UNH Research 2013
A digest of the year's research news from the University of New Hampshire

Agriculture & Biological Sciences
Business & Technology
Engineering & Physical Sciences
Health, Behavioral & Social Sciences
Humanities & the Arts
Marine & Ocean Sciences
Space Science
Sustainability & the Environment

This report is produced by the Research Development and Communications unit of the UNH Research Office.
Find it on the Web at http://www.unh.edu/research/UNH-Research-Digest.
Agriculture & Biosciences

A Lettuce in Winter?
http://www.unh.edu/unhtoday/2013/05/lettuce-winter

Locally grown and produced food is in high demand for New Hampshire residents. UNH Cooperative Extension specialists Brian Krug and Becky Sideman and UNH plant biology master’s student Claire Collie are collaborating on research to determine optimal growing techniques for winter greens such as tiny mizuna, komastuna, and arugula in local greenhouses during the fall and winter months, and, thereby, increase production potential to meet this demand.

Alumna Nancy Fernandes Wins Prestigious Fellowship
http://manchester.unh.edu/blog/campus-news/alumnae-nancy-fernandes-wins-prestigious-fellowship

After Nancy Fernandes’ son was diagnosed with Chiari malformation type I, a condition in which brain tissue extends into the spinal canal, she was galvanized to return to school at UNH Manchester after more than twenty years to complete her bachelor’s degree in biology. She received a bachelor’s degree in 2012, and quickly decided to pursue a master’s degree in biochemistry. Fernandes now has received a competitive National Science Foundation Graduate Research Fellowship that she says has inspired her to continue on to earn a Ph.D. in biochemistry after she completes her master’s.

Brian Krug Receives Alex Laurie Award, Website Honors
http://extension.unh.edu/articles/Brian-Krug-Receives-Alex-Laurie-Award-Website-Honors

Brian Krug, UNH Cooperative Extension specialist for greenhouse and floriculture, became a two-time Ohio Florists’ Association Alex Laurie award winner. Krug co-authored the paper, “Development of Euphorbia pulcherrima Under Reduced Finish Temperatures,” which was published in the academic journal HortScience. Klug is pictured (on the left) with Purdue University collaborators Roberto Lopez and Diane Caberato.

Cooperative Extension Field Specialist Selected for Inaugural Network Class
http://www.unh.edu/campusjournal/2013/02/cooperative-extension-field-specialist-selected-inaugural-network-class

Brendan Prusik, a UNH Cooperative Extension natural resources field specialist in Coos County, was selected through a competitive application process for membership in the inaugural class of the Community Practitioners Network (CPN). The CPN is a two-year leadership program designed to develop and bolster leadership skills among community members and economic development professionals from northern New Hampshire and surrounding states and Canada.
Creature Feature – Luminous Squid Lights up Research on Beneficial Bacteria

UNH researchers received a National Science Foundation grant of $716,000 to study the relationship between the Hawaiian bobtail squid and a bacterium that helps it avoid predators by masking the shape of the squid and emitting light. Associate professors of microbiology and genetics Cheryl Whistler and Vaughn Cooper are heading the three-year project. Whistler explains, “Beneficial bacteria are the foundation of health of all plants and animals – including humans – but because most research has focused on disease-causing bacteria, we don’t understand these beneficial associations very well.”

Early Mammals Shrank – Twice – During Global Warming in Paleogene Era

About 50 million years ago, the Earth heated up in a series of extreme global warming events, and as a response, early mammals shrank. Previously, this decrease in mammalian size was attributed to the first and longest global warming event. However, doctoral student Abigail D’Ambrosia and her colleagues have studied fossils (such as the jawbone fossil of an early horse pictured at left) that have connected this shrinkage to a second, smaller warming period, which suggests a pattern that can provide insight into the Earth’s current warming. “Developing a better understanding of the relationship between mammalian body size change and greenhouse gas-induced global warming during [the] geological past may help us predict ecological changes that may occur in response to current changes in Earth’s climate,” says Will Clyde, D’Ambrosia’s advisor and professor of geology.

