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SCIENCE'S GO-TO GUY

With the ear of politicians and the respect of researchers, Norman Augustine is the most influential non-scientist in US science.

BY EUGENIE SAMUEL REICH

Of the many requests for advice that stream in from the scientific community, Norman Ralph Augustine says he responds to those that meet one of three criteria: “They’re a cause you believe in; they’re for a friend; or they’ll be fun.”

Augustine, 77, says that he got the line from a friend who was advising him on what to do on his retirement as chairman of the aerospace firm Lockheed Martin, back in 1998. He never expected that following the advice would lead him to a new career, as an unpaid adviser to the scientific community. Yet the role meets all three criteria. Augustine enjoys science. He has a lot of friends in science. And it is unquestionably a cause that he believes in.

Science as a cause may sound like a contradiction in terms, and in many ways it is. But the contradiction lies at the heart of the Augustine enigma. The man who has advised NASA on its space programme, three US presidents on science and technology policy and the US Congress on

the urgent need for more science and education funding (see ‘Linked in’) has largely avoided the critical attention that the scientific community normally turns on its movers and shakers.

It helps that Augustine is not just a tireless advocate for science, but also disarmingly and naturally folksy. In 2010, while testifying to Congress about a study he had led five years earlier on the importance of science and engineering, Augustine suggested off the cuff that cutting science funding to help the economy was like saving an overloaded aeroplane by removing an engine. US President Barack Obama’s team liked the analogy so much that the president used the same line to raise a laugh from Congress when he made his own pitch for increasing science funding in his 2011 State of the Union address.

Today, that 2005 study, known as *Rising Above the Gathering Storm* (RAGS), remains one of the most influential science-policy reports in a generation, and it continues to help guide US science spending on science education and research. It also propelled Augustine into an ever-expanding role at the intersection of science and government. Among his many current duties, he leads a panel that reviews science management at the National Institutes of Health (NIH), and one that will appoint a new director for the Fermi National Accelerator Laboratory (Fermilab) in Batavia, Illinois. From health to energy, Augustine “is the go-to person for a fair judgement on a technical matter”, says Neal Lane, a physicist at Rice University in Houston, Texas, and former

head of the US National Science Foundation in Arlington, Virginia.

Augustine has his critics. Some say that he sometimes advances policies — for example, easing visa limits on foreign postdocs — that benefit US universities and businesses but harm individual American scientists. “He represents a particular set of views: of the chief executive and scientific establishment,” says Ron Hira, a labour economist at Rochester Institute of Technology in New York.

But with the success of *RAGS* and other Augustine studies, it is not hard to understand why leaders in the US scientific community are increasingly turning to him to head their panels, says David Goldston, a former staff member on the congressional committee that implemented some of the recommendations of *RAGS* and a policy expert at the National Resources Defense Council in Washington DC. “It’s like a popular television show. You want to do the sequel.”

RISING ABOVE

Although he has earned the respect of scientific leaders, Augustine has never worked in science, does not have a PhD and has limited personal experience doing research. After getting a master’s degree in aeronautical engineering at Princeton University in New Jersey in 1959, he briefly studied gas flows at Douglas Aircraft Company in Long Beach, California, before moving into management.

In the 1960s and 1970s, Augustine bounced back and forth between jobs in the defence industry and increasingly senior positions in the US Department of Defense, reaching undersecretary of the Army in 1975 under then-president Gerald Ford. In 1987, he became chief executive of aerospace company Martin Marietta, and, in that position, helped to broker what was at the time the largest merger of defence aerospace companies in US history, to form Lockheed Martin in Bethesda, Maryland.

From his first research experience, Augustine says he had been aware of science as the source of US industry’s power to innovate, but it wasn’t until he became chief executive of Lockheed Martin that he took that conviction into the political sphere. In 1996, Augustine gathered the leaders of 20 other corporations, including Hewlett Packard, Ford Motor Company and Motorola, to co-author a letter to then-president Bill Clinton about the importance of government spending on basic research.

