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I thank Chairman Lucas, Ranking Member Lofgren, and Members of the Committee for the privilege of testifying on the important topic of U.S. competitiveness in science and technology. I also am grateful to Committee staff for the hard work they do behind the scenes each and every day, and in organizing this hearing.

My name is Kelvin K. Droegemeier, and I am Regents' Professor of Meteorology, Weathernews Chair Emeritus, and Roger and Sherry Teigen Presidential Professor at the University of Oklahoma. I also am former Vice President for Research at the University of Oklahoma, former Oklahoma Cabinet Secretary of Science and Technology, and former member of the National Science Board (2004-2016), serving the last four years as Vice Chairman. From 2019 until 2021, I served as Director of The White House Office of Science and Technology Policy (OSTP) and Science Advisor to the President. For two and a half months during my time at OSTP, I also served as Acting Director of the National Science Foundation. I am testifying today solely in my roles as an academic teacher, researcher, administrator, and contributor to national science and technology policy. My views and recommendations do not reflect those of the University of Oklahoma or its Board of Regents.

This Committee has long been a bi-partisan champion of science and technology, and over many years has enacted important legislation to foster national prosperity, economic security, quality education, and international competitiveness through research, especially that which is born out of human curiosity but ultimately finds its way into practical uses which transform society. Nowhere has this been more evident than during the COVID-19 pandemic, where fundamental research in biology, mathematical modeling, human behavior, biochemistry, advanced telecommunication, artificial intelligence, supply chain management, manufacturing and, of course, human health, allowed us to lead the world in understanding and taking measures to address a global crisis.

The pandemic made ever clearer the importance to humanity of science and technology research and development, and thus I deeply appreciate this Committee's work on the CHIPS Act of 2022, which contains numerous provisions that will help ensure U.S. leadership in science and technology. Among the most important is a bottom-up quadrennial assessment of our entire

science and technology research and development enterprise, along with the creation of a National Science and Technology Strategy. I worked toward exactly these same goals while at OSTP, so I am especially encouraged to see this Committee hold a hearing on U.S. competitiveness through the lens of these important activities. I also appreciate the opportunity to provide input, and I stand ready to help in whatever ways you believe to be most beneficial.

1. The Big Picture: U.S. Global Leadership in Science and Technology

Countless reports have been written about the evolution of U.S. global leadership in science and technology (S&T) following World War II, underpinned in many respects by Vannevar Bush's 1945 seminal treatise, *Science: The Endless Frontier*.[1] Consequently, I need not recount here the many extraordinary S&T outcomes pioneered by the U.S. and its international collaborators, which have contributed to economic prosperity, national security, improved health and quality of life, and a brighter outlook for future generations. However, I do wish to describe what I consider to be the two most important factors in achieving this success, and which should figure prominently in the National S&T Strategy (hereafter NSTS) required by the CHIPS Act.

The first concerns our values and freedoms – the freedom to discover and create; the freedom to debate, challenge, and speak freely; the freedom to share; a free market system to transition research outcomes into practice for the benefit of humanity; and the freedom to pursue our own pathways and dreams. Importantly, and not surprisingly, these values are congruent with the very values by which research itself is conducted, namely, honesty, integrity, transparency, accountability, impartiality, objectivity, reciprocity, rigorous civil debate, respect, and merit-based competition.

The U.S. has always been a beacon of values and freedom to the world, and that beacon shines brightly from our research enterprise. **In a world where values and freedoms are not universally treasured and reinforced, and where authoritarian regimes seek to undermine longstanding norms and international order, the U.S. must maintain its global leadership position in S&T not only by virtue of its contributions, but also by *leading with its values*. Consequently, the NSTS should be built upon a set of principles and values that reflect the essence of our Nation's foundation and the conduct of research itself.**

The second factor concerns the multi-sector U.S. S&T enterprise, comprising academic institutions, which perform research and educate the next generation workforce; state and Federal government organizations, which both fund as well as perform research; for-profit companies, which innovate research outcomes to create products and services beneficial to society; and non-profit organizations, which fund research, help identify future priorities, organize and support professional communities, and contribute to policymaking. Our well over $600 billion yearly expenditures in S&T research and development (R&D) occur within this powerful ecosystem, which boasts trillion-dollar companies, support structures which have funded numerous Nobel Laureates and countless other scholars, five or more of the world's top 10 research universities (depending upon the source of the rankings), and 17 U.S. Department of Energy (DoE) National Laboratories which are unique in the world. **Therefore, it is vitally important that the NSTS be structured as a *whole-of-Nation plan*, involving all sectors of the U.S. S&T R&D ecosystem in an integrated manner – from planning through execution. As noted below, every sector should "see itself" in the plan and be able to use the plan to help chart its course for the future.**

2. The U.S.-China S&T Relationship: Collaboration, Competition, and Concerns

S&T R&D inherently are both domestic as well as multi-national activities, ranging from individual faculty collaborations on fundamental/curiosity-based research to massive, long-term corporate projects or multi-national facilities such as telescopes and particle accelerators. The benefits of such collaborations, and the contributions made to them by foreign nationals studying or working in the U.S. – including individuals from China – are well established[2] [3] [4] and have yielded important benefits for society. Examples include the rapid identification of the COVID-19 virus and development of vaccines and other therapies to combat it; the first image of a black hole shadow; and foundational theories of turbulence in fluids, to name but a few. Collaboration quite often yields the best outcomes by bringing to the table a diversity of ideas and perspectives, thereby enriching the research and promoting learning and a broadening of views.

Collaboration between the U.S. and China in S&T can be evaluated in a variety of ways, ranging from funded projects or formal publications involving researchers from both nations to educational exchange programs. As an example of the former, in 2020, 22% of all science and engineering (S&E) articles produced in China had international co-authors[a], while in the U.S., the figure was 40%.[5] Slightly over 26% of U.S. international articles had U.S. and Chinese co-authors, up from 14% in 2010.[5] Indeed, the number of publications having both U.S. and Chinese co-authors grew steadily from approximately 10,000 in 2007 to approximately 62,000 in 2019.[6] About one-third of the papers in 2019 had authors with dual U.S.-China affiliations, though that number fell sharply through 2021.[6]

As in most aspects of society, including sports, private business, and even families, competition is valuable if pursued in an appropriate manner. S&T research is no exception, and **China clearly is seeking to establish global dominance in S&T and thus is an important competitor for the U.S**. Xi Jingping, President of the People's Republic of China (PRC), stated the following during an address on May 28, 2021 to the Chinese Academies of Sciences and Engineering, and the China Association for S&T[7]:

> *"Science and technology self-reliance and self-strengthening should always be considered a strategic support for national development. Scientific and technological development must target the global science and technology frontiers, serve the main economic battlefields, strive to fulfill the significant needs of the country and benefit people's lives and health. Scientists and engineers must closely follow current trends, take the initiative, confront problems head-on, and overcome difficulties."*

China has made significant investments in S&T and has begun to reap significant benefits from them. Its strategic innovation triangle[7] involves a 15-year medium-long term S&T Plan, Education Reform Plan, and Talent Plan. China's internal expenditures on R&D grew in 2020 to

[a] From the source document, "articles are classified by their year of publication and are assigned to a region, country, or economy on the basis of the institutional address(es) of the author(s) listed in the article. Articles are credited on a whole count basis (i.e., each collaborating country or economy is credited with one count). Articles without international co-authorship are counts of articles with one or more institutional addresses all within a single region, country, or economy, which include single-author articles and articles coauthored under the same institutional address. International articles are articles with institutional addresses from more than one country or economy.

over 2.4% of gross domestic product (GDP) and could reach 2.8% if current trends continue.[7] By comparison, the U.S. in 2020 expended 3.45% of GDP.[8] Gross domestic R&D expenditures by China in 2019 were $526 billion compared with $658 billion for the U.S.[9] In terms of purchasing power parity (PPP)[b] dollars, China has been accelerating its investments rapidly since the early 2000s and likely has overtaken the U.S. by now in both real dollars and percentage of global share.[10] China's R&D spending focuses mostly on experimental and applied work conducted at enterprises other than universities.[7] Since approximately 2010, the source of Chinese government funding for R&D has shifted from the central to local governments.[7]

One important measure of originality in innovation, and the translation of research outcomes into practical benefits for society, is the patent. A recent article by the Center for Strategic and International Studies[11] notes that, based upon raw aggregated data, China began to emerge in 2010 as the world's leader in patent applications and grants, exhibiting significant yearly increases thereafter. Conversely, U.S. trends have been much more modest, resulting in China having more than twice the number of patent applications in 2020.[11] Of course, a more important measure is the number of patents granted, and by that measure, China has a roughly 50% lead compared to the U.S.[11] One must be careful in interpreting this figure, however, because it is believed[12] that much, if not most of China's patents do not have value in the marketplace, and that factors other than the desire to protect intellectual property for innovating products and services are at play.

Turning to education, in 2016, China produced more than twice the number of first (baccalaureate) university degrees in S&E compared to the U.S. (which produces the second most).[13] Some 15 years earlier, China was in third place globally. As of 2018, the U.S. awarded slightly more S&E doctoral degrees than China (41,071 compared to 39,768).[14] In 2020, the U.S. awarded 42,622 S&E doctoral degrees,[15] with 13.4% awarded to temporary visa holders from China.[16] Also in 2020, nearly three-quarters of doctoral recipients on temporary visas in the U.S. said they intended to remain here, which is an increase of some four percentage points since 2010.[17]

It has been said that research and innovation anywhere are good for research and innovation everywhere, and that a rising tide lifts all boats. Both are true. However, **the U.S. cannot rely on the global rising tide of S&T research and innovation to lift its boat. It must develop a bold, transformative S&T Strategy that allows it to sail higher, move more quickly, unleash the creative talents of every individual, collaborate intentionally, and lead globally with its values (see below)**. The CHIPS Act provides an opportunity to do just that.

3. Thoughts on Developing the National S&T Strategy and Quadrennial S&T Review

Congress has provided the Nation with an important and unprecedented opportunity to take full stock of its current capabilities in S&T across all relevant sectors, and to develop a forward-

[b] According to the Organization of Economic Cooperation and Development (OECD; oecd.org/sdd/purchasingpowerparities-frequentlyaskedquestionsfaqs.htm#FAQ1), "PPPs are the rates of currency conversion that equalize the purchasing power of different currencies by eliminating the differences in price levels between countries. In their simplest form, PPPs are simply price relatives that show the ratio of the prices in national currencies of the same good or service in different countries. PPPs are also calculated for product groups and for each of the various levels of aggregation up to and including GDP."

looking strategy congruent with and supportive of other Federal plans and strategies for which S&T are foundational to domestic success and global leadership. I offer in this section views and recommendations regarding the NSTS and Quadrennial S&T Review (hereafter QSTR).

