

M.C. Chang: A Short Biography (1908–91)

Min Chueh (M.C.) Chang was born in 1908, the son of school teacher, in a farming village in the Chinese county of Lan-Xian. After finishing grammar school in the village, he attended a high school in Taiyuan City about 80 km (50 mi) southeast of the village. At that time, donkeys or camels were the only means of transportation. In 1933, M.C. graduated from Tsinghua University in Beijing with a bachelor's degree in animal psychology. In 1936, he published a paper in *Anatomical Record* entitled, "A Formol-Thiol Method for the Fixation and Staining of Nerve Cells and Fiber Tract." At the time, publication of an English-language paper in a major foreign journal by a young Chinese fellow was rare. With the aid of this paper, he won a national competition award to study abroad. He first went to the University of Edinburgh, receiving a master's degree. There he met Professor Sir John Hammond, a visiting professor from Cambridge University, who advised M.C. to come to the English university, which he did. With Dr. Arthur Walton acting as his mentor, M.C. obtained his Ph.D. in 1941 studying the physiology and metabolism of ram spermatozoa. While at Cambridge, M.C. met Dr. Gregory Pincus of Harvard University, who had already made his name in the study of mammalian eggs and parthenogenesis. In May 1945, shortly before the end of the World War II, M.C. visited Pincus at the newly established Worcester Foundation for Experimental Biology (WFEB), in Shrewsbury, Massachusetts. He thought to stay there for only a year to learn the technique of rabbit IVF from Pincus before returning to China, but M.C. ended up inheriting Pincus's work on mammalian eggs and fertilization. Pincus's major interest and endeavor was shifting to steroid hormone-related disorders, in collaboration with Hudson Hoagland, co-founder of the WFEB.

In 1953, Pincus started work on the development of a new form of contraceptive in response to birth control advocate Margaret Sanger's request. M.C. became a member of the project's team and quickly focused on how progesterone can act as an effective ovulation-suppressing regent in animals, thus playing a key role in the development of a very efficient orally active female contraception. Although M.C. maintained his keen interest in and published many papers on hormonal control of male and female fertility during the rest of his life, his major interest remained the basic biology of gametes, fertilization, and fertility.

M.C.'s work during his early years (before 1960) at the WFEB included: (1) discovery of the importance of synchronization between the developmental stage of preimplantation embryos and endometrial development of uteri for successful implantation of the embryo (though the

human has proved to be an exception); (2) low-temperature storage of sperm, egg, and embryos; (3) first successful aerial transport of fertilized eggs; (4) discovery of sperm capacitation and decapacitation; and (5) presentation of indisputable evidence of successful in vitro fertilization, all using his favorite experimental animal, the rabbit. He allowed students to use animals of their choice. He himself used a variety: sheep, cattle, mink, weasel, and several types of rodents. The only animal he tried and gave up was armadillo. Its skin was too tough to operate on, he said.

I was a postdoctoral fellow of M.C.'s between 1960 and 1964. M.C. had his laboratory next to his office. The small room had a custom-made work station (hood) with a dissecting microscope. Next to it was an incubator with a Carrel flask-rocking device inside, which he used for rabbit IVF experiments. I saw him handling rabbits and doing experiments with his own hands. At that time, there were only a few very primitive copying machines in the WFEB, so journals in libraries and reprints were the major sources of scientific information. M.C. generously let students freely come into his office, search for, and borrow reprints in his file cabinets. I do not recall a time when he said, "I am too busy now." A week after I arrived at the WFEB, he called me in his office and asked me what I wanted to do. Since I had never worked on mammals before, I had no particular question I wanted to pursue. He then gave me a project with a brief explanation. "Yana. This is your bread and butter. There are five working days a week. Use three days for this project. You may use remaining two days for the work you want to do." In other words, he gave me some freedom in my research. Later, I transmitted this working code to my own students.

Over one hundred fellows from various parts of the United States and other parts of the world came to the WFEB to study under M.C., following and expanding his work. I consider M.C. Chang, Colin Austin, and Charles Thibault as three giants of mammalian fertilization study; they laid its modern foundations.

M.C. was a charter member of the Society for the Study of Reproduction (SSR) in 1967. He was also a member of the National Academy of Sciences of the United States and recipient of many awards, including: Albert Lasker Award (1954), Ortho Medal (1961), Carl G. Hartman Award (1970), Marshall Medal (1971), Francis Amory Award (1975), and Wippman Science Research Award (1987).

M.C. passed away in 1991 at age of 82. A portion of his ashes were placed under a ginkgo tree (native to China and known to have actively motile sperm) on the grounds of the WFEB, now part of the University of Massachusetts Medical School. M.C.'s son Francis took another portion of his father's ashes to the village where M.C. was born. He placed them under the tombstone bearing M.C.'s and his mother's names, located on a hill where M.C. used to play as a boy.

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