOS DIVERSITY, EQUITY AND INCLUSION WEBSITE

EOS is committed to creating an inclusive environment within our research community. Our researchers have been working across the university and collaborating with external partners to enhance justice, equity, diversity and inclusion at UNH. The new EOS Diversity, Equity and Inclusion website provides an overview of our researchers' efforts and links to relevant resources, incident report forms, and support. This website will evolve over time to reflect the ongoing nature of this work. Additional DEI website content is welcome; please contact Rebecca Irelan at rebecca.irelan@unh.edu.

NASA EARLY CAREER FACULTY RFP

NASA is seeking proposals from new faculty members who intend to develop academic careers related to space technology. Proposals must address one of the following topics: Development of lightweight solar sail attitude control technologies; development of lightweight solar sail attitude control technologies; or hibernation and recovery of solar-powered systems for lunar missions. Notices of intent are due on March 2, 2022. For more information, please visit the online solicitation and FAQs.

SMSOE GRADUATE STUDENT RESEARCH FUNDING

The School of Marine Science and Ocean Engineering is pleased to announce its Spring 2022 RFP for the SMSOE Graduate Student Research

Funds. This fund will provide supplemental support for vessel use, supplies, and/or undergraduate support for any UNH graduate student who does not have other means of funding these expenses for marine related research. The total amount of funding available for this call is $12,000. Individual awards range from $1,000 - $3,000. Students interested in applying for these funds should follow the instructions on our website. Application deadline: February 18, 2022

SMSOE BUSINESS & PROPOSAL AND SEED GRANT FUNDS — CALL FOR PROPOSALS

SMSOE is pleased to announce a call for proposals for Business & Proposal and Seed Grant Funds. The goal for Business & Proposal (B&P) and Seed Grant funds is to develop proposals or pilot research ultimately leading to external funding (private, industry, government). Proposals are due by February 25, 2022. Visit the website for full details.

CALL FOR ENTRIES: ASTROPHOTOGRAPHY / ASTRO ART EXHIBITION

The Award-Winning Art Center in Dover, New Hampshire announces a Call for Entries to a juried astrophotography and astro-art competition and exhibition featuring images of celestial objects. Submissions are due by March 19, 2022. This event will be juried by Astronomer and University of New Hampshire Observatory Director John S. Gianforte. Questions should be directed to John at john.gianforte@unh.edu.

CONFERENCE FUNDING AVAILABLE FOR STUDENT RESEARCHERS

Each year, EOS raises funds during The (603) Challenge to support our student researchers who attend professional conferences to present their work. These funds can cover travel and/or registration and are applicable for both in-person and virtual conferences. Please contact Rebecca Irelan to apply for funding.

Please send any news items or suggestions for future Convergence content to Rebecca Irelan at rebecca.irelan@unh.edu.

Convergence is produced by the Institute for the Study of Earth, Oceans, and Space.

The University of New Hampshire • Durham, NH 03824
(603) 862-1234 • TTY Users: 7-1-1 or 800-735-2964 (Relay NH)

Nicole, here is your UNH lookup ID for your reference: **8-10224982**

University of New Hampshire
9 Edgewood Road
Durham, NH 03824

Hope for Snow?

Reducing carbon dioxide emissions now could still preserve cold-weather benefits

Wednesday, February 2, 2022

PHOTO BY UNH.

Despite the dire forecast for the future of deep, consistent snow in New England, UNH researchers say that reducing carbon dioxide emissions now could still lessen the impact of climate change on snowpack — and protect the economy and ecology that depend on cold weather.

Using climate models, researchers examined the effects of both high and low levels of carbon dioxide emissions on future climate warming scenarios and found that a reduction in emissions could preserve almost three weeks of snow cover and below-freezing temperatures.

“Taking serious action now to limit, or slow, the warming of winter could mean preserving many core purposes of cold weather.”