Fairchild Dairy Teaching and Research Center

The Fairchild Dairy Teaching and Research Center had nearly 2,100 visitors in 2013, including groups of area high school and elementary students, the 4-H teen conference, UNH Law School students, and prospective pre-veterinary students. Research at the Dairy includes measurement of methane in the breath of lactating dairy cattle, investigating the effects of feeding niacin to dairy cattle, and measurement of methane produced by silage, manure, and cropland.

Farmers Market Survey Reveals High Customer Satisfaction

A recent study conducted by the College of Life Sciences and Agriculture and UNH Cooperative Extension found that the number of vendors participating in farmers markets in Rockingham and Strafford counties has grown since 2005, and that customers report feeling highly satisfied with the quality of the products sold at their local markets. Former UNH graduate student Jewel McKenzie conducted this research along with associate professor of environmental and resource economics Alberto Manalo, Cooperative Extension professor and specialist Michael Sciabarrasi, and Cooperative Extension food and agriculture field specialist Nada Haddad.
Gone Fishin’
http://www.eos.unh.edu/Spheres_1113/diessner.shtml

Calvin Diessner’s master’s degree work utilized the techniques of aquaculture and hydroponics to investigate how waste from fish could be used as the main fertilizer to supply nutrients for a plant’s nourishment. Diessner grew floating bok choy and green bib lettuce with fertilizer from hybrid striped bass, and found that greens flourished in this sustainable, self-regulating environment. Diessner would like to expand the field of aquaponics at the local level as a New England-based, nonprofit business enterprise.

How Does Moo-ving to Pasture Feeding Affect the Nutrient Composition of Cows’ Blood and Milk?

Undergraduate Jillian Smith ’12 worked with Joanne Curran-Celentano, professor of nutritional sciences, on a project comparing pasture feeding at an organic dairy to total mixed ration feeding at a conventional dairy. Smith’s results suggested that pasture-grazed cows had a higher concentration of carotenoids – nutrients linked to decreased risk of cardiovascular disease, cancer, and immune system decline – in their milk. Smith concluded that because studies have found that consumers prefer food products with added health benefits, farmers could increase profits by increasing carotenoid concentration in their cows’ feed through pasture grazing.

Karen Bennett, Andrew Fast Recognized with Awards
http://extension.unh.edu/articles/Karen-Bennett-Andrew-Fast-Recognized-Awards

UNH Cooperative Extension professor and forest resources specialist Karen Bennett was named a Fellow of the Society of American Foresters (SAF) – an honor bestowed upon only five percent of SAF members – for her outstanding contributions to the society and the forestry profession. UNH Cooperative Extension field specialist Andrew Fast was awarded the American Tree Farm System 2013 National Leadership Award to recognize his instrumental work in increasing forest stewardship in New Hampshire.

Kingman Farm
http://colsa.unh.edu/article/fall-2013/kingman-farm

Numerous faculty, including assistant professors of agroecology Iago Hale and Rich Smith and assistant professor of plant pathology Kirk Broders, use UNH’s Kingman Farm throughout the year to conduct research on plant breeding, cover crops, plant diseases, water quality, and more. Kingman Farm employs both graduate and undergraduate students, advancing the University’s mission of research, teaching, and outreach.
Manchester Charter School Students Work on NASA’s Worms in Space Study
http://manchester.unh.edu/blog/campus-news/manchester-charter-school-students-work-nasas-worms-space-study

In an effort to boost interest and participation in STEM (Science, Technology, Engineering, and Mathematics) among elementary students, UNH Manchester is partnering with local charter schools to give fourth graders hands-on experience in research. The students will be comparing their experiments involving butterflies and worms with those of a NASA scientist who is conducting the same experiment in zero-gravity on the International Space Station.

Mapping Adaptability & Resilience
http://colsa.unh.edu/article/fall-2013/mapping-adaptability-resilience

Tom Davis, professor of biology, and Rich Smith, assistant professor of agroecology, are collaborating with faculty at the Universities of Maine and Vermont to evaluate potential variations in weed distributions in northern New England resulting from climate change. Smith predicts that many weed species may become more problematic in the future due to genetic variations. The three universities will be working together to create a distribution map of the common and uncommon weeds in northern New England.

