PROFILE DON AND FRED LAMB

Twin Stars of Astrophysics Make Room for Two

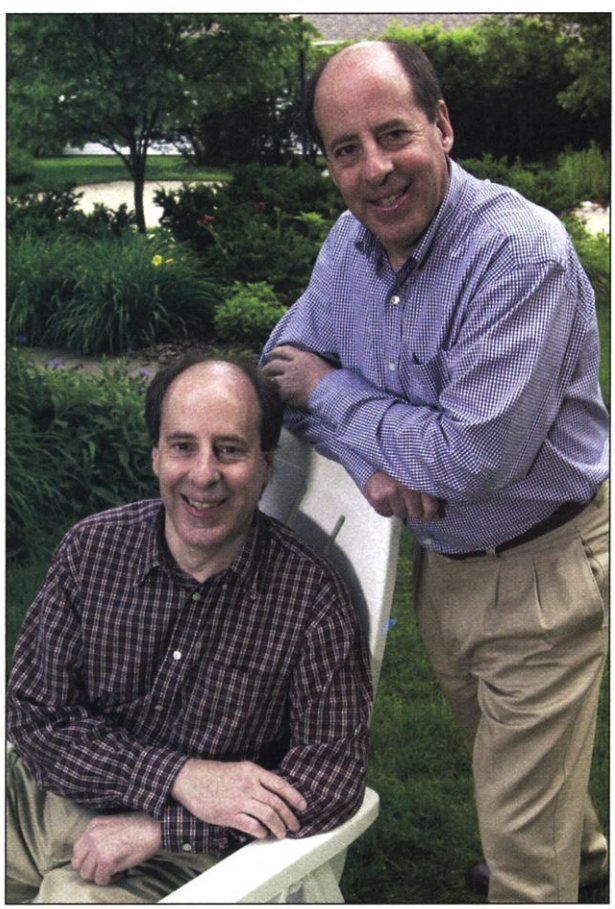
A passion for science has drawn them together since childhood, but to succeed as individuals the Lamb brothers have learned to keep their distance

It is early afternoon, and outside Don Lamb's office a winter gray twilight is starting to settle over the University of Chicago campus. Inside, Don Lamb is trying to define the difference between himself and his identical twin brother Fred. Although it is getting difficult to see in the office, he is too engrossed to get up and flick the light switch. Don, like Fred, is a kinetic storyteller. As he talks, the tales tumble out one after the other, careening from their childhood in post–World War II Kansas to Beatles-era Liverpool and back to the Midwest.

But it is Don's hands that tell the real story. Whenever he talks about Fred, his index finger sketches out a straight line. And when he talks about his own life, Don's finger pirouettes around the same line. In the gathering dark, a metaphorical light bulb turns on. "That's it," he concludes. "Fred is like a straight line, and I have kind of spiraled around."

To the untrained eye, Fred and Don look more like parallel lines. Both study the physics of binary star systems that contain compact objects such as black holes, neutron stars, and white dwarfs. They work in the same state: Fred is the director of the Center for Theoretical Astrophysics at the University of Illinois, Urbana-Champaign, and Don is a professor and former chair of the Department of Astronomy and Astrophysics at the University of Chicago. Both also serve as scientific advisers to an amazing variety of international projects, ranging from a pair of satellites carrying x-ray telescopes to nuclear nonproliferation and the plight of scientists from the former Soviet Union.

They may have followed similar paths, but the two brothers have carefully avoided sharing the same spotlight. Experience has taught them to value their separate lives. "Once people see us together and identify us as twins, they can't seem to think of anything else," says Don. The Lambs think about it, too. Their conversation abounds in mistaken-identity stories: Fred's postdoc buttonholing Don at a conference to discuss a research project Don had never heard of; an exuberant fellow physicist in Paris dashing up to bear-hug the wrong brother from behind; countless misplaced handshakes and abortive attempts at eye contact. In public, they say, it's often easier for one of them to answer to the other's name, bluff his way through the ensuing conversation, and later pass on any important information to his brother.



