

[Robert Lanza \(1956- \)](#) ^[1]

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During the twentieth and twenty-first centuries, Robert Paul Lanza studied [embryonic stem cells](#) ^[5], tissues, and endangered species as chief scientific officer of Advanced Cell Technology, Incorporated in Worcester, Massachusetts. Lanza's team cloned the endangered species of gaur [Bos gaurus](#) ^[6]. Although the gaur did not survive long, Lanza successfully cloned another cow ^[7]-like creature, called the banteng ([Bos javanicus](#) ^[8]). Lanza also worked on [cloning](#) ^[9] human embryos to harvest [stem cells](#) ^[10], which could be used to treat diseases. While previous techniques required the embryo's destruction, Lanza developed a harvesting technique that does not destroy the embryo, forestalling many ethical objections to human embryonic research.

Lanza was born on 11 February 1956. He experienced a childhood that he later said was typical of life in South Boston, Massachusetts. Lanza said that he was not close to his mother and that he struggled to connect with his father, a professional gambler. Lanza recounted exploring what wilderness there was to be found in suburban Boston or spending time in his tree house. Only two of four of his siblings completed secondary school.

In 1966, scientists explained the role of [genes](#) ^[11] in forming proteins. Three years later, in 1969 and at the age of fourteen, Lanza conducted his first experiment involving [genes](#) ^[11]. For a science fair, he altered the color of a [chicken](#) ^[12]'s white feathers to be partially black by attempting to induce melanin synthesis. Lanza recalled his motivation to work on the project because his teacher claimed that it was playing God. After completing the experiment, Lanza became frustrated by not having achieved a complete change in pigmentation. He found his way to [Harvard Medical School](#) ^[13] in Boston, Massachusetts, looking to find any professor who would listen about his experiment. Lanza recounted arriving to closed gates, but after accosting someone he thought was a custodian, he found his way inside. The supposed custodian was actually Stephen Kuffler, a scientist who researched the brain and nervous system. Kuffler talked with the young Lanza and introduced him to Joshua Sanes, at that time a graduate student specializing on the nervous system. In 1974, with the help of Kuffler and Sanes, Lanza published his findings in *Nature*.

Lanza attended the [University of Pennsylvania](#) ^[14] in Philadelphia, Pennsylvania, where he graduated in 1978 with an undergraduate degree in biology. As an undergraduate, Lanza worked in the lab of the 1972 Nobel Prize recipient Gerald Edelman at Rockefeller University in New York City, New York, in 1975. At that time, Lanza traveled to the University of Cape Town in Cape Town, South Africa, to learn from Christiaan Barnard, a surgeon who had performed the first human heart transplant.

After graduating in 1978, Lanza worked with disease researcher and polio vaccine creator Jonas Salk at the Salk Institute in San Diego, California. Lanza then spent the summer with psychologist Burrhus F. Skinner at [Harvard University](#) ^[15] in Cambridge, Massachusetts. With Skinner, Lanza conducted experiments on pigeons demonstrating that they can communicate with one another.

Lanza stayed at The [University of Pennsylvania](#) ^[14] for medical school, and he attended the University of Oxford in Oxford, United Kingdom, on a Fulbright fellowship. There, he worked with Edelman's Nobel Prize co-recipient, Rodney Porter, who studied antibodies and their structure. Lanza completed his medical degree in 1983. Then, Lanza took a two year break from research and later said that he went to Los Angeles to understand the universe.

After spending two years in Los Angeles, Lanza contacted and began to work with Patrick Soon-Shiong, a surgeon and medicinal researcher at the University of California in Los Angeles, California, working on insulin-free diabetic treatments. Soon-Shiong transplanted cells called islets, which produce insulin, into diabetic patients. Lanza observed that when foreign islets, such as animal or cadaver islets, were injected into a patient, rejection rates were high. Lanza recalled that, while working with Barnard in South Africa, he had observed that donor hearts were often rejected by the recipients, just as islets were being rejected in diabetic patients. Soon-Shiong and Lanza extracted islets from the surgically removed pancreas of a diabetic patient. These islets were accepted back by the patient's body after they were encapsulated by an immunological protectant made using algae.

Lanza returned in 1990 to Massachusetts, where chairman of BioHybrid Technologies, William Chick, convinced him to take a research position at the headquarters in Shrewsbury. Lanza continued to refine his encapsulation technique, when researchers at the Roslin Institute at the [University of Edinburgh](#) ^[16] in Edinburgh, Scotland, cloned Dolly the [sheep](#) ^[17] through [nuclear transplantation](#) ^[18] in 1996. Lanza said he began to focus on [embryonic stem cells](#) ^[5], because cloned [embryonic stem cells](#) ^[5] would not require encapsulation and would not be rejected by the intended host as frequently cells from other organisms. Lanza argued that, because cloned [stem cells](#) ^[10] are genetically identical to the patient they are derived from, the body would not view them as a foreign threat. Chick, whose health had declined and who had suffered a series of strokes, rejected Lanza's

arguments. In 1998, Chick died, and Lanza sought employment from a [cloning](#)^[9] company, Advanced Cell Technologies, Inc. (ACT), near the BioHybrid headquarters.

In 1999, Lanza joined ACT as its vice president of medical and scientific development. In 2001, Lanza cloned endangered animal, an Asian ox (the gaur or *Bos gaurus*) using [somatic cell](#)^[19] nuclear transfer. Lanza had removed the [nucleus](#)^[20] from a [cow](#)^[7]'s [egg](#)^[21] cell, into which he transplanted a [nucleus](#)^[20] from a [somatic cell](#)^[19] from a gaur. The hybrid [egg](#)^[21] was then implanted in a [surrogate](#)^[22] [cow](#)^[7] and, after fetal development, the infant gaur was born, although it only lived for a few minutes. In 2003, ACT cloned another [cow](#)^[7]-like animal, the banteng (*Bos javanicus*), which into the early decades of the twenty first century, lived in the San Diego Zoo in San Diego, California.

ACT sought to research and clone human embryonic cells in addition to animal cells, but in 2001 the President of the United States, George W. Bush, blocked new federal funds for research into [stem cells](#)^[10] that used cells from embryos previously uncultured. [Michael West](#)^[23], the ACT's chief executive officer, claimed that ACT researchers produced the first cloned human embryo soon after Bush's decision in late 2001. West's claims were shown to be spurious, engendering public distrust towards ACT. Lanza continued to promote and represent ACT despite the fallout and the discontinuation of ACT's involvement in human embryonic research.

In 2003, along with new ACT colleagues Young Chung and Irina Klimanskaya, Lanza reinitiated human embryonic experiments after continued successes on animal cells. The team received approval from external ethics boards and, with money from ACT's animal research, they cloned a sixteen cell embryo.

Lanza and ACT struggled for funds because the government still would not fund stem cell research into new stem cell lines, so they relied on private funds. Lanza's new project was to use stem cells to counteract degenerative blindness. In 2010, Lanza and his team received 25 million dollars from investors and, in 2012, he attained federal approval to start clinical trials on therapies.

Lanza and synthetic biologist George Church, from Harvard Medical School in Boston, Massachusetts, established a new company. The company aimed to further research on [induced pluripotent stem cells](#)^[24] to address issues of reproduction for livestock and possibly to clone organisms from extinct species. Into the twenty-first century, Lanza, a bachelor, lived on a small island in the middle of a lake in Clinton, Massachusetts.

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