Moving Right Along – High Tunnel Gives Farmers More Flexibility
http://www.unh.edu/unhtoday/2013/08/moving-right-along

Rolling Thunder, a moveable high tunnel, has been developed and donated to UNH’s Woodman Farm by Rimol Greenhouse Systems of Hooksett, NH. “It serves as both a resource for crop research and a state-of-the-art classroom for teaching new growing methods,” says Bob Rimol, President of Rimol Greenhouse Systems. Becky Sideman, a vegetable and berry specialist with UNH Cooperative Extension, is one of the many faculty who will use the tunnel to conduct crop research and classroom teaching, and, ultimately, provide knowledge and insight to enhance overall growing for New Hampshire farmers.

NH Farm to School Receives Grant for Gleaning Work
http://www.unh.edu/news/releases/2013/mar/sc06gleaning.cfm
http://www.unh.edu/campusjournal/2013/03/nh-farm-school-receives-funding-state-gleaning-work
http://us1.campaign-archive1.com/?u=f961de241cb5cbfd3ddcd440&id=f7529030e2

New Hampshire Farm to School, which is housed in the Sustainability Institute at UNH, was awarded a grant of more than $38,000 from the New Hampshire Charitable Foundation to support gleaning, the collection of leftover crops from farmers’ fields. Through gleaning, Farm to School aims to reduce food waste and bring fresh, local produce to state food banks, public schools, and others in need.
New Hampshire Lakes Region Local Food Guide Available

To help meet the increasing demand for locally grown produce from the New Hampshire lakes region by residents and visitors alike, the first edition of the New Hampshire Lakes Region Food Guide has been published. The project coordinator, UNH Cooperative Extension food and agriculture specialist Kelly McAdam, says the guide will help “support the growing agricultural activity while promoting community health, wellness, and the local economy.”

Organic Dairy Research Farm
http://colsa.unh.edu/article/fall-2013/organic-dairy-research-farm

During the summer of 2013, the UNH Organic Dairy Research Farm began using the aerobic digestion research facility built in the fall of 2012. The facility will allow the Dairy to capture metabolic heat released from microbes as they compost bedding, manure, and urine wastes, and then utilize that energy to pre-heat the water system in the milking parlor. Research this year included using the Organic Dairy Research Farm as a model system for measuring greenhouse gases, crop productivity, soil nutrient cycling, and manure management.

Paradigm Shift in the Soil
http://colsa.unh.edu/article/fall-2013/paradigm-shift-soil

Ph.D. student Cynthia Kallenbach ’15 is analyzing the evolution of soil organic matter and microbial growth in artificial soils treated with various types of carbon. Her initial results show that microbes play a primary role in the formation of soil organic matter, challenging the long-held belief that chemically complex plant inputs were necessary. Her advisor, Stuart Grandy, assistant professor of soil biogeochemistry, explains that Kallenbach’s research has broad implications for how soil is managed for various crops.

Researchers Receive Grant to Study Declining N.H. Moose Population
http://www.unh.edu/unhtoday/tick-tick-moose
http://www.unh.edu/campusjournal/2013/10/researchers-receive-grant-study-declining-nh-moose-population

In 1996, more than 7,600 moose roamed New Hampshire’s northern woods and mountains, but in 2013, the estimated population was 4,400. UNH professor of wildlife biology Peter Pekins says, “We think it’s probably a combination of parasites and diseases.” UNH researchers suspect that climate change – winter arriving later and snow melting earlier – is allowing winter ticks to thrive, causing increased anemia, more blood and hair loss, and decreased ability to reproduce in the moose that host them. In partnership with N.H. Fish and Game, Pekins is leading a new study that will track up to 100 calves and adult female moose over the next two years to learn why the population size is decreasing.
Researching Soil Hydrogen Dynamics in Subarctic Sweden
http://www.unh.edu/inquiryjournal/spring-2013/researching-soil-hydrogen-dynamics-subarctic-sweden

Victoria Ward ‘13 spent the summer of 2013 conducting a research project in Sweden with research teams from the United States, Britain, Bangladesh, Spain, Russia, and Germany. Ward analyzed the behavior of soil hydrogen in response to rain events and presented her findings at the 2013 American Geophysical Union Fall Meeting in San Francisco. Ward is pictured, second from left, by the Abisko River gorge in Sweden with other Northern Ecosystems Research for Undergraduates (NERU) students.