Point #1. Scope and Structure of the NSTS. As noted previously, it is vitally important that the NSTS be structured as a whole-of-Nation plan, involving all sectors of the U.S. S&T R&D ecosystem in an integrated manner – from the very inception of planning through execution. Every sector should "see itself" in the plan, and organizations within each sector should be able to use the plan to help chart their course for the future in a manner that supports national goals but is not dictated by them. **Additionally, and very importantly, participating stakeholders should be drawn from sources in addition to the most prestigious and highly ranked organizations.** In the case of academic institutions, this includes but is not limited to individuals from EPSCoR (see below) jurisdictions, Minority Serving Institutions (MSIs), Historically Black Colleges and Universities (HBCUs), emerging research institutions (ERIs, defined as institutions having less than $50 million per year in Federal research expenditures), rural institutions, and two- and four-year institutions.

Although developing the QSTR and NSTS will be monumental tasks, even more difficult and important will be ensuring their effective use. We are all too aware of massive strategic plans which mostly sit on the shelf and then are set aside after elections. This must not be the case here, which leads to the next point.

Because the NSTS and QSTR are arguably broader than any assessments or plans ever developed, it will be impossible to construct them in a traditional manner, e.g., by mining numerous reports from Federal agencies, private companies, academia, and non-profit organizations, and conducting listening sessions and focus groups. Consequently, **the power of artificial intelligence (AI) should be brought to bear to assemble and synthesize information across all sectors and key organizations, identify gaps and needs, draw comparisons with the plans of other nations, and empower the developers of NSTS and QSTR to propose bold new ideas and pathways.** AI was shown to be profoundly important in the COVID-19 pandemic, especially in synthesizing information from the thousands of publications which were emerging at extraordinary speed (see below). AI can play an even greater role with the NSTS and QSTR.

Point #2. A Plan Like No Other. The NSTS should put forth a strategy that is **highly transformative and disruptively creative**, taking a bottom-to-top approach that enables a seamless ecosystem among all sectors of the U.S. S&T R&D enterprise. It should be like no other plan, domestic or international, and do what research itself does: ***Inspire* us with bold ideas, *unite* us in our work, and *guide* us into the future**.[18]

Although we tend to speak about innovation in the context of S&T, it is important to recognize that **policy and administrative frameworks can be equally innovative**. Our ability to work across sectors is significantly challenged,[19] and researchers are overwhelmed by rules and regulations that tie our hands rather than loosen our creative capabilities. The fact that faculty in our universities spend, on average, between 42% and 44% of their time on administrative activities, unrelated to research,[20] is completely unacceptable – especially given that these percentages have not changed meaningfully in

over two decades despite the addition of research administrative and regulatory compliance personnel at many universities. And indeed, those percentages likely will increase with additional administrative tasks related to safeguarding research, as noted below. These and other challenges have been known for many years, yet no significant relief has been forthcoming despite well-intentioned attempts. The NSTS and QSTR have an opportunity to drive the needed change.

Because many of the needed changes are difficult to achieve *en masse*, **the NSTS could propose a set of experiments (e.g., in academic-corporate partnerships; Federal research assistance awards to academic researchers) in which specific stifling regulations are temporarily suspended or streamlined (e.g., via Executive Order) as a proof-of-concept, with the outcomes used to implement broader change**. The COVID-19 pandemic provided an unfortunate experimental framework where, owing to urgency and uncertainty, capabilities were developed which otherwise would not have occurred (e.g., the CORD-19[21] data base of publications and artificial intelligence applications, the nascent National Strategic Computing Reserve,[22] and of course, Operation Warp Speed[23]). Lessons learned from these and other activities should inform bold recommendations within the NSTS.

Point #3. Leave Politics Behind. The NSTS and QSTR should be **entirely apolitical and bi-partisan**, avoiding some of the political overtones in previous plans and assessments. The best way to accomplish this goal is to begin with a set of **guiding principles** to which all S&T sectors and political parties can agree, and use them as a North Star when challenging issues tend to create division on specific topics. I am pleased Congress chose The White House Office of Science and Technology Policy (OSTP), rather than specific departments or agencies, as the focal point for developing the NSTS and QSTR. Its current leadership is exceptionally qualified to lead these initiatives and has demonstrated its ability to view S&T through an objective lens.

Point #4. Broaden the Engagement of Institutions. Considerable focus has been placed recently, including in the CHIPS Act and with good reason, on providing additional funding for research to MSIs, HBCUs, and ERIs. However, often overlooked is the fact that such institutions lack the administrative capabilities to assist their faculty and other researchers in identifying and pursuing funding, managing awards once received (including the significant amount of reporting and compliance involved), commercializing intellectual property, developing multi-sector partnerships, and addressing issues of foreign government interference (see below). Consequently, simply providing more funding for research, without addressing the administrative challenges, can set such institutions up for failure, or at least significant problems.

Steps are being taken to address this capability gap to enable many more academic institutions to participate in the U.S. research enterprise. One unique example is the NSF GRANTED (Growing Research Access for Nationally Transformative Equity and Diversity) program[24], which "focuses on addressing systemic barriers within the nation's research enterprise by improving research support and service capacity at emerging research institutions." **It is important that the NSTS recognize the value of engaging every type of institution in the U.S. academic research enterprise, building upon the GRANTED concept and creating not only research, but also administrative**

partnerships across the spectrum of our Nation's institutions – large and small, public and private, long established and just getting started.

Point #5. Take the Long View. Congress has detailed in the CHIPS Act several key components of the NSTS, including that it spans four years. I support that idea. However, **the NSTS should be constructed within the context of a 25-year "horizon or arc," which does not identify specific technologies or research areas of investment – for doing so is impractical – but rather describes, in broad strokes, a U.S. vision for its future in terms of research, education, technology, domestic and international partnerships, and national and international norms of behavior**. By taking such a long view – which in fact is precisely how China operates – the U.S. could have, perhaps for the first time since World War II, a multi-decadal national context for its S&T future, within which resides a specific plan for the next four years.

This approach has the benefit of preserving the ability of the research and technology communities to take the lead in determining which activities should receive the greatest attention and resources. Although it may be tempting to create prioritized lists of specific S&T topics to be pursued (e.g., quantum computing, biotechnology, artificial intelligence, climate change), I believe we do not have such luxury. Rather, these and numerous other areas represent high priorities for the future in today's exciting but dangerous world. Consequently, the NSTS should identify **foundational elements of these and other societal imperatives** (e.g., data, communication, computation, experimentation) and ensure *they* are addressed – thus allowing numerous activities which build upon them to emerge and thrive.

Point #6. It Boils Down to People. One cannot overstate the importance of human capital to the future of U.S. science and technology research and education. Countless reports have been written about the trajectory of demographics in the U.S., the need for both a skilled STEMM (science, technology, engineering, mathematics, medicine) workforce and a skilled technical workforce, the importance of international students and workers, and the need to engage those who are traditionally underrepresented, underserved, and under-resourced. Hundreds of billions of dollars have been invested in a wide array of initiatives, national strategies have been written, and important progress is being made.

However, the NSTS and QSTR provide the U.S. with an opportunity, as never before, to coordinate workforce development on a national scale with broad national goals that involve all sectors of the S&T enterprise. I personally believe **the U.S. needs a national STEMM workforce/talent initiative, similar in many respects to the GI Bill**, which could both leverage and in some cases supplant current individual workforce initiatives and achieve what they alone have been unable to do. Namely, identify and educate what the National Science Board calls the Mission Millions.[25] **Such an initiative, which should include a participant service component to the Nation as well as a commensurate program to substantially build the teaching workforce,** would in my view be much more efficient, and lead to greater progress much more quickly, than the current array of (in many cases) disconnected programs. It also could address important issues raised in a new report by the National Academies of Science, Engineering and Medicine on diversity, equity and inclusion in STEM organizations.[26]

Additionally, the future of education, industry requirements for workers, and how individuals view themselves is not about degrees and years of service, but rather about skills, competencies, and credentials. **The NSTS is ideally positioned to provide a bold vision for moving toward a skills-based education and workforce environment, where an assemblage of demonstrated skills and capabilities is recognized as the coin of the realm**. The winds of change already are blowing in this direction, and the multi-sector approach for NSTS is ideally suited toward engaging this topic in a coordinated national manner.

Point #7. The Essential Role of Partnerships. As noted previously, the U.S. multi-sector S&T enterprise is extraordinary in its historical evolution, capabilities, and achievements. Yet, partnerships among the sectors, and even across Federal agencies, remain onerous and overly complicated owing to regulations, differing perspectives, and historical inertia. Progress happens, but the cost in terms of time and talent is far greater than it should be. Why are partnerships important and why do we need them? Because partnerships bring together people, ideas, funding, facilities, and other resources to achieve certain important goals which otherwise would be unattainable.

One relatively simple solution – which is applied occasionally – is to **have the heads of Federal R&D agencies develop relationships with heads of private non-profit and for-profit companies to "set the table" for the strategic manner in which they might partner**. All three types of organizations have different philosophies, administrative and governance structures, capabilities, and rules and laws under which they operate. This is in fact an extraordinary strength that can be leveraged in partnerships, for when two or more join together, amazing things can happen. Yet, all too often, we leave it to individual researchers or centers to build S&T relationships with companies or non-profit foundations. In many cases, the researchers are not skilled in building such relationships, especially for institutions which traditionally have not engaged in such activities. Although such interactions need to occur, we need to add strategic, institutional-leader-to-institutional-leader coordination that establishes a framework for partnering, which then can be executed by others within the organizations. This will greatly broaden the number and type of institutions participating in partnerships and lead to collateral benefits such as local and regional economic development, especially in disadvantaged regions.

Indeed, regional innovation is key, and important strides are being made in this regard, e.g., by the NSF Regional Innovation Engines and DoE Innovation Hubs. In fact, a recent report[27] on the future of the NSF EPSCoR (Established Program to Stimulate Competitive Research) program emphasizes jurisdictional (i.e., state-level) transformation via the collective engagement of universities, state government, for-profit companies, business organizations such as Chambers of Commerce and the Business Roundtable, and non-profit organizations.

Point #8. Safeguard Science and Technology. In developing the NSTS, we must recognize, as Congress did in writing the CHIPS Act (and NDAA as well), that **the U.S. faces new and ever-changing threats of foreign interference to its S&T enterprise**. Examples include failure to protect confidential information in grant proposals and subverting the peer review process, failure to disclose required information including

conflicts of interest and commitment, misappropriation of research results and credit, and outright theft of intellectual property.[28] [29] [30] [31] [32] [33] [34] [35] [36] In partial response, OSTP established in 2019 the Joint Committee on the Research Environment (JCORE)[37] within the National Science and Technology Council (NSTC). A particularly important JCORE sub-committee addresses issues of research security to ensure an **appropriate balance exists between the openness needed for U.S. research to thrive, including via principled international collaboration, and the protection of research ideas, methodologies, processes, data, and technologies prior to their formal publication or intellectual property protection.**

Numerous activities are underway to address research security challenges, starting with National Security Presidential Memorandum #33 (NSPM-33), issued in January, 2021.[38] An NSTC report was issued that same month on recommended practices in research security for research organizations (universities, private companies, independent research institutes),[39] and in January, 2022, OSTP issued guidance to Federal R&D agencies on implementing NSPM-33.[40] Numerous others activities are underway, as specified in the CHIPS Act and NDAA, including in the former the creation by NSF of a Research Security and Integrity Information Sharing Analysis Organization (RSI-ISAO). Additionally, workshops and studies are underway by government organizations, disciplinary societies, professional associations, and the National Academies of Science, Engineering and Medicine (NASEM).

