

THE AUTHOR FILE

Roger Y Tsien (1952–2016)

A chemist who illuminated biology.

In August of this year we lost Roger Y. Tsien, one of the scientific community's leading lights. Roger was a Nobel



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laureate in chemistry, a pioneer of chemical biology, a friend to many, an inspiration to many more, and a mentor to a lucky few. As some of these lucky few, we would like to honor Roger by remembering both his accomplishments and what made him such an admirable mentor.

Roger was a scientist through and through, with an early passion and aptitude for chemistry that led him to win the Westinghouse Science Talent Search at the age of 16. A defining feature of Roger's illustrious career was his ability to approach biological problems with the mindset of an organic chemist. As a PhD candidate at the University of Cambridge in the early 1970s, he recognized that a thoughtfully designed Ca^{2+} -chelating dye molecule had the potential to enable the visualization of brain activity at an unprecedented scale. Like so many of his ideas, this was at least a decade ahead of its time. It was only with Roger's 1985 *Journal of Biological Chemistry* publication on the fura-2 and indo-1 Ca^{2+} dyes that the rest of the scientific community began to comprehend his vision. The impact of this paper cannot be overstated—as of 2014 it was the 42nd most cited paper of all time. This early success perfectly captures the fearless trailblazing spirit, boundless curiosity, and breadth of knowledge that remained key traits throughout his career.

Roger continued to make contributions toward solving a dizzying array of problems, typically by first inventing a tool that changed the impossible to the possible. Concepts and inventions attributable to Roger include sequencing by synthesis, fast two-photon scanning, acetylation to improve compound permeability, voltage-sensing dyes, caged second messengers, and tags for chemical labeling of proteins. That is quite a list, and it does not even include his contributions to the understanding and use of fluorescent proteins, for which he shared the 2008 Nobel Prize in Chemistry with Osamu Shimomura and Martin Chalfie. Roger repeatedly applied his unique combination of chemical knowledge, biological interests, and deft imagination

to create breakthroughs. He had far more original ideas than one person could hope to pursue, and he loved to share them. Infamously, he was never shy about offering insightful and constructive comments during research seminars or pointed criticisms when warranted.

Roger inspired a generation of researchers to follow the trails that he blazed in a myriad of directions. He let many of his trainees build their careers on the foundation of their work in his lab, giving him the perfect excuse to launch his research in a new direction. Perhaps most important, he inspired his trainees to proudly assume the mantle of 'tool builder' even though he recognized, with humility, that many in the biology community at the time considered technology development to be of secondary importance. One of Roger's many legacies was raising tool development to a first-class discipline and spurring the establishment of high-profile journals, such as *Nature Methods*. Roger led by example and bestowed on his trainees a clear sense of their purpose in the grand scheme of science and a roadmap for making contributions to promote scientific progress.

We remember Roger fondly as a kind and generous mentor with infectious enthusiasm. His eyes would sparkle and his mouth would form a mischievous smile when he began discussing his latest, exciting research idea. Roger also liked to share amusing stories that illustrated the challenges of pursuing ideas before others could appreciate them, and the rewards that ensued when others acknowledged the accomplishment. Although we know Roger best for his scientific pursuits, he had a full range of interests outside the lab. Roger loved to travel with his wife Wendy, he kept up an active lifestyle, and he was a passionate and skilled pianist. After Roger's stroke in 2013, he requested the most strenuous regimen of physical therapy available. With incredible willpower, he overcame paralysis of half his body and recovered the ability to walk on his own. Just as Roger pursued his ideas to their fullest potential, he lived his life to the fullest.

With Roger's passing, we have lost a close mentor and colleague, and the scientific world has lost one of its most creative and sharpest thinkers. In his Nobel biography, Roger humbly stated that "development of successful techniques to address important problems allows lesser mortals to exert a widespread beneficial impact for at least a few years." As no lesser mortal, Roger developed techniques with beneficial impacts that have pushed the frontiers of research forward for three decades and are certain to live eternally in the world of scientific research.

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