Sampling Soil from Farther Afield
http://colsa.unh.edu/article/spring-2013/sampling-soil-farther-afield

Michael Cassaza ‘13, an environmental conservation studies major, was a recipient of an International Research Opportunities Program Fellowship in 2013 that allowed him to spend nine weeks doing research in Uganda. Working with post-doctoral researcher Lisa Tiemann and a lab group led by assistant professor of soil biogeochemistry Stuart Grandy, Cassaza spent the summer researching Uganda’s insecure food supply, which is caused by rising population and decreasing soil fertility.

Saving Money and Time with Tablets
http://extension.unh.edu/articles/Saving-Money-and-Time-Tablets

Cheryl Smith, UNH Cooperative Extension plant health specialist, and Brian Krug, Extension greenhouse and floriculture specialist, were awarded a grant by the N.H. Department of Agriculture, Markets & Food to provide iPad® tablets to Extension food and agriculture field specialists. The tablets will allow field staff to have information available at their fingertips. This will give them the ability to diagnose plant health problems more quickly, whether the plant is growing in a nursery, greenhouse, or farm. Smith and Krug also use the tablets to communicate via Skype with other field specialists and growers to ask questions while examining the plants in real time.

Snake Whisperers
http://www.unh.edu/unhtoday/2013/01/snake-whisperers

Loren Valliere, a 2011 UNH environmental biology graduate, and Brendan Clifford, a 2005 UNH wildlife management graduate, are working as part of a research team in the Nongame and Endangered Wildlife Program of the New Hampshire Fish and Game Department. Their project focuses on a novel study of black racer snake habitat usage in New Hampshire. Black racers were listed on New Hampshire’s list of endangered species in 2008.

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Stacia Sower: From Lampreys to Legend, A New Chapter in Neuroscience

Stacia Sower, Director of the Center for Molecular and Comparative Endocrinology at UNH, professor of biochemistry, and 30-year faculty member at UNH, studies lampreys, a species “around long before the dinosaurs.” Lampreys are the most basal vertebrates, which allows her to look at the “basic plan” of the molecular control of reproduction common to all vertebrates. Recently named as a prestigious American Association for Advancement of Science Fellow, her current research focuses on discovering how neurohormones act to control metabolism and metabolism development.

Subhash C. Minocha, Professor of Biological Sciences and Genetics – Jordan
http://unh.edu/cie/subhash-minocha

Professor of biological sciences and genetics Subhash C. Minocha travelled to Jordan to give lectures, facilitate discussions, and share his research and information about UNH Project SMART at the King’s Academy and the University of Jordan. His general lecture, “Biotechnology – Opportunities and Challenges,” was presented to the entire School Assembly at the King’s Academy, more than 400 students, professors, and researchers. Project SMART (Science and Mathematics Achievement through Research Training) is a UNH summer institute for rising high school juniors and seniors.

Taking it to the Bank
http://colsa.unh.edu/article/spring-2013/taking-it-bank

Students in Estelle Hrabak’s Genetics Lab course receive hands-on research experience isolating specific genes for DNA sequencing. In addition to learning real-world research techniques, the students are working to generate the first-ever DNA sequences for watermelon, dill, basil, and mustard plants grown from seed to include in the GenBank database. Pictured at right, Alexis Reddel ’15 examines a petri plate containing an isolation streak of E. coli.