Universities are responding as well, and the Massachusetts Institute of Technology (MIT) created an especially thoughtful approach to engaging with China[41] that is being considered by other institutions. Yet, the cost of such actions is significant, not only monetarily to taxpayers viz Federal funding agencies and research institutions, but also to researchers themselves in the form of increased administrative overhead at the expense of conducting research.[42] **We must be careful to empower our researchers, not constrain them unnecessarily.**

At the end of the day, research security boils down to behavior – namely, playing by the rules. This means understanding the rules, seeing them modeled, knowing how to comply with them, and being aware of the consequences of non-compliance. **Here again is an opportunity for the U.S. to lead with its values – to welcome foreign collaborators who may be less familiar with ethical conduct in research based upon the environments in which they were educated and trained, and to ensure their behavior, as well as the behavior of everyone in the U.S. research enterprise, reflects the highest professional standards and adherence to laws and policies.**

Point #9. Bring Benefits to the Public. The general public is the most important stakeholder in the U.S. S&T enterprise. This point was underscored by the National Science Board in its Vision 2030 report[25], for which one pillar of its roadmap is Delivering Benefits from Research. **The NSTS likewise should emphasize the delivery of benefits to the public, not only in the form of products and services, but also in U.S. leadership regarding the ethical conduct of research as well as the ethical use of technology**. With regard to the latter, the U.S. has long been an international leader, e.g., in the set of ethical principles for AI, which in May, 2019 was adopted by 42 OECD (Organization for Economic Cooperation and Development) nations[43].

<u>Point #10. Don't Play to Not Lose</u>. For my final point, working at a university in which football is far more than a topic of casual conversation, I know well, as do others, that one does not win games by playing to not lose. Although S&T research and education are not games and are not about winning and losing *per se*, they are in fact influenced by the manner in which the U.S. develops its "game plans" and executes them, especially in the context of funding. **The U.S. is positioned, with development of the NSTS, to have a very strong and powerfully unique S&T game plan for the future, leading with its values, working with the international community, and investing wisely and boldly to ensure it remains the highest ship on the seas.**

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[39] https://trumpwhitehouse.archives.gov/wp-content/uploads/2021/01/NSTC-Research-Security-Best-Practices-Jan2021.pdf
[40] https://www.whitehouse.gov/wp-content/uploads/2022/01/010422-NSPM-33-Implementation-Guidance.pdf
[41] https://orgchart.mit.edu/sites/default/files/reports/20221116-AssociateProvost-University-Engagement-with-China-final.pdf
[42]https://www.cogr.edu/sites/default/files/Version%20Dec%205%202022%20research%20security%20costs%20survey%20FINAL.pdf
[43] https://oecd.ai/en/ai-principles

Brief Biography of Dr. Kelvin K. Droegemeier

Dr. Kelvin K. Droegemeier is Regents' Professor of Meteorology, Weathernews Chair Emeritus, and Roger and Sherry Teigen Presidential Professor at the University of Oklahoma, where he served for nearly a decade as Vice President for Research. He has been at OU for 37 years and co-founded and directed one of NSF's first Science and Technology Centers. He served two 6-year terms on the National Science Board, the last four years as Vice Chairman, nominated first by President George W. Bush and then by Barack Obama and confirmed both times by the U.S. Senate. He also served for two years as Oklahoma Cabinet Secretary of Science and Technology. Most recently, Dr. Droegemeier served for two years as Director of The White House Office of Science and Technology Policy (OSTP) and Science Advisor to the President. For two and a half months during this time, he also served as Acting Director of the National Science Foundation. His research involves numerical simulation and prediction of high-impact local weather, and the assimilation of data into storm-resolving models. He is a Fellow of the American Meteorological Society and the American Association for the Advancement of Science, and has published more than 80 referred journal articles and over 200 conference publications.

Regents' Professor, University of Oklahoma, November, 2001 (life)
Professor, School of Meteorology, University of Oklahoma, July 1998-Present
OU Associates Foundation Presidential Professor, University of Oklahoma, 1998-2002
Founder and Director, Environmental Computing Applications System (research and educational supercomputing center), University of Oklahoma, 1996-2001
Co-Founder (1989) and Director (1994-2006), Center for Analysis and Prediction of Storms (CAPS) (NSF Science and Technology Center), University of Oklahoma
Associate Professor, School of Meteorology, University of Oklahoma, 1991-1998
Director of Model Development Program, Center for Analysis and Prediction of Storms, University of Oklahoma, 1989-1994
Visiting Senior Fellow, Army High Performance Computing Research Center, University of Minnesota (Sabbatical) 1 January - 30 June 1992
Deputy Director, Center for Analysis and Prediction of Storms, University of Oklahoma July 1991-February 1992
Assistant Professor, School of Meteorology, University of Oklahoma, 1985-1991
Deputy Director for Research, Center for Analysis and Prediction of Storms, University of Oklahoma, 1989-1991
Graduate Research Assistant, University of Illinois, 1980-1985
Meteorological Technician, National Severe Storms Laboratory, 1978-1980
Meteorological Aide, National Severe Storms Laboratory, 1976-1978

Federal Government Appointments

Appointed by President George W. Bush to the National Science Board and confirmed by the U.S. Senate (2004-2010)
Appointed by President Barack H. Obama to the National Science Board and confirmed by the U.S. Senate (2011-2016) (Vice Chairman of the Board 2012-2016)
Appointed by President Donald J. Trump as Director, White House Office of Science and Technology Policy (OSTP) (11 January 2019-19 January 2021)
Designated by President Donald J. Trump as Acting Director, National Science Foundation (31 March – 22 June 2020) while also serving as Director, White House Office of Science and Technology Policy

State Government Appointments

Appointed by Oklahoma Governor Mary Fallin to the Governor's Science and Technology Council (2011-2019) and Chair of Sub-Committee on Research
Appointed by Oklahoma Governor Marry Fallin as Cabinet Secretary of Science and Technology, (2017-2019)

Security Clearances

Available upon request.

Company Creation

Co-Founder of Weather Decision Technologies, Inc. (1999), now a component of DTN.

Congressional Testimony

U.S. House of Representatives Subcommittee on Science in the *Re-Competition of the NSF Supercomputing Centers* (1996)
U.S. House of Representatives Appropriations Subcommittee on *VA, HUD and Independent Agencies, on the Budgets of the NSF and NASA* (2004)
U.S. House of Representatives Subcommittee on Energy and Environment, and Subcommittee on Research and Science Education, U.S. House of Representatives Committee on Science and Technology, for the hearing titled, *Regarding the State of Hurricane Research and H.R. 2407, the National Hurricane Research Initiative Act of 2007* (2008)
U.S. Senate Committee on Commerce, Science and Transportation for the hearing titled, *Weathering the Storm: The Need for National Hurricane Research Initiative* (2009)
U.S. House of Representatives Subcommittee on Environment, in the U.S. House of Representatives Committee on Science, Space and Technology, for the hearing titled, *Restoring US Leadership in Weather Forecasting, Part 2*. (2013)
U.S. Senate Committee on Commerce, Science, and Transportation for the hearing titled, *America COMPETES: Science and the U.S. Economy* (2013)
U.S. Senate Committee on Commerce, Science, and Transportation for the hearing titled, *America COMPETES: Leveraging the U.S. Science and Technology Enterprise* (2016)
U.S. House of Representatives Appropriations Subcommittee on Labor, Health and Human Services, Education and Related Agencies for the hearing titled, *The Role of Facilities and Administrative Costs in Supporting NIH-Funded Research* (2017)
U.S. Senate Committee on Commerce, Science and Transportation, *confirmation hearing to serve as Director, White House Office of Science and Technology Policy* (2018)
U.S. House of Representatives Commerce-Justice-Science Appropriations Subcommittee hearing on the *President's FY20 Budget Proposal* (2019)
U.S. House of Representatives Committee on Science, Space and Technology hearing on the *President's FY21 Budget Proposal* (2020)
U.S. Senate Committee on Commerce, Science and Transportation hearing titled, *The American Innovation Ecosystem* (2021)
U.S. House of Representatives Committee on Science, Space and Technology hearing titled, *United States, China and the Fight for Global Leadership: Building a U.S. Science and Technology Strategy* (2023)

Professional Consulting

Sperry Commercial Flight Systems Group, Honeywell Corporation. (1989-1992)
Climatological Consulting Corporation (UAL Flight #585, Colorado Springs,

Colorado, 1997)
American Airlines (AA Flight #242, Dickinson, North Dakota, 1997)
National Transportation Safety Board (NTSB) (AA Flight #903, Florida Peninsula, 1997-1998)
American Airlines (AA Flight #1420, Little Rock, Arkansas, 1999-2002)
American Airlines (AA Flight #587, New York, New York, 2002-2007)
Air France (AF Flight #358, Toronto, Canada, 2006-2008)
Continental Airlines (CAL Flight #1404, Denver, Colorado, 2009-2013)
Continental Airlines (CAL Flight #511, McAllen, Texas, 2010-2011)
National Science Foundation (Expert Intermittent Consultant) (Aug 2022 – Present)

Depositions Given as Expert Witness

American Airlines Flight #1420 accident deposition given 1 March 2001 in Dallas, Texas
Continental Airlines Flight #1404 accident deposition given 10 December 2010 in Dallas, Texas
Continental Airlines Flight #511 in-flight incident deposition given 31 May 2011 in Dallas, Texas
Continental Airlines Flight #1404 accident deposition given 21 June 2012 in Dallas, Texas
Continental Airlines Flight #1404 accident deposition given 13 September 2012 in Dallas, Texas

Selected Activities as Director of The White House Office of Science and Technology Policy (OSTP) and Science Advisor to the President (2019-2021)

Note: A summary of key science and technology accomplishments, and OSTP leadership during the Trump Administration, may be found at: https://trumpwhitehouse.archives.gov/wp-content/uploads/2020/10/Trump-Administration-ST-Highlights-2017-2020.pdf

Chair, National Science and Technology Council (NSTC)
NSTC reports produced while serving as Chair
- Report on Near-Earth Object Impact Threat Emergency Protocols (January 15, 2021)
- Recommended Practices for Strengthening the Security and Integrity of America's Science and Technology Research Enterprise (January 15, 2021)
- National Orbital Debris Research and Development Plan (January 15, 2021)
- Progress Report on the Implementation of the Federal STEM Education Strategic Plan (December 17, 2020)
- Pioneering the Future Advanced Computing Ecosystem Strategic Plan (November 18, 2020)
- Enhancing the Security and Integrity of America's Research Enterprise (October 15, 2020)

- Research and Development Needs for Improving Resilience to Electromagnetic Pulses (June 15, 2020)
- A Strategic Vision for America's Quantum Networks (February 7, 2020)
- Nuclear Defense Research and Development Strategic Plan for Fiscal Years 2020-2024 (December 2019)
- 2019 Federal Cybersecurity Strategic Plan (December 10, 2019)
- National Strategic Computing Initiative Update 2019 (November 14, 2019)
- National Artificial Intelligence R&D Strategic Plan: 2019 Update (June 21, 2019)
- National Space Weather Strategy and Action Plan (March 26, 2019)
- Coordinated Strategic Plan to Advance Desalination for Enhanced Water Security (March 22, 2019)