“The local ski hills of New England raised me to love winter and snow,” said Elizabeth Burakowski, research assistant professor in UNH’s Earth Systems Research Center and first author of the new study. “But winters are vital to all of us and taking serious action now to limit, or slow, the warming of winter could mean preserving many core purposes of cold weather, including providing more winter protection for woodland animals, preventing the spread of invasive forest pests and increasing the ability of ski resorts to make snow — protecting the economy by maintaining the area’s multimillion-dollar recreation industry.”

ELIZABETH BURAKOWSKI (RIGHT) AND RESEARCH ASSISTANT EMILY WILCOX '19. PHOTO BY SCOTT RIPLEY.

In the study, recently published in the journal Northeastern Naturalist, the researchers analyzed 29 different climate models to determine the effect of reducing carbon dioxide emissions and other heat-trapping gasses into the atmosphere. At the current pace, by mid-century (2040–2069) ski areas in North America will face up to a 50% decline in days where conditions would be favorable to make snow. Limiting emissions could slow that to only a 10% to 30% decline in the number of snowmaking days. Colder days (below freezing) and preserving snow cover is also critical for providing winter habitats and protection for animals like porcupines and martens, a carnivorous member of the weasel family.

At the current rate of warming, the researchers found that deep snowpacks could become increasingly short-lived, decreasing from the historical two months beneath the snow to less

than one month. The researchers say that maintaining a cold winter environment is also associated with greater soil carbon storage and helps prevent the spread of invasive and very destructive forest pests such as southern pine beetle, which was recently detected as far north as New Hampshire and Maine by UNH researchers.

“Emissions scenarios play a critical role in the loss of winter conditions, indicating a potential doubling of the loss of cold days and snow cover under higher emissions,” said Alexandra Contosta, research assistant professor at UNH’s Earth Systems Research Center. “These changes could disrupt and forever change some very significant social and ecological systems that have historically relied on cold, snowy winters for habitat, water resources, forest health, local economies, cultural practices and human wellbeing.”

Historically, between 1980 and 2005, the number of snow-covered days in the Northeast was 95 days. Under the low emissions scenario, that would be reduced to 72 days — under the high emissions scenario there would only be 56 days. New Jersey, Rhode Island and Connecticut would historically expect to see 20 to 80 days of snow cover per season but by the end of the century, under the higher emissions scenario, they are more likely to have snow-free winters.

Co-authors of the study include Danielle Grogan, also at UNH; Sarah Nelson, Appalachian Mountain Club; Sarah Garlick, Hubbard Brook Research Foundation; and Nora Casson, University of Winnipeg.

This research was supported by the National Science Foundation Established Program to Stimulate Competitive Research (EPSCoR) Ecosystems and Society Project (EPS-1101245).

- ***WRITTEN BY:***

  Robbin Ray ’82 | Communications and Public Affairs | robbin.ray@unh.edu | 603-862-4864

INSTITUTE FOR THE STUDY OF EARTH, OCEANS, AND SPACE (EOS)

UNH Today RSS feeds

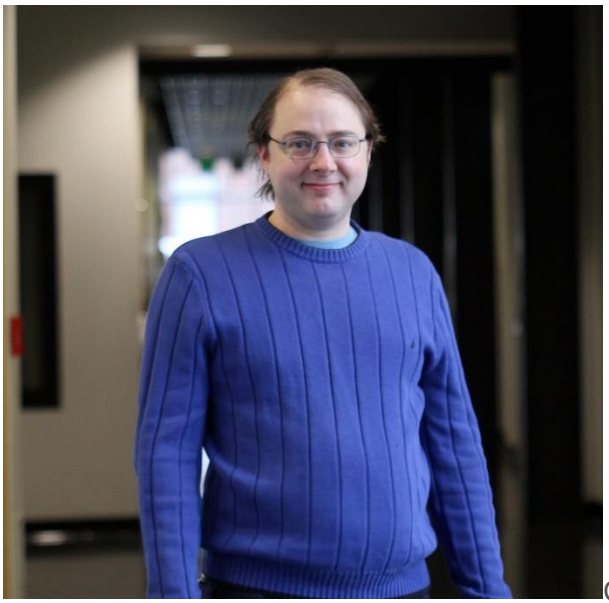
A Striking Discovery

New UNH study reveals how lightning actually starts

Monday, January 24, 2022

Lightning, for all its breathtaking and fearsome beauty, remains an incredibly mysterious force of nature. Now, a new study from UNH reveals a key piece of evidence that's eluded scientists since the days of Ben Franklin's kite experiment: how lightning actually begins within a storm cloud.