The Bees and Dinosaurs Connection – Both Went Extinct 65 Million Years Ago
http://www.unh.edu/unhtoday/bees
http://www.unh.edu/news/releases/2013/10/bp24bees.cfm#ixzz2pv82sPVz

Working in collaboration with two scientists from Australia, assistant professor of biological sciences Sandra Rehan was the first to document an extinction of bees that occurred during the event that resulted in the loss of dinosaurs and many flowering species. Rehan explained that “understanding extinction and the effects of declines in the past can help us understand the pollinator decline and the global crisis in pollinators today.”
The Evolution of Teaching

Matt MacManes, an evolutionary biologist who works at the intersection of genomics, field biology, and evolutionary biology, is the first of five new scientists with a background in genomics that will be joining the faculty of the College of Life Sciences and Agriculture (COLSA). Jon Wraith, COLSA dean, said that the new faculty from the genome-enabled biology cluster hire will “significantly increase our abilities to address student enrollment demands, build upon [UNH] research excellence, and enhance our services to the institution, profession, and stakeholders.”

The Great (Yellow and White) Pumpkin - Brent Loy Breeds Two New Varieties

Brent Loy, professor of plant biology and genetics, has conducted research at UNH for 45 years. During that time, he has developed over 60 kinds of plants that have been licensed to commercial seed companies by the University. Loy’s plant breeding expertise lies in melons, winter and summer squash, ornamental pumpkins, and gourds. Loy’s white pumpkin, Moonshine, began selling in seed catalogs about two years ago, and his jack-o-lantern Sunlight will appear soon.

The Macfarlane Greenhouse Facility

Research at the Greenhouse includes a project in collaboration with the Universities of Maine and Vermont to assess the potential for the emergence of new cropland weeds in northern New England as a consequence of climate change, as well as Brent Loy’s ongoing experiments with the breeding and genetics of cucurbits and tomatoes. In the spring, the Greenhouse collaborated with Strawberry Banke’s Curator of Historic Landscapes, John Forti, to grow a variety of heirloom ornamental and vegetable plants for use in the museum’s gardens.

Third Annual New England Food Summit Convenes in Maine

Delegates from UNH joined others from across New England in Portland, Maine for the third annual New England Food Summit. Convened by Food Solutions New England, the summits are designed to build upon ongoing regional efforts and to clarify regional priorities and action items that states can effectively undertake together.
UNH Greenhouses Get Top Grade for Sustainability
http://colsa.unh.edu/article/spring-2013/putting-green-greenhouse  
http://www.unh.edu/news/releases/2013/11/bp06sustainable.cfm  
http://www.unh.edu/campusjournal/2013/11/unh-greenhouses-get-top-grade-sustainability

The Macfarlane Greenhouse Facility received an “A” in sustainability by the Milieu Project Sierteelt (MPS) Group of the Netherlands. The Greenhouse is the first teaching and research greenhouse in the world to participate in the certification program. The MPS program assesses energy, water, and fertilizer use; crop protection methods; and waste management (including CO$_2$). The distinction reflects UNH leadership throughout northern New England and sets a standard for responsibility in agriculture and food production.

UNH Researcher Receives $750,000 from NSF for Ongoing Work on Lamprey Hormones
http://www.unh.edu/news/releases/2013/aug/bp29lamprey.cfm  

Stacia Sower, Director of the Center for Molecular and Comparative Endocrinology at UNH and professor of biochemistry, is the recent recipient of a rare, accomplishment-based renewal grant from the National Science Foundation (NSF). These grants are awarded only to researchers who have consistently made significant contributions to their fields over the course of their careers. The award also acknowledges her past productivity, evidenced by 170 publications and continuous NSF support since 1986. The grant will fund Sower’s research of reproductive hormones in the sea lamprey, one of the oldest lineages of vertebrates.

UNH Researchers Contribute to First Sequence of Lamprey Genome
http://www.unh.edu/campusjournal/2013/02/unh-researchers-contribute-first-sequence-lamprey-genome

Professor of biochemistry Stacia Sower and colleagues in the UNH Center of Molecular and Comparative Endocrinology contributed to the sequencing of the sea lamprey genome. Their work suggests an evolutionary connection between the sea lamprey – a jawless, fish-like parasite with a tooth-lined suction cup for a mouth – and humans. This breakthrough in vertebrate evolution was reported in a 2013 issue of Nature Genetics.