Co-Chair, Ocean Policy Committee
Member, National Space Council
Co-chair, Interagency Council on Advancing Meteorological Services
Chair, President's Council of Advisors on Science and Technology (PCAST)
Chair, National Research Strategy Development component of the PREVENTS Program
Led international engagements in S&T with G7 nations, Australia, and others
Initiated Joint Committee on the Research Environment (JCORE) within the NSTC
Co-authored FY20 and FY21 Federal Agency R&D Priorities Memo
Created Student, Post-Doc, and Early Career Professionals (SPEC) Subcommittee Within PCAST
Recommended Dr. Sethuraman Panchanathan to the President for Nomination as NSF Director
Recommended slate of candidates to the President for the National Science Board Class of 2020
Developed program to increase the competitiveness of HBCUs
Member, PREVENTS Task Force on Veteran Suicide Prevention
Gave commencement address at SDSMT
Gave commencement address at Penn State College of Earth and Mineral Sciences
Member, Federal Data Strategy Team
Member, President's Coronavirus Task Force
Led technical effort with OSTP and DOD to provide 100 MHz of mid-band spectrum for 5G auction

Selected Activities as Acting Director of the National Science Foundation (2020)

Member of Global Research Council Governing Board
Member, National Science Board
Chair, National Science Board Executive Committee
Member of Government/University/Industry Research Roundtable
Helped develop $2B budget request as part of Federal stimulus package
Initiated research and education efforts associated with the Trillion Trees project
Responded to several congressional inquiries (Sen Reed, Rep Shalala, Sen Wicker, Sen Alexander)

Represented NSF at the Global Research Council Board meeting (1 of 2 Vice Chairs)
Addressed Committee on Equal Opportunity in Science and Engineering (CEOSE)
Addressed Established Program to Stimulate Competitive Research (EPSCoR) PD/PI meeting
Gave input on the Schumer Frontier Act
Sent note to staff on George Floyd murder
Held discussion with Assistant Directors on George Floyd murder
Participated in Math and Physical Sciences Assistant Director search

Selected Activities as Vice President for Research, University of Oklahoma (2009-2018)

Achieved Carnegie R1 (Highest Research Activity) status (2011)
Led Aspire 2020 strategic planning process to create decadal roadmap for research and creative activity
Created new budgeting and commitment tracking/payment system in Office of the Vice President for Research (VPR)
Created the Center for Research Program Development and Enrichment in the VPR Office (works individually with faculty to scaffold their scholarly programs for the long term, build teams, identify funding, create opportunity)
Created the Broader Impacts in Research position in the VPR Office (diversity enhancement, engagement, education and outreach)
Created the Research Statistics and Analysis Group in the VPR Office (data analytics regarding all aspects of research enterprise)
Created the Office of Undergraduate Research reporting jointly to the VPR and Provost
Created the Defense/Security/Intelligence Research Initiative
Established Distinguished Faculty Fellow positions in the VPR Office
Created the VPR Advisory Committee
Created the Center for Applied Research and Development within the VPR Office (assists faculty in working with companies and mission agencies on applied R&D projects)
Established the University Strategic Organization Program (institutional investment in centers and institutes that are foundational to the University's scholarship enterprise)
Established the Faculty Challenge Grant Program
Created the VPR Awards Program
Created the Arts and Humanities Faculty Fellowship Program
Helped establish and fund the Humanities Forum
Created the Center for Autonomous Sensing and Sampling (reports to VPR)
Created the Recognition Program for Exceptional Achievements in Research and Creative Activity (incentive and reward salary bonus program for highly prestigious achievement)
Created the Faculty Leadership Academy
Created the monthly *President's R&D Highlights* publication

Oversaw production of the yearly Red Book of Federal Research Priorities for engaging the Oklahoma Congressional delegation
Created Faculty and Staff Publication Support Program (subvention, open access)
Established the National Institute for Risk and Resilience (reports to VPR)
Assisted with the construction of Four Partners Place, Five Partners Place, and the Radar Innovations Laboratory on the Research Campus
Oversaw construction and management of the Devon Energy Hall Clean Room
Chaired campus STEM Education Committee and organized a planning charrette
Coordinated several cluster hiring initiatives (radar, social science, environment)
Created and now Chair the Regional VPR/VCR Group (approximately 26 institutions among 12 states in the Midwest)
Established Memorandum of Understanding with Tsinghua University, Beijing, China
Established research engagement with Brazil via the OU in Rio Program
Assisted with recruitment of private companies to the Research Campus

Selected Activities as Oklahoma Cabinet Secretary of Science and Technology (2017-2019)

Chair, Oklahoma Science and Technology Council
Chair, Unmanned Systems Council
Oversight of Oklahoma Space Industry Development Authority (Oklahoma Spaceport)
Oversight of Oklahoma Center for the Advancement of Science and Technology
Member, Task Force on Updating Oklahoma Academic Standards for Computer Science
Member, Oklahoma Science and Technology Research and Development Board
Co-Organizer, Governor's Annual STEM Summit (keynote speaker in 2014)
Developer, Higher Education Access for Success Program
Developer, OneOklahoma concept for State's three major research universities
Coordinated with State Legislature on various initiatives and bills
Participated in recruitment of companies to Oklahoma, including direct foreign investment
Oversight of Oklahoma Center for the Advancement of Science and Technology
Member, Task Force on Updating Oklahoma Academic Standards for Computer Science
Member, Oklahoma Science and Technology Research and Development Board

Selected Activities on National Science Board (2004-2016)

Member, Vannevar Bush Award Selection Committee, National Science Board (2006)
Co-Chair, Hurricane Science and Engineering Task Force, National Science Board (2005- 2007)
[Publication: "Hurricane Warning - The Critical Need for a National Hurricane Research Initiative, available at http://www.nsf.gov/nsb/committees/archive/hurricane/initiative.pdf]

Member, Task Force on Transformative Research, National Science Board (2006-2007)
[Publication: "Enhancing Support of Transformative Research at the National Science Foundation," available at http://www.nsf.gov/nsb/documents/2007/tr_report.pdf]
Member, Vannevar Bush Award Selection Committee, National Science Board (2006-2007)
Chair, Task Force on Cost Sharing, National Science Board (2007-2009)
[Publication: **"**Investing in the Future: NSF Cost Sharing Policies for a Robust Federal Research Enterprise," available at http://www.nsf.gov/pubs/2009/nsb0920/nsb0920.pdf]
Chair, *ad hoc* Committee on Nominating for NSB Elections, National Science Board (2008)
Chair, Committee on Programs and Plans, National Science Board (2008-2010)
Member, National Science Board Executive Committee (2011-2016)
Chair, National Science Board *ad hoc* Committee on Nominating for NSB Elections (2011)
Member, National Science Board Sub-Committee on Facilities (2011-2014)
Co-Chair, National Science Board Task Force on Mid-Scale Research (2011-2012)
[Publication: "The National Science Foundation Support of Unsolicited Mid-Scale Research," available at http://www.nsf.gov/nsb/publications/2012/nsb1222.pdf**]**
Vice Chairman, National Science Board (2012-2016)
Member, National Science Board Task Force on Administrative Burdens (2012-2013)
Chair, National Science Board *ad hoc* Committee on Nominating for NSB Elections (2013)
Chair, National Science Board Committee on Science and Engineering Indicators (2014-2016)
[Publication: Multiple documents at http://www.nsf.gov/nsb/sei/index.jsp]
Chair, National Science Board *ad hoc* Task Force on NEON (2015-2016)

Fundraising and Development (University of Oklahoma)

Worked with President David L. Boren and CEO of American Airlines to establish the American Airlines Professorship in Meteorology
Worked with President David L. Boren and Dean John T. Snow to establish the Williams Chair in the School of Meteorology
Worked with President David L. Boren and Vice President for Research Lee Williams to raise $16M for the Stephenson Life Sciences Research Center
Worked with Dean John T. Snow to establish the Mark and Kandi McCasland Chair in the School of Meteorology
Led an initiative to obtain a $3M gift from a private family to create the National Alliance for Social-Behavioral Systems and Extreme Environmental Events
Presenter at various Office of Development fundraising events

Professional/Honorary Society Memberships and Service

Tau Beta Pi Engineering Society, University of Oklahoma (1978)
Mortar Board, University of Oklahoma (1979)
American Meteorological Society, Student Member (1976 – 1985)
Sigma Xi Scientific Research Society (1983)
American Meteorological Society, Full Member (1986)
American Association for the Advancement of Science (1985)
American Geophysical Union (1986)
American Association of University Professors (1985)
Vice-President, OU Chapter of Sigma Xi (1987)
President, OU Chapter of Sigma Xi (1988)
Fellow of the Cooperative Institute for Mesoscale Meteorological Studies (1986 – Present)
Society of Industrial and Applied Mathematics (1989)
American Institute for Aeronautics and Astronautics (1989)
Vice President, Central Oklahoma Chapter of the AMS (1997 – 1998)
Vice President, Central Oklahoma Chapter of the NWA (1997 – 1998)
Councilor of the American Meteorological Society (2004 – 2008)
Member, Council on Competitiveness Technology Leadership & Strategy Initiative (TLSI) (2016 – 2019)

Personal & Community Service and Leadership

Author of a 170-word, daily weather science column for the Daily Oklahoman newspaper (July, 1999-July 2001)
Board of Directors, Norman, Oklahoma Chamber of Commerce (2003-2006; 2009-2012)
Chair, Weather and Climate Team, Oklahoma Economic Development Generating Excellence (EDGE) Governor's Task Force (2003)
Member, Worship Team, Riverside Church, Norman, Oklahoma (1994-2009)
Deacon, Riverside Church, Norman, Oklahoma (2003-2005)
Founder & Co-Chair, Norman, Oklahoma Chamber of Commerce Weather Committee
Board of Advisors, Riverside Church, Norman, Oklahoma (2005-2007)
Board of Trustees, Riverside Church, Norman, Oklahoma (2007-2009)
Elder, Riverside Church, Norman, Oklahoma (2009-2010)
Head Usher, LifeChurch, Oklahoma City, Oklahoma (2013-2018)

Awards and Special Recognition

George Lynn Cross Scholarship, University of Oklahoma (1978 – 1979)
Dresser Engineering Scholarship, University of Oklahoma (1979 – 1980)
OU Engineering Dean's Student Advisory Council (1979 – 1980)
Tau Beta Pi Fellowship (1980)
Phi Kappa Phi Honor Society (1981)

