Generation

The seventeenth-century scientists who unraveled the secrets of sex, life, and growth

Matthew Cobb
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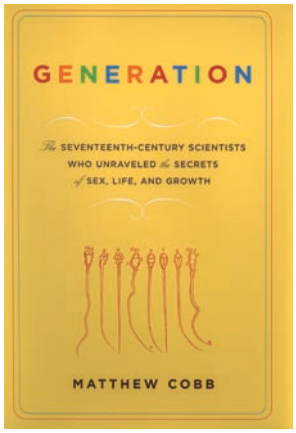

Matthew Cobb's book, *Generation: the seventeenth-century scientists who unraveled the secrets of sex, life, and growth*, describes the convoluted path that the thinkers and scientists of the 17th century took in their quest to unravel the basic principles of animal and human reproduction. Cobb is a biologist at the Faculty of Life Sciences at the University of Manchester, and although his own research concerns the role and mechanisms of olfaction and pheromones in insect behavior, his interest in the topics covered in the book can be traced to his belief, clearly elucidated on his web page, that "studying the history of biology enriches my research and provides an invaluable perspective for understanding today's problems" (http://www.ls.manchester.ac.uk/people/profile/index.asp?id=1675&tb=1).

The book tells the history of scientific and philosophical advancements of the 17th century that were instrumental in the creation of the modern concepts of reproduction. Cobb also describes in colorful fashion the cultural, social, and political backdrop of the era in which this groundbreaking work was done. The world was very different in those days, but the personal characteristics of scientists — their aspirations, strengths, and weaknesses — could be applied to any scientist today. Human nature has not changed at all.

The story evolves around the work of scientists and thinkers in Holland, France, Italy, and England and how their discoveries and insights reshaped the understanding of reproduction, or *generation*, as it was called in those days, from the petrified 2,000-year-old concepts created through philosophical deductions of Hippocrates and Aristotle. For instance, at the time, insects were thought to be generated spontaneously from dust and decay, and human embryonic development was thought to originate from menstrual blood. Ovaries were called "female testicles" and, similar to male nipples, were considered vestiges.

The key characters in the book include Reinier de Graaf, William Harvey, Francesco Redi, Nicolas Steno, Jan Swammerdam, and Anton van Leeuwenhoek. In those days, Holland was in the middle of its golden age, providing a fertile economic and cultural environment for the renaissance of arts and sciences. We all know of the Dutch master painters of those years, but it is less well known that Dutch science flourished at the same time.

It is fascinating to read Cobb's account of how the scientists identified the first pieces of the reproduction jigsaw puzzle by unraveling the role of the mammalian ovary in the production of eggs. But they hit a brick wall when nothing of importance could be found in semen. The next quantum leap required a methodological development to allow scientists to see details beyond those visible to the naked eye. This was made possible by the invention of the microscope and its diligent application by Leeuwenhoek to biological studies. Leeuwenhoek first discovered the existence of microorganisms, and later found sperm in semen.

It took an amazing 150 years before the pieces were put together. The eggs were there, and the sperm were there, but the conclusive insight that they merge and contribute equally to the formation of new life was missing. All of this seems so basic in light of our current knowledge. This is a fascinating example of how one needs a prepared mind in order to put the pieces together and see the obvious. Only then does the whole become more than the sum of its parts.

Another fascinating part of the book is the personal history of the scientists involved. Swammerdam and de Graaf started as friends and fellow medical students in Leiden, but their bitter dispute over who first discovered that ovaries produce eggs made them fierce enemies, each accusing the other of plagiarism and of stealing the other's results — nothing unheard of today. Their teacher apparently made some of the original findings, but he was sloppy in publishing, and his students scooped him. This exemplifies another reality for scientists today — publish or perish. The British Royal Society was used as the arbitrator in the fight between de Graaf and Swammerdam. They solved the dispute by assigning the discovery, not to de Graaf or Swammerdam, but to Steno, who was the first to publish on the subject. This demonstrates yet another lesson from the past that still holds true today: the importance of first publication!

The plot advances in a logical fashion until the last chapter, "From generation to genetics," in which the author summarizes the developments that followed the Dutch masters. The tremendous expansion of knowledge makes such an undertaking difficult, if not impossible. In a way, the material explodes in Cobb's hands, and the logical vein is lost. Because of this, some later key discoveries of the story remain undeveloped. For example, I would have liked to learn more about the most seminal part of the puzzle, sperm-egg fusion (conception) and how it was discovered, but this is mentioned only in passing.

The book is well worth reading. It is suited both for scientists and lay readers, although there may be too much scientific detail for the latter. It illustrates how philosophical deduction alone cannot explain natural phenomena and how both accurate experimentation and methodological advancements are essential to developing truly novel concepts. It also demonstrates the importance of insight in putting the pieces of a puzzle together. And finally, it shows how similar scientists today are to the scientists of 300 years ago.