They sent the letter to *The New York Times*, Augustine says, but the newspaper rejected it. When other papers did likewise, Augustine bought a full-page advertisement in several papers for his letter. He also began to spend time on Capitol Hill promoting basic research.

Through his stints on government advisory panels, Augustine became friendly with Burton Richter, a physics Nobel laureate at Stanford University in California. They paired up, and found that the idea of a joint briefing on the future of the US economy from a former executive and a Nobel laureate proved irresistible even to very busy congressional staffers. “Norm was more of the star,” says Richter. “I was more of the person who could provide specifics — like Batman and Robin.”

In the beginning, Augustine says, many of their victories came in forestalling threatened cuts to science funding. But the pair began to have success asking for more money in 2005, even though President George W. Bush and the Republicans in Congress were pledging to rein in spending. Augustine’s extensive business background may have helped him to win over some of the Republican lawmakers. That year, he, Richter and others garnered bipartisan support for increasing science funding from the two Democratic and two Republican leaders on the Senate and House science committees.

The leaders asked the US National Academies to produce a report on the top ten things that Congress could do to strengthen science and engineering with a view to improving national competitiveness. Sherwood Boehlert, Republican chairman of the House Committee on Science at the time, says that he was delighted when Augustine was picked to chair the National Academy of Sciences panel that put together the *RAGS* report. “I couldn’t have been happier, it was like something from heaven,” he says. “He’s a national treasure.”

Of the 20 recommended actions in the report, the most notable were calls to recruit 10,000 science and mathematics schoolteachers and to increase federal support for basic research, especially in the physical sciences, by 10% per year for 7 years. Both recommendations were welcomed by senior scientists, who saw them as obvious and long overdue.

But some workforce experts found plenty to dislike in the report, including calls to increase the number of visas for scientific workers. Labour economists have found that temporary visas can lead to the offshoring of jobs because businesses can train foreigners in the United States, then keep them on the payroll when they return home. Hira, who was a reviewer of the report, says that these concerns were given short shrift on the panel, which included eminent scientists and university and corporate leaders, but no representatives of US workers, junior working scientists or economists studying their situations.

Hira and others say that those are striking omissions for a panel tasked with discussing the technical workforce. The first version of the report also ended up including at least one major exaggeration: that China graduated nearly ten times more engineers than the United States (600,000 versus 70,000) — a comparison used to argue for increasing the number of scientists and engineers in the United States. But the Chinese data probably included two-year technical degrees whereas the US figure did not. The error “contributed to the alarm quality of the report”, says Michael Teitelbaum, an economist at the Alfred P. Sloan Foundation in New York, who says that he questioned the numbers in his role as a reviewer. “I don’t know of any serious analyst with an open mind who has concluded there are shortages in the science and technology workforce,” he says. In fact, many US scientists and engineers were struggling to find high-quality jobs in academia and industry, a trend that continues today.

The *RAGS* committee had been given an incredibly tight deadline of just 13 weeks. National Academies spokesman Bill Kearney says that the panel operated with much the same rigour as other academy committees. But participants recall some differences from standard procedures. Charles Vest, who served on the *RAGS* panel and is now president of the National Academy of Engineering, says that some of the most compelling facts in the report about the United States being out-competed by other countries came not from careful reviews of economic and science-policy research literature, but from newspaper clippings that Augustine had collected over the years. Not all of those items were fact-checked by academy staff.

The final version of *RAGS*, released in 2007, corrected the Chinese figures — but by that point the report had already made its mark. The conclusions were roundly welcomed by academic leaders, whose institutions would benefit from the increased funding and influx of foreign students and postdocs.

And it had a much wider impact than that.