University of Illinois Fellowship (1981 – 1982)
Outstanding Young Men of American (1982)
Outstanding First-time Presentation, 12th Conference on Severe Local Storms, San Antonio, TX, American Meteorological Society (1982)
University of Illinois Fellowship (1982 – 1983)
University of Illinois Fellowship (1983 – 1984)
Sigma Xi Research Paper Award, University of Illinois (1985)
Who's Who in Technology Today (1985)
OU Associates Distinguished Lectureship Award (1986)
Presidential Young Investigator, National Science Foundation (1987 – 1992)
Oklahoma State Senate Citation (1987)
Fellow of the NOAA Cooperative Institute for Mesoscale Meteorological Studies (1987-Present)
OU Associates Distinguished Lectureship Award (1987)
OU Associates Distinguished Lectureship Award (1988)
OU Associates Distinguished Lectureship Award (1989)
Professor of the Year, College of Geosciences (1991)
Discover Magazine Award for Technology Innovation to CAPS (computer software category) (1997)
Computerworld Smithsonian Award to CAPS (science category) (1997)
OU Associates Presidential Professorship (1998)
NSF Pioneer Award (2001)
Regents' Professorship, University of Oklahoma (2001)
Fellow of the American Meteorological Society (2002)
NOAATech 2002 Award for Best Use of Advanced Networks: "WSR-88D Radar Data over the Internet/NGI" (co-recipient, 2002)
Federal Aviation Administration Excellence in Aviation Award (2002)
Roger and Sherry Teigen Presidential Professorship (2004)
Invited Speaker for the Millennium Lecture Series, UTEP (2006)
Honorary Citizen of the State of Oklahoma (2008)
Fellow of the American Association for the Advancement of Science (2014)
University of Illinois Department of Atmospheric Sciences Distinguished Alumni Speaker (2016)
Rod Rose Award for best article in the *Journal of Research Administration* (2017)
Washingtonian Tech Titan, Washingtonian Media, Inc. (2019)
Public Service Award, Association of Independent Research Institutes (2019)
Indiana University Bicentennial Medal (2019)
Inaugural Recipient of Champion of Research Development Award, National Organization of Research Development Professionals (2020)
University of Illinois College of Liberal Arts and Sciences 2020 Alumni Achievement Award (2020)
Broader Impacts Champion Award, Center for Advancing Research Impacts in Society (2023)

Selected Departmental and University Service Activities

Undergraduate Advisor, School of Meteorology (1985-2009)
Member of Advisory Council, Cooperative Institute for Mesoscale Meteorological Studies (1987 - 1988)
Member, School of Meteorology Graduate Studies Committee (1988-1990)
Coordinator of Oklahoma Symposium on High-Performance Scientific Computing (1987)
Chairman, OU Campus Computing Advisory Committee (1987-1989)
Administrative Director, Geosciences Computing Network (1987-1989)
Member, EECS Faculty Search Committee (1989)
Member, Math Department Chair Search Committee (1989)
Chairman, School of Meteorology Graduate Studies Committee (1989-1990)
Facilitator for Course on Numerical Grid Generation, Televised from Mississippi State University (Spring 1990)
Member of the State of Oklahoma Supercomputer Advisory Committee (1990)
Coordinated purchase and installation of the CAPS computer system (1992)
Faculty Advisor to School of Meteorology Student Affairs Committee (1993)
Chairman, University of Oklahoma Task Force on Computer Networking (1994-1995)
Capstone Course Mentor (1994-1997)
Member, Engineering Dean Search Committee (1996-1998)
Member, Budget Council (1996-1998)
Member, School of Meteorology Committee A (executive committee) (1996-1998)
Chair of Environmental Computing Applications System Steering Committee and Director of ECAS (1996-1999)
Chair of School of Meteorology Budget Sub-Committee (1996-1997)
Member of OU Research Council (1997-2000)
Member, Faculty Senate Task Force on Intellectual Property (1998)
Vice Chair of OU Top 10 Scientists Group (1998)
OU Speakers Bureau (1997-1998)
Member, Search Committee for the Director of the Office of Research Administration (1998)
Member, Presidential Professorship Selection Committee (1998-2001)
Member, Conflict of Interest Advisory Committee (1998-2000)
Member, Technology Development Council Task Force on Computing (1998)
Chair of OU Research Council (1999-2000)
Initiated Effort to Create the American Airlines Endowed Professorship in Meteorology (1999)
Member, Graduate Studies Committee, OU School of Meteorology (1999-2001)
Member of Ad Hoc Undergraduate Committee, OU School of Meteorology (1999-2005)
Search Committee, Associate Vice President for Technology Development (2000)
Member of Lowry Chair Search Committee (1999-2001)
Member of Williams Chair Search Committee (2001-2002)
Chair of SoM Undergraduate Studies Committee (2001-2005)

Member, Board of Advisors, OU Supercomputing Center for Education & Research (2001-2017)
Member, OU Patent Advisory Committee (2003-2005)
Member, Two Faculty Search Committees in SoM (radar hires) (2003-2005)
Member, ECE Chair Search Committee (2004-2005)
Member, Search Committee for the Dean of the College of Earth and Energy (2005-2006)
Facilitator of Research Retreats for the College of Earth and Energy (2005)
Member, OU Renaissance Project Planning Committee (2006-2007)
Chair of Eddie Carol Smith Scholarship Selection Committee (2006)
Member, OU Research Cabinet (2006-2016)
Member, K20Center/Education College Faculty Search Committee (2006-2008)
Member, State of Oklahoma EPSCoR Committee (2007-2018)
Member, McCasland Chair Search Committee (2007-2008)
Member, Graduate College Outstanding Dissertation Award Selection Committee (2008)
Member, Task Force on Establishing a Doctoral Program, OU College of Architecture (2009)
Member, Selection Committee, Regents' Award for Superior Staff Performance (2010)
Member, OU University Club Board of Trustees (2013-2016)
President, OU University Club Board of Trustees (2014-2015)
Member, Search Committee, Director of the Oklahoma Geological Survey (2014)
Chair, State EPSCoR Subcommittee on Strategic Planning (2014-2015)
Co-Chair, Environmental Leadership Search Committee (2015-2016)
Member, OU Graduate Education Task Force (2015-2017)
Founding Director of OU Faculty Leadership Academy (2015)
Convocation Address to Graduate College, OU Health Sciences Center (2016)
Member of Committee A, School of Meteorology (October, 2022 – present)

Selected Professional Development and Service Activities

Summer Faculty Fellow, Minnesota Supercomputer Institute (1986)
Member, Joint Peer Review Board, National Center for Supercomputing Applications and Pittsburgh Supercomputer Center (1987-1991)
Member, American Meteorological Society STAC Committee on Severe Local Storms (1987-1990)
Member, NCAR Supercomputer Upgrade Panel (1989)
Visiting Scientist, Minnesota Supercomputer Institute (1990)
Program Co-Chairman, 16th AMS Conference on Severe Local Storms (1990)
Member, AMS Committee on Severe Local Storms (1987 - 1990)
Associate Editor, *Monthly Weather Review* (1991-1999)
Member, Review Panel, NSF High Performance Computing and Communications Program (1992)
Visiting Senior Fellow, Army High Performance Computing Research Center, University of Minnesota (1992)

Member, AMS/EPA Steering Committee on Air Quality (1992-1994)
Co-Organizer, Workshop on High-Performance Computing in the Geosciences, Les Houches, France (1993)
Member, US Weather Research Program Prospectus Development Team #1 (1994)
Member, University Relations Committee, University Corporation for Atmospheric Research (1995 - 2001)
Co-Organizer, 1st Joint US-Korea Workshop on Storm- and Meso-Scale Weather Analysis and Prediction (1996)
Member, University Governance Examination Team, University Corporation for Atmospheric Research (1996)
Member, US Weather Research Program Proposal Review Panel (1996)
Member, US Weather Research Program Scientific Steering Committee (1997-2001)
Co-Organizer, 2nd Joint US-Korea Workshop on Storm- and Meso-Scale Weather Analysis and Prediction (1997)
Member, National Centers for Environmental Prediction Review Panel for Aviation Weather Center (1998)
Co-Chair, US Weather Research Program Prospectus Development Team #9 (1998)
Member, Geosciences-2000 Working Group, National Science Foundation (1998-1999)
Member, User Advisory Council, National Computational Science Alliance (1998-2000)
Member, Scientific Computing Division Advisory Panel, National Center for Atmospheric Research (1998-2003)
Chair, University Relations Committee, University Corporation for Atmospheric Research (1998-1999)
Member, Planning Committee of the World Weather Research Program Sydney Olympics 2000 Forecast Demonstration Project (1998-2000)
Co-Organizer of the First Study Conference on Aviation Weather Hazards (1998)
Member of the Oklahoma Secretary of Science and Technology Development's Terabit Testbed Network Advisory Panel
Founder and Manager of Project CRAFT: The Collaborative Radar Acquisition Field Test (CRAFT) (1998-2006)
Gave Congressional Briefing on the 3 May 1999 Oklahoma Tornado Outbreak (1999)
Organizer and Chair, National Symposium on the Great Plains Tornado Outbreak of 3 May 1999 (2000)
Member, Organizing Committee, US Weather Research Program Workshop on Research Needs of the Private Sector (2000)
Organizer, Special Issue of the American Meteorological Society Journal *Weather and Forecasting* Devoted to the May 3rd Tornado Outbreak (2000-2001)
Leader, Analysis and Verification Team, Weather Research and Forecast (WRF) Model Project (2000)
Participant in the Higher Education Academy of the Oklahoma Educator's Leadership Academy (2000-2001)
Member, Advisory Committee, NSF Geosciences (GEO) Directorate (2001- 2005)
Member, Blue Ribbon Panel on Cyber Infrastructure, National Science Foundation (2001-2002)

Member, National Science Foundation Proposal Review Panel, 4th Science and Technology Centers Competition (2001)
Member, Board of Trustees, University Corporation for Atmospheric Research (2001-2008)
Member, Organizing Committee, Workshop on Cyberinfrastructure for Environmental Research and Education (2002)
Member, National Research Council Committee on Weather Forecasting Accuracy for FAA Air Traffic Control (2002)
Attendee, American Meteorological Society Summer Colloquium on Science and Public Policy (2002)
Adjunct Member of the National Weather Service Science and Technology Integration Plan (STIP) Observing Integrated Planning Team (ObsIPT) (2002)
Member, Organizing Committee, EPSCoR Workshop on Cyberinfrastructure (2002-2003)
Member, National Science Foundation Steering Committee for Cyberinfrastructure Research and Development in the Atmospheric Sciences (CyRDAS) (2002-2003)
Vice Chairman, Board of Trustees, University Corporation for Atmospheric Research (2003-2004)
Chair, US Weather Research Program CONDUIT/CRAFT Steering Committee (2003-2007)
Member, Advisory Committee, NSF Directorate for Computing Information Science and Engineering (CISE) (2003-2004)
Member, Review Panel, NSF Extensible Terascale Facility (ETF) proposal solicitation (2003)
Member, ad hoc Search Committee for a Senior Scientist at Howard University (2003)
Chairman of the Board of Trustees, University Corporation for Atmospheric Research (2004-2008)
Member, Advisory Committee, NCAR Data Assimilation Strategic Initiative (2004-2006)
Member, Sasaki Applied Meteorology Research Institute (SAMRI) Council (2004-2006)
Member of Southeastern Research Universities Association (SURA) High Performance Computing/Grid Planning Group (2004-2005)
Appointed by President George W. Bush to the National Science Board (2004-2010)
Councilor, American Meteorological Society (2004-2008)
Member, Weather Research and Forecasting (WRF) Model Research Advisory Board (2005-2006)
Member, National LambdaRail (NLR) Science Research Council (NSRC) (2005-2007)
Member, Data Center Blue Ribbon Panel, National Center for Atmospheric Research (2005-2006)
Member, Advisory Committee, National Center for Computational Sciences and the Computer Science and Math Division, Oak Ridge National Laboratory (2006)
Member, Scientific Advisory Board, Microsoft Research Corporation (changed to Microsoft External Research Advisory Board in January, 2009) (2006-2008)
Member, National Advisory Council, Renaissance Computing Institute (2007-2010)
Member, Program Committee for e-Science 2007 Conference (2007)
Member, TeraGrid Requirements Analysis Team (2007-2008)

