

# From Stem Cell Research to Biotechnology

## Quotations

“I was not a particularly good classroom learner. It’s odd to become a professor and then have to acknowledge that you were a bad student.” (Chad Cowan)

“Early on in Kansas, my next door neighbor was actually an astrophysicist, which is relatively rare in Kansas. [...] He had a real passion for the stars and so he would come knock on my door when I was just a little boy and wake me up in the middle of the night to show me for instance Saturn, through a home-made telescope. So I think having people like that engage your curiosity in the world around you [is important].” (Chad Cowan)

“I got lucky in that I fell in love with science. And I really truly fell in love with it once I understood that I could do experimental biology and could actually ask questions on my own. After that, this passion carried me through the next 15 years without me even questioning why I was doing it. [...] Just that simple passion was enough to not make it feel like work, which was good, because I’ve worked harder at that job than I’ve worked at anything in my life.” (Chad Cowan)

“Most of science is all about new techniques. In other words, developing new technologies that allow you to answer new questions that then eventually give rise to new ideas, or new solutions. That’s exactly the opposite of what most students would think. Most students think that you have this big idea and that idea drives you towards trying to do something. And that’s a really intellectually satisfying way to think about a problem, but it turns out it’s usually a new tool that gives you the ability to take a new approach to an old problem and suddenly shed a new light on it.” (Chad Cowan)

“[Advice] to students of any age: 1. Keep learning (That seems to be one of the underlying themes for the things I do. I try to do things that let me keep learning.) And 2. Try to follow your passions. If you’re lucky enough to have a passion that you can turn into a job, you’ll never feel like you did a day’s work.” (Chad Cowan)

## Vocabulary

Source: Merriam Webster online dictionary [www.merriam-webster.com](http://www.merriam-webster.com)

### **General Vocabulary**

**autoantibodies (noun):** an antibody active against a tissue constituent of the individual producing it

**autoimmune (adjective):** of, relating to, or caused by autoantibodies or T cells that attack molecules, cells, or tissues of the organism producing them

**B cell (noun):** any of the lymphocytes that have antigen-binding antibody molecules on the surface, that comprise the antibody-secreting plasma cells when mature, and that in mammals differentiate in the bone marrow (also: B Lymphocyte)

**beta cell (noun):** any of the insulin-secreting pancreatic cells in the islets of Langerhans

**beta globin (noun):** the chain of hemoglobin that is designated beta and that when deficient or defective causes various anemias (as beta-thalassemia or sickle cell anemia)

**cardiovascular (adjective):** of, relating to, or involving the heart and blood vessels

**cognition (noun):** cognitive (adjective): of, relating to, being, or involving conscious intellectual activity (such as thinking, reasoning, or remembering)

**consciousness (noun):** the quality or state of being aware especially of something within oneself

**Globin (noun):** a colorless protein obtained by removal of heme from a conjugated protein and especially hemoglobin

**hematopoiesis (noun):** the formation of blood or of blood cells in the living body

**metabolic (adjective):** of, relating to, or based on metabolism: the sum of the processes by which a particular substance is handled in the living body

**monogenic (adjective):** of, relating to, or controlled by a single gene and especially by either of an allelic pair

**multiple sclerosis (noun):** a demyelinating disease marked by patches of hardened tissue in the brain or the spinal cord and associated especially with partial or complete paralysis and jerking muscle tremor

**perception (noun):** perceive (verb): to become aware of through the senses

**pluripotent (adjective):** capable of differentiating into one of many cell types

**sequence (verb):** to determine the sequence of chemical constituents (such as amino-acid residues or nucleic-acid bases) in a protein

**sickle cell anemia (noun):** a chronic inherited anemia that occurs primarily in individuals of African, Mediterranean, or southwest Asian ancestry who are homozygous for the gene controlling hemoglobin S and that is characterized especially by episodic blocking of small blood vessels by sickle cells

**sickle cell (noun):** an abnormal red blood cell of crescent shape

**stem cell (noun):** an unspecialized cell that gives rise to differentiated cells

**T cell (noun):** any of several lymphocytes (such as a helper T cell) that differentiate in the thymus, possess highly specific cell-surface antigen receptors, and include some

that control the initiation or suppression of cell-mediated and humoral immunity (as by the regulation of T and B cell maturation and proliferation) and others that lyse antigen-bearing cells (also :T Lymphocyte (noun))

**type 1 diabetes (noun):** a form of diabetes mellitus that usually develops during childhood or adolescence and is characterized by a severe deficiency in insulin secretion resulting from atrophy of the islets of Langerhans and causing hyperglycemia and a marked tendency toward ketoacidosis

## Discussion Questions

- 1) Do you have any moral doubts or concerns about stem cell research?
- 2) How important is it to introduce kids to science at an early age?
- 3) When thinking of long-term scientific progress, is it better to invest in higher education or in technological developments?
- 4) How far will medical science progress in the next 30 years? How many severe diseases will be eradicated by 2050?
- 5) What is the longest life expectancy imaginable for human beings? What factors are most limiting? Could medicine advance to a point where a form of immortality could be achieved (for example through technology or transplantation)?