

John Philip Trinkaus (1918-2003)

John Philip Trinkaus studied the processes of cell migration and gastrulation, especially in teleost fish, in the US during the twentieth century. Called Trink by his friends, his social confidence and work ethic combined to make him a prolific and decorated developmental biologist. His scientific contributions included investigations of several different aspects of embryology.

Trinkaus was born 23 May 1918 in Rockville Center, New York. Trinkaus studied at Wesleyan University in Connecticut, where he obtained his BA in 1940. He then moved to New York City to attend Columbia University, from which he obtained his MA in 1941. After leaving Columbia, Trinkaus matriculated to Johns Hopkins University in Baltimore, Maryland. Shortly after arriving at Johns Hopkins, however, World War II interrupted his studies. Trinkaus spent three and a half years in the military stationed in the US doing aviation research. After the war, he returned to Johns Hopkins to resume his work in the lab of embryologist Benjamin H. Willier, and he received his PhD in embryology in 1948.

In 1948, Trinkaus became an instructor of biology in the Department of Zoology, later the Department of Biology, at Yale University in New Haven, Connecticut. He was soon promoted to full professor, and he taught and researched at Yale throughout his academic career. In addition to teaching and researching, Trinkaus was a fellow of Yale's Branford College from 1951 to 1966 and its master from 1966 to 1973, during which time he also served as director of graduate studies in biology.

While an undergraduate at Wesleyan, Trinkaus began spending his summers at the Marine Biological Laboratory (MBL) in Woods Hole, Massachusetts, and summers at the MBL became a tradition for him. Though he taught one summer course in embryology at the MBL early in his career, his later work in Woods Hole focused on research. Trinkaus's season-long annual visits to his summer residence and lab in Woods Hole occurred almost without exception for the rest of his life.

During a summer at the MBL, Trinkaus met Galina Gorokhoff, and they married each other a few years later. They had three children: Gregor, Tanya and Erik. The family lived in New Haven during the academic years, and Woods Hole during the summers. Years later, while on a Guggenheim Fellowship in France, Trink met Madeleine Robineaux. Though both were married, they quickly became inseparable, and after finalizing their divorces, they were married in 1963. They remained together for the rest of their lives.

Trinkaus published dozens of academic papers during his career on a variety of subjects within embryology, but much of his research focused on cell migration and development during gastrulation. He found a particularly appropriate research subject in the fish *Fundulus heteroclitus*. The transparent eggs and embryos of this teleost served his needs, as much of his research was primarily observational. Though he used dye-stains and transmission electron microscopy, many of his research publications were based on simple photomicrographic images of the teleost eggs. Through observation and dissection, Trinkaus became an expert on the developmental processes occurring within the eggs. His expertise led him to clarify the relevant terminology, as he named or renamed several internal structures including the yolk syncytial layer (YSL) and yolk cytoplasmic layer (YCL).

Trinkaus's focus on fish eggs originated from his interest in epiboly, which he considered the initial phase of gastrulation. He studied epiboly extensively, elucidating through observation and experimentation the relationship between the YSL and the blastoderm, specifically the primary role of the YSL in the development of the blastoderm during epiboly. He also demonstrated that cytoplasmic activities in intact embryos were similar to those activities for cells in culture, assuaging worries

about the validity of research on morphogenesis in cell cultures.

Trinkaus's life was filled with other honors and activities. He was a member of the US Space Biology Advisory Panel of NASA from 1976 to 1979, and he was a John Simon Guggenheim Fellow at the College de France, Paris, in 1959. He wrote two editions of *Cells into Organs: The Forces That Shape the Embryo*, a treatise on cell invasion of bodily tissues that was relevant to the study of cancer. In addition, he was a member of the American Society of Zoologists, the American Society for Cell Biology, the International Institute of Embryology, and the American Society for Developmental Biology. He also spent time working at the Station Biologique in Roscoff, France, and was one of the first scientists to receive a Method to Extend Research in Time (MERIT) Award from the US National Institutes of Health. The grant money allowed him to continue his research after retiring from teaching.

Described as opinionated, complex, and curious, he lived a life with little separation between his private and professional worlds. He judged the annual beer-drinking contest at Yale, and his colleagues said that he told irreverent jokes, lectured with a joy that was infectious, and opened his homes to students, colleagues and friends. His seventieth birthday was celebrated at the MBL with a special symposium, which came to be known as Trinkfest. Scientific talks and poster sessions intertwined with evening banquets full of food, alcohol, and laughter, a tribute to a man who never retired from science, continuing to research into his 80s. Soon after finishing his autobiography, *Embryologist: My Eight Decades in Developmental Biology*, Trinkaus died on 8 February 2003 at the age of 84.

Sources

1. Betchaku, Teiichi, and John Philip Trinkaus. "Contact relations, surface activity, and cortical microfilaments of marginal cells of the enveloping layer and of the yolk syncytial and yolk cytoplasmic layers of *Fundulus* before and during epiboly." *Journal Of Experimental Zoology* 203 (1978): 381-426.
2. Jacques Cattell Press. "Trinkaus, J(ohn) P(hilip)." *American Men and Women of Science*. 12th ed. Vol. 6 (1973): 6463.
3. Kimmel, Charles B., and James A. Weston. "An Overview of Trink's Scientific Accomplishments." *Developmental Dynamics* 228 (2003): 586-87.
4. Saunders, John W. Jr. "Trink, The Man." *Developmental Dynamics* 228 (2003): 588-90.
5. Schoenwolf, Gary C. "Trink: His Life, His Philosophy." *Developmental Dynamics* 228 (2003): 591-93.
6. Trinkaus, John Philip. *Cells into Organs: The Forces that Shape the Embryo*. Englewood Cliffs, NJ: Prentice Hall, 1969.
7. Trinkaus, John Philip. "Surface activity and locomotion of *Fundulus* deep cells during blastula and gastrula stages." *Developmental Biology* 30 (1973): 68-103.
8. Trinkaus, John Philip. "Mechanism of *Fundulus* Epiboly—A Current View." *American Zoologist* 24 (1984): 673-688.
9. Trinkaus, John Philip. "The yolk syncytial layer of *Fundulus*: Its origin and history and its significance for early embryogenesis." *Journal of Experimental Zoology* 265 (1993): 258-84.
10. Trinkaus, John Philip. *Embryologist: My Eight Decades in Developmental Biology*. Alexandria, VA: J&S, 2003.
11. "Trinkaus, John Philip." *New York Times*, February 25, 2003, Classifieds section, Obituaries.
12. Vaughan, R B., and John Philp Trinkaus. "Movements of Epithelial Cell Sheets In Vitro." *Journal of Cell Science* 1 (1966): 407-13.
13. *Yale Bulletin & Calendar*. "Biologist John Trinkaus, Expert on Cell Migration, Dies." Yale University. <http://www.yale.edu/opa/v31.n19/story17.html> (Accessed April 25, 2008).