Different orbits. Astrophysicists Don (left) and Fred Lamb had to work at forging separate professional identities.

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Yet if Fred and Don have learned to laugh off such bizarre byproducts of twinhood, they also acknowledge that they have constantly striven to keep their distance, driven by the need to maintain separate professional identities in a small, tightly knit scientific field. The policy has paid off. Both brothers are widely respected for their individual accomplishments and now stand at the pinnacle of distinguished careers. Despite their best efforts, however, a shared passion to explore the world around them has repeatedly—and happily for the brothers—drawn the twins back together.

First, we take Manhattan

The Lamb brothers began trading notes on their experiences almost from birth, although at first no one else could understand what they were talking about. "Until we were 5 years old, we spoke our own language," Fred says. Although that infant dialect has since faded into obscurity, the brothers' exchanges can be nearly as impenetrable today, their conversations a blur of half-completed sentences and unspoken understandings that bewilder even their closest relatives. "We always know exactly what the other one is trying to say," Don says. "We can track each other's minds." Fred agrees. "It is wonderful to have someone who is so *simpatico*," he says.

As children in Manhattan, Kansas, the brothers shared a passion for electronics and gadgetry. Don designed elaborate train models; Fred built ham radios from scratch. They entered their teens just in time to be swept up in the national science-education boom that followed the 1957 launch of Sputnik. "After that, there was no question about it," Don says. "Anyone who was good at science felt an obligation to do it." Like many budding high-school physicists, they applied to the California Institute of Technology, which accepted them to fill two of the 170 slots in its freshman class.

Two roads diverged

Then Don began the first of his many professional loops that would carry him far from Fred before curling back to reunite them. "We decided Caltech wasn't big enough for the both of us," Fred recalls. While Fred went straight to Pasadena, Don opted for Rice University in Houston, drawn by its broader range of courses and free tuition. He began as an English literature major but soon switched to a double major in physics and mathematics. Several thousand kilometers away, Fred immersed himself in physics leavened with academic activism, campaigning against Caltech's harrowing former system of frequent comprehensive exams and publicly posted grades. "It was traumatic; 25% of the freshmen were gone before the end of the first year," he says. Although he himself thrived in

the environment, Fred gave a speech lambasting the system's cruelty and shortsightedness and helped form a faculty-student committee that eliminated grades for freshmen—a policy still in force.

After graduation, Don won a Marshall scholarship to study experimental high-energy physics in Liverpool and soon joined a research team at CERN, the European particle physics laboratory near Geneva, Switzerland. Independently, Fred won a Marshall scholarship to study high-energy physics in Oxford, just down the road from Don. Even as the maturing brothers were trying to establish separate adult lives, fate had closed the loop for the first time.

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Across the pond

Fred settled right in and eventually completed his D.Phil. in theoretical physics at Oxford. Don, however, grew restless tracing out the spiral tracks of particles passing through CERN's bubble chambers. Returning to Liverpool, he buried himself in the library and gorged himself on quantum mechanics. His master's thesis—the first calculation of antiproton-proton annihilation using Murray Gell-Mann's "eightfold way" particle theory—was advanced enough to have been a Ph.D. dissertation, but Don had other ideas. He enrolled in a doctoral program at the University of Rochester in New York, where the less structured program allowed him to explore many areas of physics before settling on astrophysics. With the discovery of pulsars and the advent of x-ray astronomy, Don foresaw a golden age of research, one that needed light-on-their-feet scientists to absorb information quickly, connect disparate ideas, and contribute fast. First, though, came another swerve of the spiral, as Don took a year off in mid-dissertation to organize work on George McGovern's 1972 presidential campaign.

Back in the U.S.A.

Fred also felt the lure of astrophysics. In 1972, he returned to the States to join a group of "young Turks" studying the physics of neutron stars at the University of Illinois, Urbana-Champaign. "I realized that this was when the structure of a completely new kind of star would be worked out," Fred says. "I wanted to be a part of that." He is still there and still studying neutron stars.

