

Mary-Claire King (1946?) ^[1]

By: Zhu, Meilin Keywords: Breast Cancer ^[2] Genetics ^[3]

Mary-Claire King studied genetics in the US in the twenty-first century. King identified two [genes](#) ^[4] associated with the occurrence of breast cancer, *breast cancer 1 (BRCA1)* and *breast cancer 2 (BRCA2)*. King showed that mutated *BRCA1* and *BRCA2* [genes](#) ^[4] cause two types of reproductive cancer, breast and ovarian cancer. Because of King's discovery, doctors can screen women for the inheritance of mutated *BRCA1* and *BRCA2* [genes](#) ^[4] to evaluate their risks for breast and ovarian cancer. King also demonstrated the genetic similarities between chimpanzees and [humans](#) ^[5] and helped to identify victims of human rights abuses using genetics. King's identification of the *BRCA* [genes](#) ^[4] and their relationship to breast and ovarian cancer, both reproductive cancers, has allowed physicians to screen thousands of women for the [genes](#) ^[4] and for those women to choose to undergo preventative cancer treatment to lower their risk of cancer.

On 27 February 1946, King was born to Clarice and Harvey W. King in the suburbs of Chicago, Illinois. King grew up and attended high school in the suburbs with her brother, Paul King. In high school, King's childhood friend died of cancer. King stated that she attributes her motivation and interest in science and cancer research to that experience. After high school, King matriculated at Carleton College, in Northfield, Minnesota, and graduated with a bachelor's degree in mathematics in 1966. After graduating, King pursued a doctorate in biostatistics at the University of California, Berkeley, in Berkeley, California.

During King's time at the University of California, Berkeley, the US invaded Cambodia during the Vietnam War in 1970. King organized a protest at the campus and temporarily dropped out of college when the National Guard removed the demonstrating students. While not attending classes, she worked for Ralph Nader, an activist, to investigate the effect of pesticides on farm workers in Berkeley.

Shortly after, King returned to the University of California, Berkeley. She switched her PhD to genetics and began working under Allan Wilson, a professor of biochemistry and molecular biology. Together, King and Wilson demonstrated the genetic similarities between chimpanzees and [humans](#) ^[5]. They showed that chimpanzees and [humans](#) ^[5] shared ninety-nine percent of their DNA and suggested that chimpanzees and [humans](#) ^[5] evolved from a common ancestor. Before King and Wilson's discovery, many scientists were still doubtful of the relationship between chimpanzees and [humans](#) ^[5]. However, King and Wilson's genetic evidence supported the theory that chimpanzees and [humans](#) ^[5] have a genetic tie, which indicates a common ancestor. King received her PhD in genetics in 1973 and completed her postdoctoral training at the University of California, San Francisco in San Francisco, California.

That same year, King married Robert Colwell, a zoologist in San Francisco, California. Following her postdoctoral training, King and Colwell moved to Santiago, Chile, to teach students science for several months before moving back to the United States when Salvador

Allende, then president of Chile, was assassinated on 11 September 1973. King and Colwell had one daughter, Emily Colwell, in 1975. In 1975, King and Wilson jointly published a book, *Evolution at Two Levels in Humans and Chimpanzees*, about their theory of [humans](#) ^[5] and chimpanzees diverging from a single ancestor five million years ago. In 1976, King joined the faculty at the University of California, Berkeley, as a professor of genetics and epidemiology. King and Colwell divorced in 1980.

In 1984, King began applying her studies of genetics to human rights work. At the University of California, Berkeley, King and her lab worked with Abuelas de Plaza de Mayo (Grandmothers of Plaza de Mayo), a non-governmental [organization](#) ^[6] that aimed to find stolen and illegally adopted children from the Argentine Dirty War in Plaza de Mayo, Argentina. The Argentine Dirty War was a conflict between the right wing Argentine Anticommunist Allegiance and communist political dissidents, which resulted in a state of terror that lasted from 1974 to 1983. During that period, the Argentine dictatorship persecuted and imprisoned women and took their children. Military families illegally adopted many of those children without the consent of the children's biological mothers or fathers. In 1977, Las Abuelas (The Grandmothers) protested the seizure of their grandchildren and sought their return. They gathered information to identify the missing children. However, the new democratic government required proof of kinship for the return of any children. King helped to prove kinship using genetics.

King used dental genetics, or the drawing genetic information from dental samples, to identify the missing children by matching their [genes](#) ^[4] with their biological parents. King specifically used dental samples to find mitochondrial DNA and blood type markers to match the child to the parents. She successfully identified fifty-nine of the approximately 500 missing children and helped return them to their biological families. In 1984, the Supreme Court of Argentina recognized King's tests for positively identifying the relationship of Paula Logares to her family, thus establishing a precedent for the ultimate reunification of dozens of families with their stolen children.