Member, Board of Directors, National Weather Museum and Science Center (2009-2017)
Member of Search Committee for Director, National Center for Atmospheric Research (2008)
Chair, UCAR Review Panel for the NOAA Aviation Weather Center, Storm Prediction Center, Environmental Modeling Center, NCEP Central Operations (2008-2009)
Member, Board of Directors, Council on Governmental Relations (2009-2014)
Member, Program Committee for e-Science 2009 Conference (2009)
Member, Program Committee for the 10th IEEE/ACM International Symposium on Cluster, Cloud and Grid Computing (CCGrid 2010; 2009-2010)
Member, Board of Directors, Oak Ridge Associated Universities (ORAU) (2010-2013)
Member, Board of Directors, Oak Ridge Associated Universities (ORAU) Foundation (2010-2013)
Member, Advisory Committee, Computer Science and Mathematics Division, Oak Ridge National Laboratory (2010-2012)
Member, AAU Task Force on Strengthening the University-Government Research Partnership (2010-2018)
Member, Board of Trustees, Southeastern Universities Research Association (2011-2019)
Member, Presidential Search Committee, University Corporation for Atmospheric Research (2011)
Member, Oklahoma Governor's Science and Technology Council (2011-2019)
Vice Chairman, Board of Directors, Oak Ridge Associated Universities Foundation (2011-2013)
Member, Executive Committee, Association of Public and Land Grant Universities Council on Research Policy and Graduate Education (2011-2014)
Member, Board on Research Data and Information, National Research Council of the National Academies (2011-2015, 2016-2019)
Member, Search Committee for the Director of the NOAA National Weather Service (2012)
Chairman-Elect, Council on Research Policy and Graduate Education, Association of Public and Land Grant Universities (2012-2013)
Member, National Research Council Panel on Information Science at the Army Research Laboratory (2013-2015)
Chair, Development and Relations Committee, Southeastern Universities Research Association (SURA) Board of Directors (2013-2015)
Member, Board of Directors, Association of Public and Land Grant Universities (APLU) (2013-2014)
Member, NCAR Director Blue Ribbon Advisory Panel (2014)
Chairman, Council on Research (formerly Council on Research Policy and Graduate Education), Association of Public and Land Grant Universities (2013-2014)
Keynote Speaker, Governor Mary Fallin's Annual STEM Summit (2015)
Creator of and Host for the Inaugural Meeting of Central and Southern Plains Vice Presidents and Vice Chancellors for Research, University of Oklahoma (2014)
Member, Board of Directors, The Alliance for Science and Technology Research in America (ASTRA) (2014-2019)

Member Presidential Search Committee, University Corporation for Atmospheric Research (2015-2016)
Past-Chairman, Council on Research (Formerly the Council on Research Policy and Graduate Education), Association of Public and Land Grant Universities (2014-2016)
Member, NSF Search Committee for Director of Office of Integrative Activities (2015-2016)
Vice-Chairman of the Board of Trustees, Southeastern Universities Research Association (SURA) (2016-2018)
Member, NSF Assistant Director of Geosciences Search Committee (2016)
Leader of the Central and Southern Plains Vice Presidents and Vice Chancellors for Research Group and Chair of the Executive Committee (2014-2018)
Member, State of Oklahoma EPSCoR Executive Subcommittee (2015-2018)
Invited Participant, Future of OSTP Planning Meeting, Sponsored by the Baker Institute, Rice University (2016)
Member, Council on Competitiveness Technology Leadership and Strategy Initiative (2016-2019)
Chairman of the Board of Trustees, Southeastern Universities Research Association (SURA) (2018 – 2019)
Member, Alan T. Waterman Award Selection Committee, National Science Foundation (2021-2024)
Member, AMS Task Force on Open Access Publishing (2022-Present)

Courses Taught at the University of Oklahoma (* indicates developed new)

Introduction to Meteorology (Undergraduate)
Atmospheric Dynamics I (Undergraduate)
Atmospheric Dynamics II (Undergraduate)
Mesoscale Meteorology (Undergraduate)
*Computational Fluid Dynamics I (Graduate)
*Computational Fluid Dynamics II (Graduate)
Convective Dynamics and Modeling (Graduate)
Numerical Weather Prediction (Graduate)
*Variational Data Assimilation (Graduate)
Physical Mechanics for Meteorology (Undergraduate)
*Severe and Unusual Weather (Undergraduate)
Advanced Synoptic Meteorology (Graduate)
Synoptic-Dynamic Meteorology (Undergraduate)
*Hazardous Weather Detection and Prediction (Senior Undergraduate/Graduate)
*Foundations of Academic Research and Creative Activity (Online, All Disciplines, All Levels Undergraduate and Graduate)

Previous Externally-Sponsored Research Grants

NOAA "Central Oklahoma Mesoscale Modeling and Analysis Project". Principal Investigator, $8,199. (6/15/86 to 8/15/86).

NSF "Numerical Simulation and Observational Analysis of Thunderstorms and Subcloud Phenomena". Principal Investigator, $125,920. (7/15/86 to 7/14/88).

NOAA "Central Oklahoma Mesoscale Modeling and Analysis Project". Principal Investigator, $12,891. (12/1/86 to 5/31/88).

Keck Research Foundation - Proposal to Upgrade the Digital Image Processing Facilities of the Geosciences Computing Network. Co-Principal Investigator (with T.H.L. Williams), $350,000. (December, 1988)

OCAST Oklahoma Center for the Advancement of Science and Technology, Computer System for Digital Image Processing and Graphic Visualization. Principal Investigator, $100,000 (November, 1989).

Honeywell Sperry Commercial Flight Systems Group, Air Transport Systems Division - "Development of an Expert System for the Honeywell Windshear Computer Using Data from a Numerical Thunderstorm Model. Part I. Computations Support". Principal Investigator, $8,095. Yr 1.

Honeywell Sperry Commercial Flight Systems Group, Air Transport Systems Division - "Development of an Expert System for the Honeywell Windshear Computer Using Data from a Numerical Thunderstorm Model. Part I. Computations Support". Principal Investigator, $8,900. Yr 2.

NSF "Convective Modeling and Predictability Studies". Principal Investigator, $177,606. (2/15/89 to 7/1/91).

NSF "Simulation of Meso- and Convective-Scale Dynamics". Presidential Young Investigator Award. Principal Investigator. (Funded 1987-1992)

- 1st year funding, including NSF and industrial match: $247,040 (1987-1988)
- 2nd year funding, including NSF and industrial match: $137,984 (1988-1989)
- 3rd year funding, including NSF and industrial match: $142,500 (1989-1990)
- 4th year funding, including NSF and industrial match: $ 99,500 (1990-1991)

- 5th year funding, including NSF and industrial match: $100,000 (1991-1992)

NSF "Center for Analysis and Prediction of Storms (CAPS)". Science and Technology Research Center. Co-Principal Investigator (with D. Lilly) and Deputy Director for Research, $4,900,000. (1988 - 1993, first 5 of 11 years).

NSF "Center for Analysis and Prediction of Storms (CAPS)". Science and Technology Research Center. Co-Principal Investigator (with D. Lilly, F. Carr, and T. Gal-Chen) and Deputy Director, $8,617,076. (1992 - 1997).

FAA "Parameter Retrieval from Doppler Radar Observations and Development of Related Mesoscale Prediction Models". Co-Principal Investigator (with D. Lilly and T. Gal-Chen), $295,092. (1991-1993).

NSF "Further Development of the CAPS Advanced Regional Prediction System". Principal Investigator (supplement to CAPS grant from Army Atmospheric Sciences Laboratory), $17,529. (1992).

EDR "Numerical Simulation of Fog Formation in Complex Terrain Using the ARPS Model". Principal Investigator, $63,633, (Nov 1993 - Oct 1994). Year 1 of 3 Years.

NSF "Dynamics and Predictability of Convective Storms". Principal Investigator, $118,100 (1 Jul 1993 - 30 Jun 1994)

EDR "Numerical Simulation of Fog Formation in Complex Terrain Using the ARPS Model". Principal Investigator, $78,869 (Nov 1994 - Oct 1995). Year 2 of 3 years.

FAA "Supplement to the Center for Analysis and Prediction of Storms (CAPS)" Principal Investigator (with J.T. Lee), $292,262.

NSF "Center for Analysis and Prediction of Storms (CAPS)". Principal Investigator (with D. Lilly, F. Carr, J. Straka, and Q. Xu), $1,586,383.

AMR Corp "Project Hub-CAPS: Developing a Prototype Storm-Scale NWP System for Commercial Aviation. Principal Investigator, $342,630, year-1 of 3 years (1 July 1996 - 31 June 1997).

NSF "Dynamics and Predictability of Convective Storms". Principal Investigator, $118,791 (year 3 of 3 years: 31 December 1995 - 30 Jun 1997).

EDR	"Numerical Simulation of Fog Formation in Complex Terrain Using the ARPS Model". Principal Investigator, $55,490 (Nov 1994 - Oct 1996). Year 3 of 3 years.
NSF	"Center for Environmental Applications of the Oklahoma Mesonet". Co-Principal Investigator. $1,010,000 (EPSCoR Program).
NSF	"Joint US-Korea Workshop on Storm- and Meso-Scale Weather Analysis and Prediction." PI, $44,394, 1 year.
Rome Labs	"Mesoscale Modeling of Lake Effect Snow." PI (with D. Jahn as Co-PI), $33,897, 1.5 years.
NSF	"Center for Analysis and Prediction of Storms (CAPS)". Principal Investigator (with F. Carr, J. Straka, A. Shapiro, K. Brewster, M. Xue), $1,592,810. (year 9 of 11)
NSF	"Research Experiences for Undergraduates at the Oklahoma Weather Center". Co- Principal Investigator, $72,695 (Fall 1997 - Spring 1998).
NSF	"Center for Analysis and Prediction of Storms (CAPS)". Principal Investigator (with F. Carr, J. Straka, A. Shapiro, K. Brewster, M. Xue), $1,582,616. (year 10 of 11)
Various	"A Proposal to Upgrade the Cray J90 Supercomputer at the OU Environmental Computing Applications System (ECAS)." Principal Investigator, $233,000, 1 year (1 July 1997-31 June 1998). Funded by University of Oklahoma, AMR Corporation/American Airlines, Oklahoma State Regents for Higher Education.
NSF	"Acquisition of Equipment to Create the Environmental Computing Applications System". Principal Investigator, $580,000 (1 September 1995 - 31 August 1998).
AMR Corp	"Project Hub-CAPS: Developing a Prototype Storm-Scale NWP System for Commercial Aviation. Principal Investigator, $327,600, year-3 of 3 years (1 July 1996 - 31 June 1999).
NSF	"Center for Analysis and Prediction of Storms (CAPS)". Principal Investigator (with F. Carr, J. Straka, A. Shapiro, K. Brewster, M. Xue), $1,379,226. (year 11 of 11).
OSRHE	"Enhancement of the CAPS Storm-Scale Numerical Weather Prediction System and Real Time Access to Level II NEXRAD Radar Data." Principal Investigator, $256,000, 2 years. Funded by Oklahoma State Regents for Higher Education