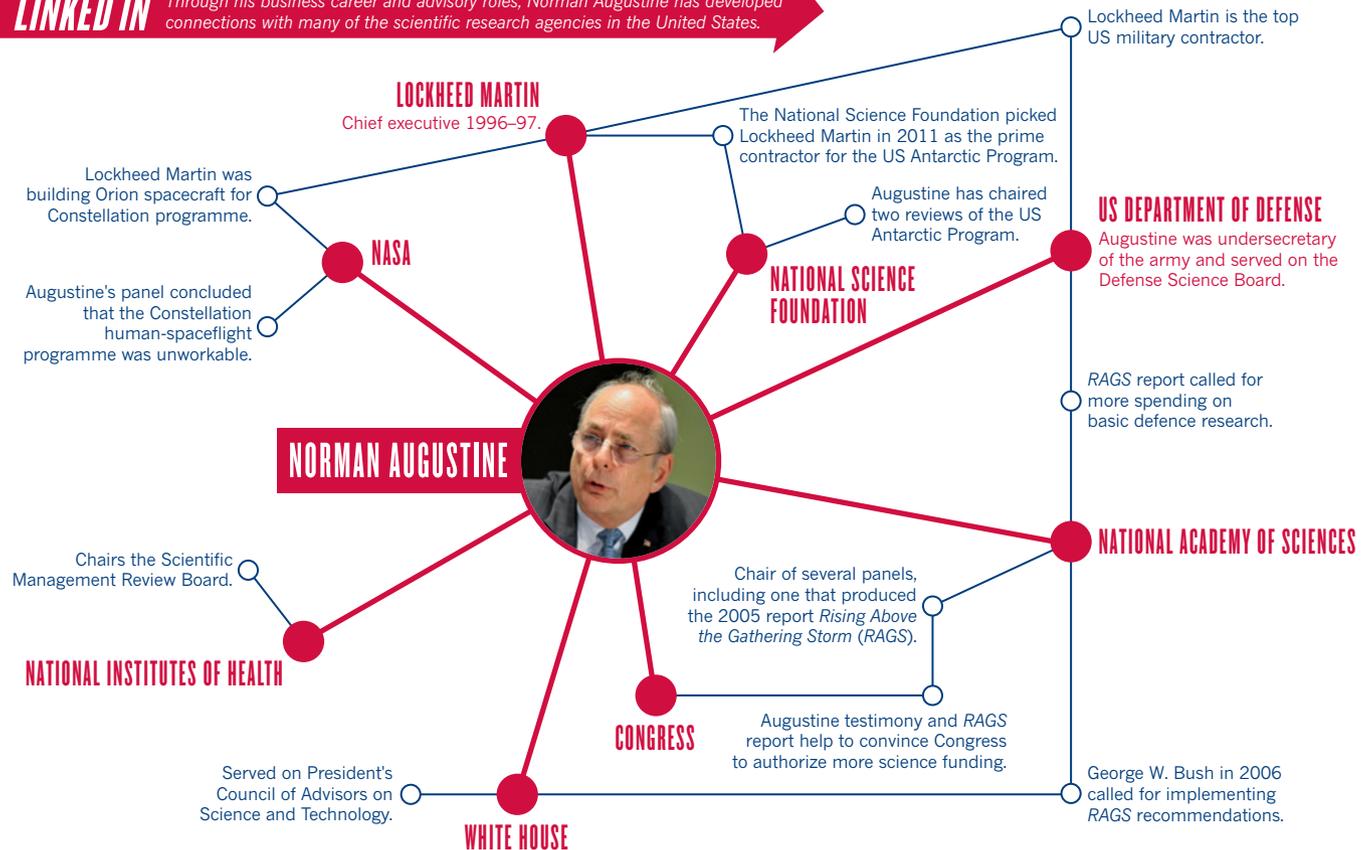
In his 2006 State of the Union address, Bush announced what he called the “American Competitiveness Initiative”, which took up many of the *RAGS* recommendations as White House policy. A year later, Congress passed legislation called America Creating Opportunities to Meaningfully Promote Excellence in Technology, Education, and Science (COMPETES), which set a goal of increasing research investment in science funding agencies by 10% per year, just as *RAGS* had recommended.

