

John D. Gearhart ^[1]

By: Wu, Ke Keywords: [Genetics](#) ^[2] [Pluripotency](#) ^[3] [Biography](#) ^[4] [Stem cells](#) ^[5]

John D. Gearhart is a renowned American developmental geneticist best known for leading the [Johns Hopkins University](#) ^[6] research team that first identified and isolated human pluripotent [stem cells](#) ^[7] from human primordial [germ cells](#) ^[8], the precursors of fully differentiated [germ cells](#) ^[8]. Born in Western Pennsylvania, Gearhart lived on the family farm located in the Allegheny Mountains for the first six years of his life. After his coal-miner father died, Gearhart's mother and younger brother stayed on the farm while he and his older brother were sent to Girard College, an all-male school for orphans located in inner city Philadelphia, Pennsylvania. Gearhart remained at the college, where he was a mediocre student, for the next ten years – 1950 to 1960 – while receiving his first through twelfth-grade education. After completing secondary school, he entered Pennsylvania State University, pursuing a Bachelor of Science in Biological Science with dreams of becoming the world's best pomologist.

As a result of living on a farm, Gearhart developed interests in horticulture, an interest that led him to take classes in biology and, in particular, genetics. In his introductory genetics course with Jim Wright, Gearhart fell in love with the subject. As an undergraduate, he completed an honors thesis on the genetic pathways leading to different pigmentation in flower petals. Given his interest in genetics, Dick Gregg, Gearhart's thesis advisor, suggested that he go to the University of New Hampshire and spend time with Owen Rogers, an expert on lilacs and lilac breeding. Taking Gregg's advice, Gearhart left for New Hampshire after graduating from Pennsylvania State University in 1964. In 1966, he was awarded a Master of Science in Genetics from the University of New Hampshire, graduating with a special expertise in lilacs.

Interested in congenital [birth defects](#) ^[9] in [humans](#) ^[10], specifically [Down syndrome](#) ^[11], Gearhart moved away from plants towards studying genetics in animals. During his doctorate studies at [Cornell University](#) ^[12], he analyzed the model genetic system in *Drosophila melanogaster*, better known as the common fruit fly. After completing his PhD in genetics, development and [embryology](#) ^[13] in 1970 Gearhart pursued a postdoctoral position at the [Institute for Cancer Research](#) ^[14] in Philadelphia where he studied genetic influences on [mouse](#) ^[15] development. He worked in the lab of [Beatrice Mintz](#) ^[16], who had developed [chimeras](#) ^[17] to understand [cell lineage](#) ^[18]. After spending five years at the institute, Gearhart became Associate Professor of Anatomy at the University of Maryland School of Medicine located in Baltimore, Maryland. In 1980, Gearhart joined the staff at [Johns Hopkins University School of Medicine](#) ^[19] as Associate Professor of Pediatrics, Cell Biology and Anatomy, and Gynecology and Obstetrics.

For years Gearhart worked on [mouse](#) ^[15] models to better understand mental [retardation](#) ^[20] in [humans](#) ^[10]. His primary interest was [Down syndrome](#) ^[11], a chromosomal disorder that causes mental [retardation](#) ^[20]. After spending time targeting the [mouse](#) ^[15] [genome](#) ^[21], Gearhart eventually wanted to work with human [embryonic stem cells](#) ^[22] in order to develop various human tissues that could aid the study of [Down syndrome](#) ^[11]. With financial support from [Geron Corporation](#) ^[23], a biotech firm headquartered in Menlo Park, California, Gearhart began experimenting with aborted embryos provided after [informed consent](#) ^[24]. This experimentation culminated in the 10 November 1998 Proceedings of the [National Academy of Sciences](#) ^[25] paper "[Derivation of Pluripotent Stem Cells from Cultured Human Primordial Germ Cells](#)" ^[26], coauthored with several scientists including postdoctoral fellow Michael Shambloott. This was one of two independent reports published in November 1998 concerning the first isolation of pluripotent human [stem cells](#) ^[7]. The other was by James A. [Thomson](#) ^[27] at the University of Wisconsin-Madison.

This revolutionary accomplishment had many implications for medical advancement including improved drug development, transplant therapy, and tissue growth but research with human embryos raised ethical debates. Sensitive to the ethical issues surrounding his research, Gearhart presented a report to an international symposium on the ethics of human [cloning](#) ^[28] and [stem cells](#) ^[7] on the progress of his research months before his November 1998 publication. By presenting his study, he hoped to ignite discussion concerning the creation of guidelines for the ethical use of isolated and cultured human [embryonic stem cells](#) ^[22].

As a highly involved member of the scientific community, Gearhart has made over 100 trips to Washington DC advocating US federal funding for [embryonic stem cell research](#) ^[29] and in 2002 helped found the [International Society for Stem Cell Research](#) ^[30]. He has written or co-authored at least 221 publications concerning transgenesis, [Down syndrome](#) ^[11], and [stem cells](#) ^[7]. Such extensive work has resulted in many honors including the 1999 Gold Plate Award from the Academy of Achievement in recognition for his 1998 contribution to the field of [stem cells](#) ^[7] and the Basil O'Connor Starter Research Award from the March of Dimes Birth Defects Foundation, and he was named a Joseph P. Kennedy, Jr. Scholar for his work on mental [retardation](#) ^[20].

In 2008, Gearhart accepted an offer at the [University of Pennsylvania](#)^[31]. Right before he left Johns Hopkins, Gearhart was the C. Michael Armstrong Professor of Medicine, a Professor of Gynecology and Obstetrics, Physiology, and Comparative Medicine, and the Director of the Stem Cell Program at the Institute for Cell Engineering at the Johns Hopkins School of Medicine. Additionally, he held a professorship in Biochemistry and Molecular Biology in the Bloomberg School of Public Health and was Co-Director of the Stem Cell Biology and Ethics Program at the Berman Ethics Institute. Effective 1 July 2008 he became the James Effron University Professor at the [University of Pennsylvania](#)^[31] in addition to being named Director of the Institute for Regenerative Medicine. His professorship was held jointly shared in the Department of Cell and [Developmental Biology](#)^[32] in the School of Medicine and Department of Animal Biology in the School of Veterinary Medicine. This joint appointment made him the perfect candidate to become the eighth Penn Integrates Knowledge Professor. Penn Integrates Knowledge was created in 2005 with the goal of recruiting faculty members to the [University of Pennsylvania](#)^[31] whose extraordinary research and teaching integrate knowledge across disciplines. Since joining the [University of Pennsylvania](#)^[31], Gearhart has continued contributing to the field of stem cell research, application, education, and policy.

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Arizona State University. School of Life Sciences. Center for Biology and Society. Embryo Project Encyclopedia.

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Last Modified

Tuesday, July 3, 2018 - 21:40

DC Date Accessioned

Thursday, May 10, 2012 - 14:06

DC Date Available

Thursday, May 10, 2012 - 14:06

DC Date Created

2011-01-19

DC Date Created Standard

Wednesday, January 19, 2011 - 07:00

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