Dale J. Benos, who died suddenly Oct. 7, a week after his 60th birthday, was born in Cleveland, Ohio. His father, who had mixed Greek and Czech heritage, was a railroad worker, whereas his mother, whose family was of Italian ancestry, was a beautician.

After briefly considering a career as a professional baseball player, Dale elected for the decidedly less glamorous path of a physiologist, a choice that nonetheless yielded significant prominence.

After parochial school, Dale attended Case Western Reserve University, where he carried out laboratory research as an undergraduate, bringing him and another student, Pete Cala, to the lab of Bodil Schmidt-Nielsen, the daughter of August Krogh and one of the great comparative physiologists of the 20th century.

Under Bodil’s guidance, and that of postdoctoral fellow Robert Prusch, Dale embarked on his first formal scientific research: studying osmoregulation in freshwater hydra. That work, and a summer fellowship in 1972 with Bodil at Mount Desert Island Biological Laboratory in Maine, resulted in a lifelong interest in the mechanisms underlying whole body salt and water homeostasis. This led Dale, by degrees, from studies in erythrocytes, frog skin, blastocysts and principal cells of the renal collecting duct to his most recent work on the ion-transport pathways involved in migration and proliferation of glioma cells.

At MDIBL, Dale met Dan Tosteson, who became his doctoral adviser at Duke University. The early 1970s at Duke were remarkable for the collection of young, enthusiastic scientists involved in physiological research, including Sid Simon, Ramon Latorre, George Somjen, Toshio Narahashi, Bob Gunn, Clint Joiner, Bob Balaban, Dave Shoemaker and Peter Lauf, along with John Parker, Art Finn and Luis Reuss just up the road at the University of North Carolina at Chapel Hill. Added slightly later to the mix was Dale’s friend from Case, Pete, who was a postdoc in Tosteson’s lab.

Tosteson, who could reduce students and postdocs and, as Dale later said, even long-established chairs of physiology departments to quivering masses of jelly by the pure force of his intellect, jointly supervised Dale and Pete, although he passed on responsibility later to Laz Mandel, who became one of Dale’s lifelong mentors and friends.

During this period, Dale published the first of numerous studies on the effect of the diuretic amiloride on sodium transport after being prompted to do the experiments by Sid Simon, who had attended a seminar on the drug. Inhibition of transport by this compound has since become one of the hallmarks used to characterize voltage-insensitive sodium channels.

In 1978, Dale joined Harvard Medical School as an Andrew W. Mellon scholar in reproductive biology, and his work focused on the mammalian blastocyst; although his research into sodium transport in frog skin and erythrocytes continued, the latter was something of a personal achievement for someone who hated the sight of blood!

The preimplantation rabbit blastocyst undergoes dramatic changes in Na⁺ permeability and volume during development, and elucidating the mechanisms involved in this process occupied Dale and colleague Bob Balaban for most of the early 1980s. Dale then began to focus on the Na⁺ channel itself.

With Sarah Sariban, Latorre, Mo Burg and Lori Olans, Dale isolated the amiloride-sensitive Na⁺ channel from an amphibian renal cell line A6. Incorporation of the purified protein into a lipid bilayer and the demonstration that this protein formed an amiloride-sensitive Na⁺ channel resulted in the 1984 publication of a seminal paper in Nature. Subsequent papers in the Proceedings of the National Acad-
emy of Sciences, Biochemistry and the Journal of Biological Chemistry, as well as a landmark review co-authored with Haim Garty, described the isolation and characterization of a mammalian Na⁺ channel complex.

At Harvard, Dale recruited his first graduate student, Juan Reyes, to work on metabolism and transport in spermatozoa. Their finding that gossypol, a component of cottonseed oil, could block oxidative phosphorylation in spermatozoa, and the potential role of gossypol as a male contraceptive, led to an article by Good Housekeeping magazine, an achievement of which Dale was quite proud!

In 1985, he joined the University of Alabama at Birmingham as an associate professor and remained there the rest of his career. He was appointed full professor in 1987 and chairman of the department of physiology and biophysics in 1996.

He continued work on the mammalian Na⁺ channel and later on ENaC, using bilayers, patch clamp and biochemical approaches. This expanded to include studies of epithelial chloride and sodium transport in the airways, of the effects of the HIV envelope protein gp120 on function of the Na⁺/H⁺ exchanger and of the role that glutamate efflux from astrocytes might have on neuronal death and cognitive deficits in AIDS patients. His recent research focused on the role of Na⁺ transport in glioma cells and was spurred, in part, by illness in his family and the death from a stage IV brain tumor of his friend and mentor Mandel.

A committed and proud member of the American Physiological Society, he served as president in 2006. He continued to be heavily involved in the APS until his death.

Dale had a passion for teaching, a legacy from Tosteson, an inspiring, if slightly terrifying, teacher who instilled the importance of lifelong learning, reiterating earlier advice from Dale’s parents and grandparents.

Dale could make the somewhat dry topic of membrane biophysics interesting and fun, enlivening lectures with videos, demonstrations and interviews with notable physicians and scientists, jokes and, occasionally, cookies. He recently invited students to use Twitter during class to ask him questions or make comments. He also gave out pens advertising the UAB Center of Clinical and Translational Science, for which he served as director of educational programs. This had an unexpected effect on his 60th birthday, when his freshman medical school class tweeted him birthday wishes and presented him with numerous pens. His teaching ability was naturally recognized by multiple university- and student-based awards.

He also advocated for scientific communication, serving as editor of the American Journal of Physiology – Cell Physiology for six years, starting in 1990, and later as chairman of the APS publications committee from 1999 to 2004. He joined the Journal of Biological Chemistry’s editorial board in 1989 and became an associate editor in 2006. He was justifiably proud of this appointment and encouraged everyone to submit their best work to the journals with which he was involved.

Dale was also a fierce athletic competitor, occasionally deserting houseguests early in the morning to play pick-up games of basketball; on finding himself on the wrong side of a best-of-three challenge, his fellow players would be dismayed to find that the game had suddenly changed to a best-of-five or, worse, a best-of-seven competition. He played fast-pitch softball and was pleased when, on a departmental outing to a Birmingham Barons game, he was asked to throw the first pitch, and one of the pro players noted the ball had “popped.”

He also was a fan of Formula One racing; his Italian heritage and admiration for innate ability led him to support the Ferrari of Michael Schumacher. One of his fondest office accessories was a scale model of Schumacher’s car picked up on one of his trips to the U.S. Grand Prix.

Meanwhile, Dale also found time to coach his daughters’ softball teams and, once they entered high school, to help with their cheerleading squads. Without question, his greatest passion was for his wife, Kim, and his daughters, Kaitie and Emilee. He is survived by them and his two brothers, Wayne and Rick. He also is survived by an extended scientific family who grieves the loss of an outstanding colleague, mentor and dear friend.

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To read more online:
To read thoughts and reflections from several of Dale’s friends and colleagues, go to http://bit.ly/cmNcbt.

IN MEMORIAM
Donations can be made to the Dale J. Benos Research Fund, c/o UAB Gift Records, 1530 Third Ave. S., AB1230, Birmingham, AL, 35294.