King used her technique in other cases, such as identification of deceased individuals after a war. For example, in 1993 King used the technique to identify more than 750 massacred individuals in the village of El Mozote, El Salvador. In addition to the Abuelas de Plaza de Mayo, King also worked with human rights organizations such as Physicians for Human Rights and Amnesty International to help identify missing individuals in Argentina, Chile, Costa Rica, El Salvador, Guatemala, Haiti, Honduras, Mexico, Rwanda, ex-Yugoslavia, and the Philippines. King's lab also worked with the US Army, the United Nations, and the United Nations' war tribunals.

While still at the University of California, Berkeley in 1990, King discovered that the gene *BRCA1* on chromosome 17 was associated with the occurrence of breast and ovarian cancers. Over the course of sixteen years, King collected data from breast cancer patients and tested her hypothesis that some cases of breast cancer were genetically linked to *BRCA1*. Later, she also identified the gene *BRCA2* on chromosome 13 as associated with breast and ovarian cancer. King found that the *BRCA1* and *BRCA2* [genes](#) ^[4] are responsible for expressing proteins *BRCA1* and *BRCA2*. Those proteins are tumor suppressor proteins, meaning they repair damaged DNA in the cell and thereby prevent cancer. However, if the *BRCA1* or *BRCA2* [genes](#) ^[4] are mutated, then the proteins they produce may not function effectively. If the proteins *BRCA1* and *BRCA2* are unable to repair damaged DNA, then a cell may become cancerous. King found that individuals with the inherited *BRCA1* or *BRCA2* gene

mutation had an eighty-one percent risk of getting breast cancer over a lifetime, whereas individuals without the mutation had an 8.1 percent risk of developing breast cancer over a lifetime. King reported that approximately five to ten percent of all breast cancer cases are due to BRCA gene mutations. King's discovery allowed women to get screened for *BRCA1* and *BRCA2* to become informed of their risk for developing breast and ovarian cancer.

After discovering the association between the [genes](#) ^[4] *BRCA1* and *BRCA2* with breast and ovarian cancer, King continued studying the genetics of disease and applying genetics to other purposes. In 1991, William Maples, a forensic anthropologist, sought out King to help genetically analyze the body remains of the Romanov family, the last dynasty of Imperial Russia, found in Ekaterinburg, Russia. In 1995, King became the American Cancer Society Research Professor at the University of Washington in Seattle, Washington. After moving to Washington, she continued working on cancer research and finding genetic links to other diseases and conditions, such as deafness. In 1999, King and her lab successfully cloned the first deafness-related gene. She has also worked on the human Genome Diversity Project, which sought to find differences among individuals' genomes to understand human [evolution](#) ^[7] and historical migrations.

King received many awards during her life. In 2005, she was inducted into the [National Academy of Sciences](#) ^[8], a private nonprofit [organization](#) ^[6] of successful scientists. In 2006, King received the Peter Gruber Foundation Genetics Award, the Weizmann Women & Science Award, and the Dr. A.H. Heineken Prize for Medicine. She also received the Cold Spring Harbor Laboratory Double Helix Medal Honoree in 2010 for her studies in genetics and the Paul-Ehrlich and Ludwig-Darmstaedter Prize in 2013, which is awarded to excellent researchers in medicine-related areas. In 2014, King received the Hudson Alpha Life Sciences Prize and the Lasker Award, which is awarded to living scientists who have made major contributions to science and public service.

As of July 2017, King teaches and conducts research on breast and ovarian cancer and the genetics of schizophrenia at the University of Washington.

Sources

1. Colwell, Robert K., and Douglas J. Futuyma. "On the measurement of niche breadth and overlap." *Ecology* 52(1971): 567-76.
2. Cummings, Steven R., Stephen Eckert, Kathryn A. Krueger, Deborah Grady, Trevor J. Powles, Jane A. Cauley, Larry Norton, Thomas Nickelsen, Nina H. Bjarnason, Monica Morrow, Marc E. Lippman, Dennis Black, Joan E. Glusman, Alberto Costa, Craig Jordan. "The Effect of Raloxifene on Risk of Breast Cancer in Postmenopausal Women: Results from the MORE Randomized Trial. Multiple Outcomes of Raloxifene Evaluation." *Journal of the American Medical Association* ^[9] 281(1999): 2189-97.
3. Fisher, Bernard, Joseph P. Costantino, Lawrence Wickerham, Reena S. Cecchini, Walter M. Cronin, Andre Robidoux, Therese B. Bevers, Maureen T. Kavanah, James N. Atkins, Richard G. Margolese, Carolyn D. Runowicz, Joan M. James, Leslie G. Ford, Norman Wolmark. "Tamoxifen for the Prevention of Breast Cancer: Current status of the National Surgical Adjuvant Breast and Bowel Project P-1 Study." *Journal of the National Cancer Institute* 97 (2005): 1652-62.
4. Gruber Foundation Yale. "2004 Genetics Prize: Mary-Claire King." Gruber Foundation

