

Remembering Sanjiv (Sam) Gambhir, MD, PhD

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Sam Gambhir served as the radiology chair, the Virginia and D.K. Ludwig Professor in Cancer Research, director of the Molecular Imaging Program at Stanford, director of the Canary Center for Cancer Early Detection, and director of the Precision Health and Integrated Diagnostics Center. He authored approximately 700 peer-reviewed articles and 5 books, and he filed 40 patents. Work from his lab has been featured on 36 journal covers. Sam mentored more than 150 postdoctoral and clinical fellows and graduate students, as well as many young faculty in a wide array of disciplines. These individuals benefited from Sam's inspiring and caring leadership and proudly go on to honor Sam by promulgating his teachings and values. All these activities reflect the immense vision, creativity, energy, ambition, and leadership of Sam as a scholar of international acclaim in molecular imaging, biomedical sciences, medicine, and health care in his relentless desire to do his part to improve the world we live in.

Here, we want to remember who Sam was personally and who he was to us.

In 1967, when Sam was 5 years old, his mother, Sharda, and father, Raj, emigrated from India to settle in Arizona. Sharda and Raj taught their son, Sam, and daughter, Sangeeta, the values and principles Sam would live by throughout his life.

Sam graduated from Arizona State University with degrees in physics and mathematics (*summa cum laude*) and applied to medical school at UCLA. This was the first year of UCLA's MD/PhD program. Sam's application was mistakenly placed in the MD/PhD pool. He was accepted into the combined program, with the Department of Biomathematics as the PhD track—a truly fortunate “mistake” for Sam and his many subsequent students and colleagues. He graduated at the top of his medical school and PhD classes.

When Sam was an intern, he worked harder than anyone else and far beyond the program requirements. Sam showed empathy and compassion and truly cared for his patients. Yet, despite the heavy clinical workload, Sam continued his research.

This exhaustive and productive pace continued as Sam became both a nuclear medicine resident and an assistant professor in the Department of Molecular and Medical Pharmacology and dramatically expanded his research. Sam's ever-expanding academic effort appeared limitless, and this characteristic continued throughout his career. Sam believed that although speed and intensity were not sufficient conditions for success, they were necessary ones.

After Sam became an assistant professor, he was concerned that people might never be interested in his work of combining biostatistics, physics, and nuclear medicine. We assured him that he had the ability, imagination, and relentless drive not only to create interest in nuclear medicine but also to build a new future for it.

It was evident at this time that Sam was an extraordinary young man at the extremes—extreme natural curiosity, extreme drive to discover and invent, and extreme work ethic, all coupled with genuine warmth and generosity to others and with a charming sense of humor. All these attributes and talents made life with Sam exciting and fun. Sam lived at work in these early days and often slept on the bed of the PET scanner (this really never changed, except that he no longer slept on the PET scanner bed). In those times, and throughout his career, Sam went to bed excited about what he was going to do tomorrow; everyone around him could feel and share in the sense of excitement, and all were eager to do their part.

When Sam joined the Department of Molecular and Medical Pharmacology, we both served as directors for divisions of the Atomic Energy Laboratory (later becoming the Department of Energy) at UCLA—the Nuclear Medicine Division (Mike) and the Cell and Molecular Biology Division (Harvey). Harvey had been working on repetitive, noninvasive imaging of gene expression *in vivo*, using luciferase bioluminescence. It occurred to us that many advantages could be gained if we could develop PET reporter genes, including performing these assays on patients. But how to do it? The answer? Sam! Of course! Sam became the idea guy, the execution guy, and the validation guy. We were in the right place at the right time, and—most importantly—with the right colleague. When the National Cancer Institute decided to fund the first *In Vivo* Cellular and Molecular Imaging Centers in 2000, we, along with Memorial Sloan Kettering and Harvard, received the first round of awards. We were working with a remarkable group of colleagues—Simon Cherry, Henry Huang, John Maziotta, Johannes Czernin, Heinz Schelbert, Owen Witte, Jorge Barrio, Nagichettiar “Saty” Satyamurthy, Toni Ribas, Anna Wu, Charles Sawyers, Arnie Berk, Hong Wu, Arion Chatzioannou, and others. This was a time when we were integrating basic and clinical sciences to, among other things, broaden the principles and foundation of molecular imaging. Because of our diverse backgrounds with the goal of doing things together that none of us could do alone, we had to be both good teachers and good students of each other in our weekly meetings. Many of us, on reminiscing about Sam, remember these interactions as the most enjoyable, productive, and stimulating academic research activities we have experienced. Sam flourished in this environment, constantly demonstrating his remarkable ability to quickly grasp and develop concepts, come up with new ideas, integrate them into a broad scientific perspective, suggest modifications of goals, identify flaws on the fly, and do experiments at a quick pace, as a force in the dynamics of these meetings week after week.

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Sam was a teacher for people of all ages, kindergarten to grade 12, college students, colleagues, and the public. He had, even then, several personal attributes and interests that originated from his amazing insight, intuition, and imagination. Sam saw a new world in Apple computers, at a time when many people focused on what these systems could not do rather than what they could uniquely do. He saw Apple computers as media and communication technologies and acquired one of the first Apple computers at UCLA. Sam was convinced these systems would change the world, beginning with education. Starting with an idea from his insight and imagination, he established, with a group of about 6 students ranging from kindergarten to college age, a truly creative educational program called, “Kids Building Learning Systems for Kids.” What emerged were the first computer-based, multimedia learning systems using the unique features of the Mac. With Sam’s math background, he knew game theory, which was the basis of video games. He used this knowledge to develop and build innovative and fun learning games with names such as “Let’s Play _____, where the blank was math, biology, disease, . . . and even PET. Sam and his kids beat Apple and Microsoft in a national competition in computer-based, multimedia learning systems. While building these systems, Sam and his kids thrived as both teachers and students of one another, each contributing to the principles of these novel learning systems with pride and purpose, while having fun.

It was Sam’s conviction that learning should be a way of life for all people regardless of age. In everything Sam did, he followed a creative vision, striving to do what had not been done before. He adhered to the principles of excellence, lifelong learning, and teaching that drove his research throughout his life at UCLA and Stanford, in science, medicine, education, and public service.

When Sam was recruited to Stanford, he created an ever-expanding sphere of scholarship and influence with colleagues, students, and staff. At the center of this sphere was Sam, with his intense natural curiosity, generosity, good will, boundless energy, and relentless effort to add pieces to a puzzle in a program pathway he envisioned as ranging from the basic sciences to the clinical sciences to patient care. His remarkable personal and professional attributes, communication skills, and delightful sense of humor facilitated his interactions and work with people from different disciplines, interests, and ages and motivated them to achieve common goals. In addition, he became an expert at raising funds from the National Institutes of Health, Department of Energy, Department of Defense, foundations, and donors because people trusted and believed in Sam—that he would not give up until he delivered what he had promised or discovered better alternatives.

Sam embraced the teachings of Norton Simon, who said, “There is a natural curve in life. You go up, plateau and go down. The way to deal with this is to be continually starting new curves and by this to remain in a state of becoming.” This philosophy was at the very heart of Sam’s persona and part of the means by which he accomplished so much in a life that was much too short.

Our love goes out to Sam’s wife, Aruna, and the entire Gambhir family. Losing their beloved son Milan to cancer brought incredible sadness to their lives. Aruna, as we mourn the loss of Sam, your pain and sadness are unimaginable and incomprehensible. Please know that all of Sam’s friends, colleagues, students, and staff—as members of your greater family—are here for you, as we have always been.