FAA	"Explicit Modeling of Convection in the Terminal Area." Principal Investigator, $25,000, 1 year (Oct 1998 - Oct 1999).
NSF	"The Oasis Project: Oklahoma Atmospheric and Surface-Layer Instrumentation System." Co-Principal Investigator, $1,509,729, 3-years.
NSF	“Center for Environmental Applications of the Oklahoma Mesonet”. Co-Principal Investigator. $23,469 (EPSCoR Program).
NSF	"Research Experiences for Undergraduates at the Oklahoma Weather Center". Co-Principal Investigator, $150,000, 2 years.
FAA	"Comparison of Deterministic Thunderstorm Prediction with the Statistical Growth and Decay Tracker. Principal Investigator, 1 year, $60,000. Funded.
NSF	"National Symposium on the Great Plains Tornado Outbreak of 3 May 1999." Principal Investigator, 1 year, $15,255.
NSF	"National Symposium on the Great Plains Tornado Outbreak of 3 May 1999." Principal Investigator, 1 year, $5,000. Funded by the Oklahoma EPSCoR Program.
KMA	"Continued Development of the Advanced Regional Prediction System for the Korean Meteorological Administration." Co-Principal Investigator, 1 year, $60,000.
AMR Corp	"Continued Enhancement of the Hub-CAPS Forecast System." Principal Investigator, 1 year, $25,000.
Williams	"Advanced Weather Forecasting for Energy." Principal Investigator, 5 years, $8,090,518. Funded by Williams Energy Marketing and Trading Company. Project was terminated due to the Enron scandal and associated disruption of energy marketing and trading industry; approximately $4.5M of the planned $8.1M were expended.
WDT	"Enhancement of the Advanced Regional Prediction System (ARPS) for Commercial Application." Principal Investigator, 1 year, $135,243. Funded by Weather Decision Technologies, Inc.
NOAA	"A Prototype Regional Fine-Scale Numerical Weather Analysis and Prediction System Using NEXRAD Radar Data." Principal Investigator, $474,200, 1-year.

NSF	"A Probabilistic Framework for Assessment and Interpretation of Quantitative Precipitation Forecasts from Storm-Scale Models." (USWRP Program). Co-Principal Investigator (with E. Foufoula-Georgiou, University of Minnesota), $334,171, 3 years.
NOAA	"Moving Realtime WSR-88D Base Data Over The NGI." Co-Principal Investigator, 1 year, $198,000.
METRI	"Assimilation of X-Band and WSR-88D Doppler Radar Data into a Mesoscale Forecast System." Principal Investigator, 1 year, $22,500.
NOAA	" A Real-time, NGI-Based, Direct Digital Ingest and Archive of WSR-88D Base Data as a Prototype for a National System." Co-principal investigator, 3 years, $540,000.
HRL	"Observing System Simulation Experiments for Airborne Weather Sensors." Principal Investigator (4/15/05-6/14-05), $33,560.
NSF	"Research Experiences for Undergraduates at the Oklahoma Weather Center." Co-Principal Investigator, 2 years, $163,467.
ATSC	"Preparation of SBIR Proposal on the Calibration of Ensemble Forecasts of Atmospheric Dispersion." Co-Principal Investigator, 3 months, $4,677.
NSF	"MRI: Acquisition of an Itanium Cluster for Grid Computing." Co-Principal Investigator, 3-years, $340,000.
NSF	"On the Optimal Use of WSR-88D Doppler Radar Data for Variational Storm-Scale Data Assimilation." Co-Principal Investigator, 3-years, $599,846.
ATSC	"Calibration of Fine-Scale Ensemble Forecasts for On-Demand Probabilistic Dispersion Modeling." Principal-Investigator, 6 months, $6,468.
NSF	"Collaborative Research: ITR Linked Environments for Atmospheric Discovery (LEAD)." Principal Investigator (OU portion of 9-institutional collaborative proposal is $1,875,709. Total grant is $11,250,000.
NSF	"Collaborative Research: ITR Linked Environments for Atmospheric Discovery (LEAD) – Supplement" Co-Principal Investigator, $119,346.
NSF	"Advancing Biotechnology and Climatology (ABC): Educating for Economic Growth in Oklahoma." Co-Principal Investigator, 3-years, $598,559.

ATSC "Technical Support for the WRF Ensemble Reforecast System." Co-Principal Investigator (funded from DTRA), 2-years, $56,290.

NSF "Engineering Research Center for Collaborative Adaptive Sensing of the Atmosphere (CASA)." Co-Principal Investigator and Deputy Director (OU portion of total budget for first 5 years is $5,478,109). (Total budget to date is $23,160,030.)

NOAA "Life and Death Decisions: "An Integrative Approach to Understanding and Mitigating the Impacts of Extreme Weather." Principal Investigator, 1 year, $50,000. Funded (2014-2015)

NOAA "A Partnership to Develop, Conduct and Evaluate Realtime High-Resolution Ensemble and Deterministic Forecasts for Convective-Scale Hazardous Weather." Principal Investigator, 3 years, $374,825. (2007-2010)

NSF "Assimilation of Doppler Radar Data for Storm-Scale Numerical Prediction Using an Ensemble-based Variational Method." Co-Principal Investigator, 3 years, $199,990. (2008-2011)

FAA "Weather Processors Support Task: Rightsizing NextGen Weather Observation Network." Principal Investigator, 2 years, $186,667. (2009-2011)

NOAA "Development of a Digital Collaboration for the Alliance for Integrative Approaches to Extreme Environmental Events." Principal Investigator, 1 year, $48,544. (2017-2018)

NOAA/NSSL "Development of a Digital Collaboration for the Alliance for Integrative Approaches to Extreme Environmental Events, Phase I: Scoping and Functional Requirements Development." Principal Investigator, 1 year, $35,482. (2017-2018)

Previous Internally-Sponsored Research Grants

OU Associates Research and Creative Activity Fund - "Central Oklahoma Mesoscale Modeling and Analysis (COMMA) Project, Phase II". Principal Investigator, $22,110. (1988)

CAPS "Initialization of a Convective Cloud Model From Observations". Principal Investigator (with C. Hane and C. Ziegler), $42,020 (2/1/90 to 2/1/91).

CAPS "Initialization of a Convective Cloud Model From Observations". Principal Investigator (with C. Hane and C. Ziegler), $59,762 (2/1/91 to 1/31/92).

OU "Instructional and Advising Improvement". Co-Principal Investigator (with F. Carr), $28,771.

CAPS "Initialization of a Convective Cloud Model From Observations". Principal Investigator (with C. Hane and C. Ziegler), $35,994 (2/1/92 to 1/31/93).

OU "Meteorological Classroom Visualization". Co-Principal Investigator (with K. Crawford), $13,375. (Funded for $9,125 on 13 April 1994).

VPR "Support for CAPS' P/R and Marketing Specialist", $10,000 (1998-2000)

Philanthropic Support for Research

ImpactWx "The Alliance for Integrative Approaches to Extreme Environmental Events." Account Sponsor, $3,000,000. (2018-2020).

Current Externally-Sponsored Research Grants

None

Pending Externally-Sponsored Grant Proposals

NSF "Assimilation of Radar Data with Weather-Dependent Error Covariances and Machine-Learning Method for Convective-Scale NWP." Co-PI with J. Gao and A. Fagg, 3 years, $1,044,452. Submitted 12/16/22.

Chair of Graduate Student Committees (Degrees Completed)

Richard Carpenter (M.S., 1988) *Application of the Piecewise Parabolic Method to Meteorological Modeling* (with C.E. Hane)

Kimberly Carver (M.S., 1990) *The Origin of Rotation in Numerically Simulated Dry Convection*

Steven Lazarus (M.S., 1990) *The Influence of Helicity on the Stability and Morphology of Numerically Simulated Storms*

Kriste Lyon Paine (M.S., 1991) *A Comparison of Two Methods for Dynamic Grid Adaption in Two-Dimensional Scalar Transport*

William McPherson (M.S., 1991) *Sensitivity of Numerically Simulated Downbursts to the Horizontal Radius of the Initial Rain Disturbance*

Renee McPherson (M.S., 1991) *Predictability Experiments of a Numerically Modeled Supercell Storm*

James T. Johnson (M.S., 1992) *Investigation of Outflow Strength Variability in Florida Downburst-Producing Storms.*

Michael Babcock (M.S., 1992) *Aircraft Trajectory Analyses Through Simulated Microbursts*

Yong Li (Ph.D., 1994) *On the Topological Complexity of the Cost Function in Variational Data Assimilation*

Hao Jin (M.S., 1994) *Numerical Study of Cold-Air Damming* (with Q. Xu)

Richard Carpenter (Ph.D., 1994) *Entrainment and Detrainment in Numerically Simulated Cumulus Congestus Clouds* [Dissertation won the OU Outstanding Dissertation Prize in the Science and Engineering Category.]

David Jahn (M.S., 1995) *Simulation of Convective Storms in Environments with Independently-Varying Bulk Richardson Number Shear and Storm-Relative Helicity*

Seon-Ki Park (Ph.D., 1996) *Sensitivity Analysis of Deep Convective Storms*

Steven Lazarus (Ph.D., 1996) *Assimilation and Prediction of a Florida Multicell Storm Using Observed Single-Doppler Data*

Edwin Adlerman (M.S., 1997) *Numerical Simulation of Cyclic Mesocyclogenesis*

DeWayne Mitchell (M.S., 1997) Observations of Convection Initiation During CaPE 1991: A Case Study (Co-Chair with M. Eilts)

Stephen Weygandt (Ph.D., 1998) *Retrieval of Initial Forecast Fields from Single Doppler Observations of a Supercell Thunderstorm* (Co-Chair with Alan Shapiro)

Jason Levit (M.S., 1998) *A Simple Diabatic Initialization Technique for Storm-Resolving Models*

Xuechao Yu (M.S., 1999) *On Quantitative Precipitation Forecasting Using High Resolution Non-Hydrostatic Models*

Yvette Richardson (Ph.D., 1999) *The Influence of Horizontal Variations in Vertical Shear and Low-Level Moisture on Numerically Simulated Convective Storms*

Matthew W. Miller (M.S., 2000) *The Determination of Usefulness of Precipitation Forecasts and Probabilistic Precipitation Verification Using SAMEX 1998 Ensemble Data* (E. Kalnay principal supervisor)

Ernani de Lima Nascimento (Ph.D., 2002) *Dynamic Adjustment in an Idealized Numerically Simulated Bow echo.*

Hee-Dong Yoo (Ph.D., 2003) *The Impact of Radar Data Assimilation on the Chorwon Yonchon 1996 Heavy Rainfall Event.*