Chris Sterpka, a UNH Ph.D. student studying lightning physics, is the first author of a groundbreaking study published in the journal Geophysical Research Letters that could fundamentally shift the future of lightning research and ultimately improve the protection of humans and infrastructure from lightning strikes.

 CHRIS STERPKA IS THE FIRST AUTHOR OF A GROUNDBREAKING NEW STUDY ABOUT LIGHTNING INITIATION.
“This is huge,” Sterpka says of the study results. “This is the first time we can actually see lightning initiation in three dimensions and on such a small scale — these new data offer an increase in timing precision and accuracy over previous studies, which allowed us to image lighting with more detail.” And for researchers who study the physics of particles that are smaller than an atom and travel at nearly the speed of light, that precise scale really, really matters.

Within the lightning science community, there have been two major competing theories on how lightning begins: either by cosmic rays from outer space that enhance the electrical field within the clouds, or by a series of subatomic processes that cause electrons within the cloud to form streamers, which are filamentous cold plasma. As more and more streamers form, it leads to an avalanche that boosts the background electrical field enough to form a hot leader channel, the pathways that lightning can use to travel out of the cloud.

The problem is that it’s difficult to see inside a storm cloud to find out which theory holds weight; cameras flown into clouds haven’t proven very successful, so scientists turned to a large array of radio telescopes (called the Low Frequency Array, or LOFAR) in The Netherlands to pick up radio waves generated from lightning. A large lightning event recorded by LOFAR in 2018 caught the eye of some scientists, who tapped Sterpka to scour through mountains of data to produce detailed images of the exact moment when lightning may have started. After months of piecing together a three-dimensional map using radio waves at the nanosecond scale, Sterpka and the rest of the science team began to get excited over the results. Discussions ensued, and they concluded that “the sources of lightning are indeed the streamers, and that supports the hydrometeor initiation theory,” Sterpka explains. He’s currently combing through a couple of other LOFAR datasets and says he is finding similar results, indicating that the 2018 lightning strike was not unique; it’s likely that most lightning begins this way, not just the large events, he adds.

> "This is huge. This is the first time we can actually see lightning intiation in three dimensions and on such a small scale."

“This study really sheds light on how the majority of lightning flashes are initiated,” says Ningyu Liu, UNH professor of physics and a co-author on the paper. “Previous research using small radio sensor arrays has helped us to study the electrical breakdown at the start of large lightning events that generate strong radio signals, but the LOFAR radio telescopes are much more powerful, allowing us to obtain details of lightning initiation starting with weak radio events.”

“To me, this study also provides strong motivation to improve the sensitivity of small radio sensor arrays — those smaller than LOFAR — dedicated to lightning observation,” Liu adds.

But for all the clarity gained from these data, another head-scratcher emerged: As the radio waves ramped up at an exponential rate, their velocity remained linear. “We don’t know how that’s possible,” Sterpka says, noting that they should both be linear, according to the hydrometeor initiation theory. “It’s puzzling. Hopefully we’ll find some clues in similar behavior as we examine other data sets.”

In the wake of this study, numerous scientists and journalists have reached out to Sterpka to talk to him about the results. The attention has been a little overwhelming, he admits, but he is excited to discuss the findings.

“To be able to go through the data and see things on this level, to actually be able to extract meaningful data and piece it together like this — it’s just fascinating,” he adds.

This research was funded by UNH AFOSR Grants No. FA9550-16-1-0396 and No. FA9550-18-1-0358.