Illinois set the stage for the brothers' only long-term collaboration when, about a year after Fred started, the physics department hired Don. When another department member told Fred what was in the works, "I thought he was joking," Fred recalls. But soon department secretaries had taped up deskside mug shots of mustachioed Fred and clean-shaven Don to tell them apart. Although both twins worried that their similar styles might lead them to overlook the same mistakes, they proved a creatively combustible combination. "Fred and Don work extremely well together," says Chris Pethick, an astrophysicist who was Fred's first roommate at Illinois and who now works at NORDITA in Copenhagen, Denmark. "Things went off like a bomb." Literally: Fred and Don co-authored several papers arguing that the x-ray bursts just discovered by the first x-ray telescopes are produced in thermonuclear explosions on the surfaces of neutron stars.

But the party didn't last long. The brothers began to worry that their close collaboration was obscuring their individual contributions. "There was some confusion in the community about who was doing what," says Fred. So while on a 1-year sabbatical in Boston, where Don's wife was launching a career in child development, Don resigned his tenured position at Illinois. His quest for new challenges also played a role in the decision. "Every few years I need a change," he says. "Otherwise, I find I am not being as creative."

Don's ever-widening gyre has now carried him to the outermost fringes of the universe. In the 1990s, he plunged into arguments about the immensely powerful cosmic explosions known as gamma ray bursts (GRBs). Before September 1991, virtually all astronomers believed GRBs came from inside the galaxy. But when the Compton Gamma Ray Observatory revealed that GRBs are distributed smoothly across the sky, not in the pancake shape of the Milky Way, "astronomers split 50–50 over whether the bursts were galactic or cosmological," recalls Princeton astrophysicist Bohdan Paczyński. On 22 April 1995, Paczyński and Don squared off in a public debate in Washington, D.C., Paczyński arguing for cosmological GRBs, Lamb for galactic. (Fred, on the sidelines, backed Don's view.) The evidence was inconclusive. Only in 1997 did the Italian BeppoSAX satellite firmly locate the bursts at the fringes of the universe. "I was wrong on that one," Don admits.

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But he quickly rebounded and leapt headlong into a new problem. For the past year, Don and his collaborators have been arguing that GRBs are powerful probes of the early universe and have been using data from the High Energy Transient Explorer-2 (HETE-2, the near-twin of the HETE satellite that failed to reach orbit in 1996) to exploit the new tool. "That is not moral ambiguity; it is the mark of a good scientist," says astrophysicist Stan Woosley of the University of California, Santa Cruz, who has known Don since their student days together at Rice University. "Don was able to accept the data, reformulate his position, and move on gracefully."

Fred Lamb, meanwhile, has become an acknowledged leader in neutron-star physics, a field that now can boast hard numbers to flesh out its theoretical speculations. Since 1979, Fred has been a member of a team that proposed a new satellite to study how the x-ray emissions from neutron stars and black holes vary over time. Initially designed to be launched on a rocket, then redesigned for the Space Shuttle, and then re-redesigned for rocket launch following the Challenger disaster, the Rossi X-ray Timing Explorer (RXTE) finally took to the skies on 30 December 1995. It has been returning data to Earth ever since. "RXTE has evolved into a tool to test general relativity and study the ultradense matter in neutron stars," Fred says. "We are entering a new era."

As the two 56-year-old astrophysicists enter the mature stage of their careers, they seem to have struck a balance between the forces that push them apart and pull them together. They live close enough to share an occasional weekend barbecue with the kids (Fred has a son and daughter, Don a son) but far enough that months can pass between face-to-face meetings. Their professional interests are similar enough that they can critique each other's ideas, but different enough that they are usually invited to separate conferences. In fact, as they themselves point out, the Lambs are a lot like the binary stars they study: closely bound, but following distinct, overlapping trajectories.

–MARK SINCELL

Mark Sincell writes from Houston.