UNH Researchers Develop Drones for Orchard Management
http://www.unh.edu/news/releases/2013/11/bp13applescab.cfm  
http://www.unh.edu/campusjournal/2013/11/researchers-develop-drones-orchard-management

Assistant professor of plant pathology Kirk Broders and Ph.D. student Matt Wallhead are bringing precision agriculture to New England orchard management by creating a financially efficient unmanned aerial vehicle (UAV). The UAV is equipped with a camera, GPS, and infrared technology, which will enable researchers to see early pests, nutrient stress, and infections affecting crops.
UNH Student Receives Prestigious American Cancer Society Fellowship
http://www.unh.edu/campusjournal/2013/04/unh-student-receives-prestigious-american-cancer-society-fellowship

Jenny Jing ‘13, a biomedical sciences major and Honors Program senior, was selected as an Alvan T. – Viola D. Fuller Junior Research Fellow by the American Cancer Society. The Fuller Fellowships offer undergraduate students from New England an opportunity to participate for ten weeks during the summer in laboratories conducting cancer research. During the summer of 2013, Jing worked in the Massachusetts General Hospital lab of Harvard University pathology professor Andrea McClatchey.

UNH, UC Davis Launch Network to Study Environmental Microbes
http://www.unh.edu/news/releases/2013/11/bp07microbes.cfm#ixzz2pvE96bpw
http://www.unh.edu/campusjournal/2013/11/unh-uc-davis-launch-network-study-environmental-microbes

Scientists at UNH and the University of California, Davis received a $500,000 grant from the National Science Foundation to create a Research Coordination Network on microbial biodiversity. Their work will utilize novel genome sequencing technology to study and classify eukaryote species such as fungi, single-celled animals, and marine nematodes (pictured at left), an abundant yet largely unknown category of organisms. W. Kelley Thomas, Hubbard Professor in Genomics and director of UNH’s Hubbard Center for Genome Studies, is co-principal investigator on this research that will lead to a better understanding of the vital functions these organisms play in the environment.

What Is There to Lose?
http://unh.edu/cie/newsletter/2013/spring/uganda-tiemann.html

Lisa Tiemann, a post-doctoral researcher and soil biogeochemist, spent the summer of 2013 collecting soil samples from 150 sites around Kibale National Park in Uganda. She is collaborating with UNH agroecologist Stuart Grandy and geographer Joel Hartter to conduct preliminary research for Uganda’s implementation of a healthy soil fertility management strategy that aims to prevent wide scale food insecurity in the densely populated country. Her research is supported by a three-year fellowship from the National Science Foundation’s Science, Engineering, and Education for Sustainability program.

Wildflower Guide Now Available Online
http://extension.unh.edu/articles/Wildflower-Guide-Now-Available-Online

Cathy Neal, UNH Cooperative Extension nursery and landscape horticulture specialist, and Amy Douglas-Papineau, a research assistant, are studying wildflower meadow establishment. They have created an online resource and photo guide for native wildflowers, from seedling stage to mature plants. The New Hampshire Plant Growers Association Horticulture Endowment Fund provided initial funding for the research, and further funding has been provided by New England Grows and the UNH College of Life Sciences and Agriculture through the Anna and Raymond C. Tuttle Environmental Horticulture Fund.
Woodman Farm

http://colsa.unh.edu/article/fall-2013/woodman-farm

The variety of research projects at the Woodman Farm reflects the breadth of interests of UNH faculty. In 2013, a hardy kiwi breeding project was started. At the same time, scientists and students continued studies of bitter rot and apple scab, made advancements in strawberry genetics and plant breeding, carried out a peach tree pruning experiment, and researched greenhouse salad greens in collaboration with the New Hampshire Department of Agriculture, Markets, and Food. The Woodman Farm also is a regular host to tours for University classes as well as local and regional schools.