The Institute for the Study of Earth, Oceans, and Space (EOS) is UNH's largest research enterprise, comprising six centers with a focus on interdisciplinary, high-impact research on Earth and climate systems, space science, the marine environment, seafloor mapping and environmental acoustics. With more than $60 million in external funding secured annually, EOS fosters an intellectual and scientific environment that advances visionary scholarship and leadership in world-class research and graduate education.

- ***WRITTEN BY:***

  Rebecca Irelan | Institute for the Study of Earth, Oceans, and Space | rebecca.irelan@unh.edu | 603-862-0990

INSTITUTE FOR THE STUDY OF EARTH, OCEANS, AND SPACE (EOS)

Follow us on YouTube

Follow us on Instagram

Find us on LinkIn

UNH Today RSS feeds

Team USA Battles Climate Change

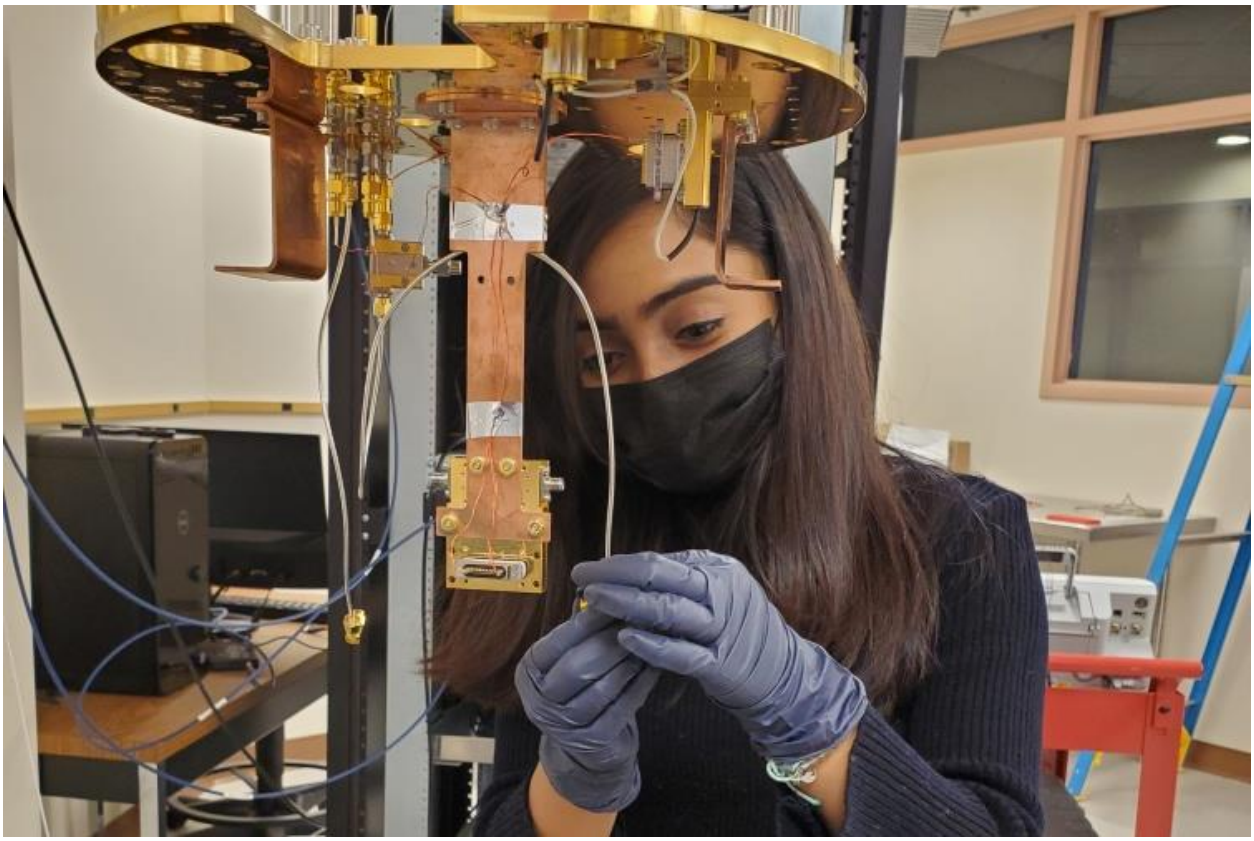
Elizabeth Burakowski is featured in a podcast where she talks about Winter Olympians who are sounding the alarm on climate change