Mike Quear, who helped to draft the America COMPETES legislation as a Democratic congressional staff member, says that the rationale of *RAGS* was understood by Congress and the White House precisely because it had been communicated by Augustine in clear, common-sense terms, without using ideas from economics that could be disputed and without pandering to constituencies such as postdoc unions. “That was Norm’s effectiveness,” Quear says. “He was like a big stone rolling down a hill. No one wanted to get in his way.”

When Augustine came to testify on the report, his unscripted remarks were a hit on Capitol Hill. Augustine also cemented his testimony with political friendships. Boehlert says that when Augustine realized that the congressman was a self-described “baseball nut”, he began to quiz him about sports trivia.

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LINKED IN Through his business career and advisory roles, Norman Augustine has developed connections with many of the scientific research agencies in the United States.



Augustine didn't quit after the legislative victory. When Congress failed to provide funding for elements of the COMPETES act or implement some of his recommendations on school education, Augustine prepared another report, in 2010, just as America COMPETES came up for reauthorization, that called attention to the shortcomings. Those reports continue to carry weight on Capitol Hill, where science agencies have generally fared better in terms of funding than other agencies.

The success of RAGS has brought Augustine invitations to join a wide variety of science advisory boards. Lane says that community leaders who want to get something done turn to Augustine because they know that any report he writes will be read by the right people in Congress. "The chair has to be politically tuned-in," he says — and Augustine is.

Yet Augustine has also been accused of being used by establishment figures to provide external validation for their plans. For example, he leads the NIH Scientific Management Review Board, which was asked in 2010 to assess plans for a new translational research centre. Francis Collins, the NIH chief, was pushing hard for the centre — but many researchers were worried about Collins's proposal to dismantle the National Center for Research Resources (NCRR), which oversees important elements of US research infrastructure, to make way for his brainchild.

Jeremy Berg, director of the National Institute of General Medical Sciences and a member of the review board at the time, e-mailed Augustine, warning that the reputation of the board would be damaged if it didn't assert its independence from Collins and take a hard look at the implications of abolishing the NCRR. Three days later, however, the board voted through Collins's plan with little examination of what might happen to the NCRR. "I never heard from Norm," says Berg, the only person on the board who opposed the creation of the translational medicine institute. Augustine says that the board heard from a number of stakeholders before reaching its decision.

But the unease that some researchers felt about the swiftness of that reorganization points to another concern about Augustine's advisory work. His background leads him to view scientific organizations from a

business model, a perspective that can conflict with the way that science actually works. Research is often economically unproductive, for example, and the aims of university and government leaders do not always align with the needs of working scientists. Some organizations seeking Augustine's advice have therefore brought in other experts to complement his outlook. Last year, Augustine and Teitelbaum co-chaired a National Academy of Sciences panel on the defence science workforce to produce a more nuanced report than the discussion in RAGS. Yet nothing has swayed Augustine from the same basic conclusion he reached long ago: "If America wants to compete, it needs to double the research budget — in which case more scientists will be needed."

To those who say that he simply supports the scientific establishment, Augustine counters that he is independent enough to say what he thinks. And he has demonstrated that before. In 2009, a panel that Augustine chaired for NASA concluded that the agency could not complete the Constellation human-spaceflight programme, which upset NASA leaders and possibly his former colleagues at Lockheed Martin, a major space contractor. More recently, public accountability watchdogs complained that Augustine should not have been chosen to review a controversial fracking study at the University of Texas at Austin because he had been on the board of the oil and gas company ConocoPhillips in Houston, Texas. Yet in December, Augustine's panel issued a bruising critique of the study. Indeed, it is difficult to predict from Augustine's private interests how he will vote on any given topic.

But friends say that there is one thing they can predict: Augustine's recommendations will be motivated by a strong sense of patriotism. His love of science stems from his devotion to country, from his sense of science's place in the nation and in the global economy, which is precisely why his words have traction with politicians. "It's incorrect to refer to Norm as an advocate for science," says Vest. "He's an advocate for what he thinks the United States needs." ■

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