Janelle Janish (M.S., 2003) *Relationships Between Baroclinically-Generated Horizontal Vorticity and Mesocyclone Intensity as Revealed by Single-Doppler Velocity Retrievals Using WSR-88D Data*

Edwin Adlerman (Ph.D., 2003) *Numerical Simulations of Cyclic Storm Behavior: Mesocyclogenesis and Tornadogenesis*

Nicki Levit (M.S., 2004) *High-Resolution Storm-Scale Ensemble Forecasts of the 28 March 2000 Fort Worth Tornadic Storms*

Adam Lopes (M.S.P.M., 2004) *Forecasting Aircraft Turbulence: A Historical Perspective and New Approaches for Forecasting Aircraft Turbulence through Mesoscale Numerical Weather Prediction.*

Melissa Bukovsky (M.S., 2004) *Initiation and Propagation of Convection in Forecast Models Using Convective Parameterizations* (co-chair with J. Kain)

Jessica Proud (M.S., 2006) *Optimal Sampling Strategies for Tornado and Mesocyclone Detection Using Dynamically Adaptive Doppler Radars*

Ashton Robinson (M.S., 2007) *Impact of Low-Altitude Radar Data on Storm-Scale Numerical Weather Prediction*

Derek Rosendahl (M.S., 2008) *Identifying Precursors to Strong Low-Level Rotation Within Numerically Simulated Supercell Storms: A Data Mining Approach* (co-chair with Amy McGovern)

Bob Fritchie (M.S., 2009) *Detection of Hazardous Weather Phenomena Using Data Assimilation Techniques.*

Guoqing Ge (Ph.D., 2011) *On the Further Studies of Suitable Storm-Scale 3DVAR Data Assimilation for the Prediction of Tornadic Thunderstorms* (Co-advisor with Jidong Gao)

Service on M.S. Committees (Excluding Own Students)

Chuan-Lau Hwang, M.S. in Meteorology, 1987
A Comparison of Sigma-Coordinate and Pressure-Coordinate Primitive Equation Systems in a Regional Model

Stephen Allen, M.S. in Meteorology, 1988
An Investigation into the Gravity Current Aspects of a Cold-Air Outbreak using Variational Analysis Technique

Guang Ping Lo, M.S. in Meteorology, 1989
Observing Systems Experiments using FGGE/MONEX Data: Impact on numerical prediction of cyclones

Yu-Chieng Liou, M.S. in Meteorology, 1989
Retrieval of Three-dimensional Wind and Temperature Fields from One Component Wind Data by using the Four-dimensional Data Assimilation Technique

Daniel Zacharias, M.S. in Meteorology, 1989
A Case Study of the 10 Day 1985 Tornado Outbreak in Northern Kansas

Yvette Richardson, M.S. in Meteorology, 1993
Verification of NMC Short-Range Models Using Wind Profiler Data

David Dowell, M.S. in Meteorology, 1993
A Comparative Study of Two Supercells: Airborne Doppler Analyses

Gordana Sindic-Rancic, M.S. in Meteorology, 1994
Test of an Advanced Passive Scalar Advection Scheme for Numerical Weather Prediction

Yiping Wang, M.S. in Meteorology, 1994
The Effects of Sampling Error on Satellite IR and Microwave Rainfall Estimates Over the Open Ocean

Daniel Bickford, M.S. in Meteorology, 1994
Effects of Wind Filling in the Near-Environment of a Numerical Storm Simulation

Yunyun Lu, M.S. in Meteorology, 1994
Large-Scale Wind Field Retrieval Using Kinematic Models and a Reflectivity Conservation Equation

Travis M. Smith, M.S. in Meteorology, 1994
Three Dimensional Visualization of WSR-88D Data

John Krause, M.S. in Meteorology, 1995
Application of the Bratseth Technique to Mesoscale Objective Analysis

Robert D. Duncomb, Jr., M.S. in Meteorology, 1996
Verification of VORTEX '94 Forecasts

David S. Andrus, M.S. in Meteorology, 1996
An Observational and Modeling Study of Two EMVER-93 Gulf of California Surge Events

Andrew C. Wood, M.S. in Meteorology, 1997
Analysis of Supercell Storms on 8-9 June, 1994 in Northeastern Colorado

John J. Mewes, M.S. in Meteorology, 1997
Quantitative Verification of Non-Hydrostatic Model Forecasts of Convective Phenomena

Scott Ellis, M.S. in Meteorology, 1997
Hole-Filling Data Voids in Meteorological Fields

Jeffrey B. Basara, M.S. in Meteorology, 1998
The Relationship Between Soil Moisture Variation Across Oklahoma and the Physical State of the Near-Surface Atmosphere During the Spring of 1997

Christopher M. Stock, M.S. in Meteorology, 1998
Intercomparison of Icing Aviation Impact Variable Forecasts Produced During Realtime Mesoscale Numerical Weather Prediction

Dan Bikos, M.S. in Meteorology, 1998
Simulation of a Great Lakes Lake-Effect Snow Event

Eric Kemp, M.S. in Meteorology, 1999
Comparative Assessments of Mesoscale Aircraft Icing and Turbulence Forecasts from the Advanced Regional Prediction System

Justin Lane, M.S. in Meteorology, 2000
A Climatology of Heat Bursts as Detected by the Oklahoma Mesonet: October 1993 Through September 1998

Derek Arndt, M.S. in Meteorology, 2001
The Lasting Effects of Mesoscale Convective Systems Over Eastern Oklahoma during August 1994

Nicole P. Kurkowski, M.S. in Meteorology, 2002
Assessment of Implementing Satellite-Derived Land Cover Data in the Eta Model

Thomas A. Jones, M.S. in Meteorology, 2002
Verification of the NSSL Mesocyclone Detection Algorithm: A Climatological Perspective

Kevin McGrath, M.S. in Meteorology, 2003
Mesocyclone Climatology of The Southern Great Plains of The United States Using the National Severe Storms Laboratory's Mesocyclone Detection Algorithm

Geoffrey Stano, M.S. in Meteorology, 2003
A Case Study of Convective Initiation on 24 May 2002 during the IHOP Field Experiment

Kodi Nemunaitis, M.S. in Meteorology, 2003
Validation of the North American Land Data Assimilation System (NLDAS) Using Data from Oklahoma Mesonet Sites

Andrew A. Taylor, M.S. in Meteorology, 2003
Adjusting Model Output Statistics (MOS) Temperature Forecasts Using Linear Regression of Observations Against Past Errors

Elaine Godfrey, M.S. in Meteorology, 2003
A Study of the Environment and Intensity of Tornadoes from Quasi-Linear Convective Systems.

Christy Carlson, M.S. in Professional Meteorology, 2004
A 1% Temperatures Climatology for the Continental United States

Robert Weinzapfel, M.S. in Professional Meteorology, 2004
High-Resolution Numerical Simulations of a Flooding Rainfall Event in Houston, Texas Associated with Tropical Storm Allison, June 2001

Suresh Marru, M.S. In Electrical Engineering, 2004
A Grid-Enabled Scientific Workbench for Integrated Predictive Earth System Simulation

Nathan Snook, M.S. In Meteorology, 2006
Sensitivity of Tornadic Thunderstorm and Tornadogenesis in Very High Resolution Numerical Simulations to Variations In Model Microphysical Parameters

Patrick Marsh, M.S. In Meteorology, 2007
Assessment of the Severe Weather Environment in North America Simulated by a Global Climate Model

Brittany Dahl, M.S. In Meteorology, 2014
Sensitivity of Vortex Production to Small Environmental Perturbations in High-Resolution Supercell Simulations

Carpenter, Noah, M.S. In Meteorology, 2022
Evaluation of the Experimental Warn-on-Forecast System and WoF-Hybrid 3DEnvVAR System on Short-Term Forecasts for 2021 Real Time Cases

Cohen, Brandon, M.S. In Meteorology, 2022
Examining Meteorological Benefits of Rapid-Scan, Dual-Polarization, All-Digital Phased-Array Radar Observations for Detecting Tornado Formation and Intensification

Service on Ph.D. Committees (Excluding Own Students)

Eugene McCaul, Ph.D. in Meteorology, 1988
The Dynamics of Simulated Convective Storms in Hurricane Environments

Jose Rodriguez Azara, Ph.D. in Aerospace Engineering, 1988
Substitution Theory for Compressible Flows

Rodger Brown, Ph.D. in Meteorology, 1989
Initiation and Propagation of Thunderstorm Mesocyclones

Bok Yoon, Ph.D. in Aerospace Engineering, 1990
Computational Analysis on Hypersonic Flow Past Elliptic Cone Waveriders

Carlyle Macedo, Ph.D. in Computer Science, 1990
Parallel and Vector Algorithms for Numerical Modeling Using Adaptive Grid Techniques

Wan-Shu Wu, Ph.D. in Meteorology, 1990
Helical Buoyant Convection

Juanzhen (Jenny) Sun, Ph.D. in Meteorology, 1992
Convective-Scale 4-D Data Assimilation Using Simulated Single-Doppler Radar Observations

Jiyu Zhan, Ph.D. in Physics, 1993
Several Investigations and Applications of Light Scattering by Small Particles

Litao Deng, Ph.D.in Meteorology, 1993
Dynamics of Tornado-Like Vortices

R. Jeffrey Trapp, Ph.D. in Meteorology, 1994
Numerical Simulation of the Genesis of Tornado-Like Vortices

Scott Richardson, Ph.D. in Meteorology, 1995
Multiplate Radiation Shields: Investigating Radiational Heating Errors

Yu-Chieng Liou, Ph.D. in Meteorology, 1995
Numerical Investigation of a Heated, Sheared Planetary Boundary-Layer

Chia-Rong Chen, Ph.D. in Meteorology, 1996
Improved Treatment of Surface Evapotranspiration in a Mesoscale Numerical Model

Pengfei Zhang, Ph.D. in Meteorology, 1997
Numerical Simulation of Nonlinear Buoyancy Waves in the Lower Atmosphere

Anil Rao, Ph.D. in Meteorology, 1998 (Florida State University)
A Numerical Modeling Investigation of the Cape Canaveral Land-Water Circulations

Xiaoguang Song, Ph.D. in Aerospace and Mechanical Engineering, 1998
Error Estimation and Structural Shape Optimization

Jian Zhang, Ph.D. in Meteorology, 1999
Moisture and Diabatic Initialization Based on Radar and Satellite Observations

Keith Brewster, Ph.D. in Meteorology, 1999
Phase-Correcting Data Assimilation and Application to Storm-Scale Numerical Weather Prediction

Katharine M. Kanak, Ph.D. in Meteorology, 1999
On the Formation of Vertical Vortices in the Atmosphere

Susan Stanislav Alguindigue, Ph.D. in Chemistry, 2000
Investigation of Ligand Misdirection Using the Kinetic Element Effect and the Kinetic Enthalpy Effect

Kazuhito Hatano, Ph.D. in Physics, 2000
The Direct Analysis of Spectra of Type 1A Supernovae

Renee A. McPherson, Ph.D. in Meteorology, 2003
The Impact of Oklahoma's Winter Wheat Belt on the Mesoscale Environment
Michael E. Baldwin, Ph.D. in Meteorology, 2003
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