Listen to the episode of My New Favorite Olympian

Research Snapshot: Space Rays

Testing equipment to learn about supernova explosions in space

Friday, January 28, 2022



Adrika Dasgupta, a Ph.D. student in physics, installs a transition-edge sensor (TES) in a dilution refrigerator located in Morse Hall.

A TES is a type of detector that scientists hope to use in mapping gamma ray emissions from supernovas in space and to help better understand how elements are formed during these stellar explosions. TES detectors work well in lab settings, but they will need some

improvements to meet the requirements of astrophysics, says Fabian Kislat, UNH assistant professor of physics who advises Dasgupta on her research in the Space Science Center and the College of Engineering and Physical Sciences.

“With some improvements, TES detectors will allow us to measure the energy of a gamma ray extremely precisely, more than 10-times better than with the semiconductor detectors used by other experiments,” Kislat explains.

These TES detectors need to be extremely cold — about 70 milli-Kelvin, or 0.07 degrees Celsius above absolute zero; a dilution refrigerator is capable of reaching 7mK. This frigid environment mimics the cryostat chamber in which the TES detectors will be housed during a future trip into space on a telescope. In the lab, this refrigerator will allow Dasgupta to test and compare various detector designs to find the best one for flight and to guide the future development of the devices.

Dasgupta and Kislat are collaborating with the NIST in Boulder, Colorado, on this project.

- ***WRITTEN BY:***

  Rebecca Irelan | Institute for the Study of Earth, Oceans, and Space | rebecca.irelan@unh.edu | 603-862-0990

RESEARCH SNAPSHOTS

University of New Hampshire

UNH Today is produced for the UNH community and for friends of UNH.
The stories are written by the staff of UNH Communications and Public Affairs.
Email us: unhtoday.editor@unh.edu.

A Town That Saved a Mountain, and a Mountain That Saved a Town

Elizabeth Burakowski discusses climate and snowsports in this N.Y. Times story

Read the article in the New York Times

From the Sea to the Stars

Two researchers receive National Science Foundation grants

Wednesday, February 2, 2022

UNH researchers Atsushi Matsuoka and Fabian Kislet have received National Science Foundation EPSCoR Track 4 grants to understand carbon cycling in the ocean and X-rays in space. Matsuoka, research assistant professor in the School of Marine Science and Ocean Engineering, received $220,000 and will collaborate with scientists at Scripps Institute of Oceanography to explore how phytoplankton are acclimating to a changing Arctic. Kislat, assistant professor of physics in the Space Science Center, received $160,000 to gather experimental data about interactions of neon ions with hydrogen and helium gas commonly found in astrophysical environments.

- ***WRITTEN BY:***
  Beth Potier | Communications and Public Affairs | beth.potier@unh.edu | 2-1566

GRANTS AND CONTRACTS NEWS

UNH Today is produced for the UNH community and for friends of UNH.
The stories are written by the staff of UNH Communications and Public Affairs.
Email us: unhtoday.editor@unh.edu.

Passings: Professor Robert Harriss

UNH mourns influential figure in early growth of EOS

Monday, January 24, 2022

IMAGE BY NASA/JSC.

Professor Robert Harriss, an influential figure in the early growth of the UNH Institute for the Study of Earth, Oceans, and Space (EOS), passed away on Dec. 24, 2021 at his home in Boulder, Colorado. He was 80 years old.

Harriss earned his Ph.D. in geochemistry in 1965 from Rice University and moved on to become a faculty member at McMaster University in Ontario, then worked as a senior scientist at NASA's Langley Research Center. He joined UNH in 1988 as a professor in EOS and the

department of Earth sciences. During his time at UNH, he contributed to the rapid expansion of what was then the Complex Systems Research Center, now the Earth Systems Research Center, in the years surrounding 1990.

