

Solving the riddle of life's inception

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TREE FROG tadpoles in their eggs.

Edward Dolnick's *The Seeds of Life: From Aristotle to da Vinci, from Sharks' Teeth to Frogs' Pants, the Long and Strange Quest to Discover Where Babies Come From* opens with a simple question: "Where do babies come from?" From that seemingly simple query, Dolnick launches into a voyage through centuries of human attempts to tackle the broader question about the purpose and the origin of life.

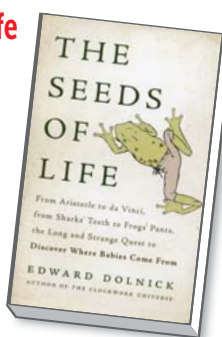
Dolnick, a former chief science writer at the *Boston Globe* and the author of *The Clockwork Universe: Isaac Newton, the Royal Society, and the Birth of the Modern World* (2011), focuses primarily on the 17th and 18th centuries in his latest book. *The Seeds of Life* retraces the steps scientists took—both forward and backward—as they solved the puzzle of how human life is created. Dolnick also highlights the work of some dazzling autodidacts who, despite their comparative lack of resources, challenged deeply embedded prejudices.

Like their predecessors, most 17th-

The Seeds of Life

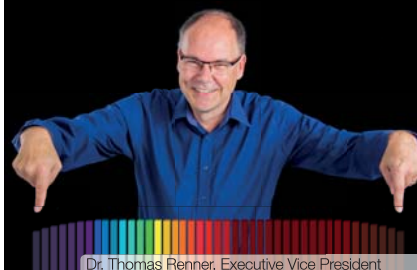
From Aristotle to da Vinci, from Sharks' Teeth to Frogs' Pants, the Long and Strange Quest to Discover Where Babies Come From

Edward Dolnick
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century thinkers reckoned that the miracle of human life started with a woman and a man having sex. However, the exact process that led from the coupling to pregnancy remained difficult to pinpoint until 1875, when Oscar Hertwig, a German researcher working in Naples, Italy, eventually observed the union of sperm and egg.

The Seeds of Life consists of four parts that track the reasons why it took so long

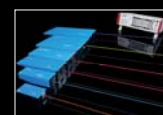


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to answer the critical question. The first section explains the ethical and legal issues early anatomists faced in finding corpses for dissection. Given the technical impossibility of looking inside a breathing body, autopsies were the key providers of hints and answers. Early anatomical guesses by Leonardo da Vinci, Andreas Vesalius, and others contributed to the riddle's solution but did not fully unravel the mysteries of reproduction.

The book's second part deals with a convoluted 17th-century debate between "spermists" and "ovists." Both sides were convinced that only one of the sexes was responsible for passing on the spark of life. In a world in which nearly every influential position was held by men, most researchers believed that, in Dolnick's words, "semen was a magical, almost divine concoction." Ovists, however, argued that eggs held the key to life; God, they said, "had favored the circle above all other shapes, because it was geometrically perfect."

Followers of both schools of thought ran into obstacles. Spermatozoa, discovered by the self-taught microscopist Antoni van Leeuwenhoek, were long thought to be wormy parasites, intruders in the semen that played no role in fertilization. Eggs were more difficult to collect than sperm, but the hardest issue was overcoming the general prejudice against the idea that women might contribute to the creation of a new human being. Dutch anatomist Regnier de Graaf eventually "found ruptured follicles in the ovary and tiny embryos in the uterus," beginning a slow march to the still-unrealized goal of full equality.

Preformism theory, which shows up in part 3 of the text, argued that human beings developed from small-scale versions of themselves. The theory, which subsumed ovism and spermism, combined science and religion with its assertion that all the miniatures came to be contemporarily and only once, right at the moment of creation by God. In dealing with this topic, Dolnick takes care to emphasize the historical and religious context, thus allowing us to understand that preformism was not at all absurd, as it may appear nowadays. On the contrary, it was consistent with the most common religious and scientific certainties of the time.

The last part of the book brings us to the end of the quest. Cell theory is present in the background of Dolnick's story,

but insights and clever experiments by underappreciated scientists such as the Catholic priest Lazzaro Spallanzani are the focus. Spallanzani used an unconventional approach: He made miniature pants for male frogs in order to contain their semen. His experiment demonstrated that fertilization could not occur without contact between semen and eggs. About a century later, Hertwig, using his microscope to watch as two nuclei combined into one, became the first man in history to observe the fusion of a sperm and an ovum.

Dolnick's writing style is breezy and direct, and his account of the science is endearing and witty. The historical characters, vividly depicted with merits and defects, continuously grasp the reader's attention.

Nonetheless, here and there the reader might feel lost or bewildered. At times, digressions and temporal jumps fragment the narrative, or Dolnick gets stuck repeating the same event or concept. However, science, too, proceeds with digressions, jumps, and repetitions, and I suppose that the sometimes disjointed structure of the book endeavors to pass that message along to the reader. Eccentric and ordinary people were thwarted or inspired by each other and were hindered or supported by economic, religious, and ethical needs. There were scientists who came within a step of the "great discovery" but misinterpreted a result and temporarily reversed the course of scientific progress.

As a teacher of university-level general zoology, I think *The Seeds of Life* is a useful text that will help students understand the historical, social, and cultural context in which some crucial discoveries occurred. It will encourage students to think beyond mere "reproductive biology," because it considers the people who investigate human life and the profound existential questions that drove their research. You can live without knowing what life is, as you can have children without knowing how the gamete forms. But in my view as a woman and a biologist, the desire to understand the phenomena that underlie the origin of life emphasizes life's value and can lead to the continuous improvement of the human condition.

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