- Yale. <http://gruber.yale.edu/genetics/mary-claire-king> ^[10] (Accessed August 3, 2017.)
5. Guillem, Jose G., William C. Wood, Jeffrey F. Moley, Andrew Berchuck, Beth Y. Karlan, David G. Mutch, Robert F. Gagel, Jeffrey Weitzel, Monica Morrow, Barbara L. Weber, Francis Giardiello, Miguel A. Rodriguez-Bigas, James Church, Stephen Gruber, Kenneth Offit. "ASCO/SSO Review of Current Role of Risk-Reducing Surgery in Common Hereditary Cancer Syndromes." *Journal of Clinical Oncology* 24 (2006): 4642-60.
 6. Hall, Jeff M., Ming K. Lee, Beth Newman, Jan E. Morrow, Lee A. Anderson, Bing Huey, and Mary-Claire King. "Linkage of Early-Onset Familial Breast Cancer to Chromosome 17q21." *Science* 250 (1990): 1684-9.
 7. Hartmann, Lynn C., Daniel J. Schaid, John E. Woods, Thomas P. Crotty, Jeffrey L. Myers, Arnold PG, Paul M. Petty, Thomas A. Sellers, Joanne L. Johnson, Shannon K. McDonnell, Marlene H. Frost, Clive S. Grant, Virginia V. Michels, Robert B. Jenkins. "Efficacy of Bilateral Prophylactic Mastectomy in Women with a Family History of Breast Cancer." *New England Journal of Medicine* 340 (1999): 77-84.
 8. King, Mary-Claire, and Allan C. Wilson. "Evolution at two levels in [humans](#) ^[5] and chimpanzees." (1975): 107-16.
 9. King, Mary-Claire, Joan H. Marks, Jessica B. Mandell, and New York Breast Cancer Study Group. "Breast and Ovarian Cancer Risks due to Inherited Mutations in BRCA1 and BRCA2." *Science* 302 (2003): 643-6.
<http://science.sciencemag.org/content/302/5645/643.short> ^[11] (Accessed August 3, 2017).
 10. Encyclopedia of World Biography. "Mary-Claire King." Encyclopedia.com.
<http://www.encyclopedia.com/doc/1G2-3404707384.html> ^[12] (Accessed August 3, 2017.)
 11. Maples, William R., and Michael Browning. *Dead men do tell tales: the strange and fascinating cases of a forensic anthropologist*. New York City: Broadway Books, 1995.
 12. Nobelprize.org. "Mary-Claire King. Panelist, Nobel Week Dialogue 2012." Nobelprize.org. <http://www.nobelprize.org/events/nobel-week-dialogue/2012/panellists/mary-claire-king.html> ^[13] (Accessed August 3, 2017.)
 13. Park, Alice. "Lessons from the Woman Who Discovered the BRCA Cancer Gene." *TIME Magazine*, June 2, 2014. <http://time.com/2802156/lessons-from-the-woman-who-discovered-the-brca-cancer-gene/> ^[14] (Accessed August 3, 2017.)
 14. Vogel, Victor G., Joseph P. Costantino, Lawrence Wickerham, et al. "Effects of Tamoxifen vs Raloxifene on the Risk of Developing Invasive Breast Cancer and Other Disease Outcomes: the NSABP Study of Tamoxifen and Raloxifene (STAR) P-2 Trial." *Journal of the American Medical Association* ^[9] 295 (2006): 2727-41.
 15. Vogel, Victor G., Joseph P. Costantino, Lawrence Wickerham, et al. "Update of the National Surgical Adjuvant Breast and Bowel Project Study of Tamoxifen and Raloxifene (STAR) P-2 Trial: Preventing breast cancer." *Cancer Prevention Research* 3 (2010): 696-706.
 16. Walsh, Tom, Jon M. McClellan, Shane E. McCarthy, Anjené M. Addington, Sarah B. Pierce, Greg M. Cooper, Alex S. Nord, Mary Kusenda, Dheeraj Malhotra, Abhishek Bhandari, Sunday M. Stray, Caitlin F. Rippey, Patricia Rocanova, Vlad Makarov, B. Lakshmi, Robert L. Findling, Linmarie Sikich, Thomas Stromberg, Barry Merriman, Nitin Gogtay, Philip Butler, Kristen Eckstrand, Laila Noory, Peter Gochman, Robert Long, Zugen Chen, Sean Davis, Carl Baker, Evan E. Eichler, Paul S. Meltzer, Stanley F. Nelson, Andrew B. Singleton, Ming K. Lee, Judith L. Rapoport, Mary-Claire King, Jonathan Sebat. "Rare structural variants disrupt multiple [genes](#) ^[4] in neurodevelopmental pathways in schizophrenia." *Science* 320 (2008): 539-43.

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Subject

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