While at Langley and UNH, Harriss was a key organizer of several NASA field campaigns that used aircraft, tower-based and ground-based measurements to quantify key processes affecting the chemistry of the atmospheric boundary layer and trace gas exchange between the land surface and the atmosphere.

"Bob Harriss was a brilliant and committed scientist," says Berrien Moore III, a former director for EOS who made the decision to hire Harriss during that time period and who now serves as the dean of the College of Atmospheric and Geographic Sciences at the University of Oklahoma. "However, even his brilliance was overshadowed by his genuine kindness and devotion to family and the planet. I never met anyone quite like Bob; his quiet strength left me in awe, and it also gave me strength to carry on no matter the setbacks or steepness of the mountain. I sense this now; he is still with me as he is still with all that knew him."

Harriss left UNH in 1994 but showed no signs of slowing down in his career; he later held positions as the director of the science division of NASA's Office of Mission to Planet Earth, director of the Environmental and Societal Impacts Group at the National Center for Atmospheric Research, and president of the Houston Advanced Research Center. Even after retiring from this last position, Harriss served as a lead senior scientist at the Environmental Defense Fund, contributing to their Methane SAT Project — a mission scheduled for launch this year that will provide global, high-resolution coverage of methane emissions from oil and gas facilities.

During the course of his career, Harriss was awarded the NASA Exceptional Scientific Achievement Award in 1985 and the NASA Outstanding Leadership Medal in 1997. He was also elected a Fellow of the American Association for the Advancement of Science in 1988.

Among his many legacies, Harriss had a major impact on graduate students in EOS, who worked with him on a wide range of research projects. Here are memories from several of them:

Antonio Donato Nobre, a retired senior scientist at the Brazilian Institute of Space Research, came from Brazil to study tropical forest biogeochemistry with Harriss at UNH: "Harriss was much more than a wise and respected teacher and activist, which he certainly was. He opened the doors of wonder and marvel to all of us who were fortunate enough to be his students. His enchanting narrative made us see this miraculous planet as if we were astronauts gazing at the shining orb while floating in space."

Greg Norris, director for the Sustainability and Health Initiative for NetPositive Enterprise at MIT, came to study natural resources with Harriss at UNH: "His door was always open to us, his students and mentees, no matter how busy he truly was. His love of learning and of science and his absolute intellectual integrity were always on vivid display and in charge. He somehow combined a pure love of truth with an activist passion, and he radiated a genuine, heartfelt respect for all people and a love of life."

Steve Frolking, UNH research professor of Earth systems science, switched fields from physics to study biogeochemistry with Harriss during graduate school: "Bob was an exceptional scientist and person, and a major influence on my life and career — helping me establishing connections that turned into lifetime collaborations with excellent researchers; teaching me by example that everything is interesting, and that the most important thing was to do good science, whatever the topic; and emphasizing that science had an important role in making the world a better place for all."

Ruth Varner, UNH professor of Earth sciences, served as a teaching assistant for Harriss in the last year of her M.S. degree in Earth sciences: “I met Bob at a critical point in my career. After serving as his TA in my last semester of my M.S. degree in 1993, he hired me to do research on methane in landfills. This led me to the Trace Gas Biogeochemistry Group and ultimately launched my research career. I credit Bob for seeing something in me that I did not. I know I would not be the researcher or mentor I am today without his kindness, support and wisdom.”

As Nobre puts it, "Bob prepared and inspired us to go out into the field and fight for everything that is alive and for everything that is good and right.”

- ***WRITTEN BY:***

  Rebecca Irelan | Institute for the Study of Earth, Oceans, and Space | rebecca.irelan@unh.edu | 603-862-0990

INSTITUTE FOR THE STUDY OF EARTH, OCEANS, AND SPACE (EOS)

UNH Today is produced for the UNH community and for friends of UNH.
The stories are written by the staff of UNH Communications and Public Affairs.
Email us: unhtoday.editor@unh.edu.