

Pulse: The Coming Age of Systems and Machines Inspired by Living Things

By Robert Frenay

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“We have now begun pushing up against our habitat limits. It’s time for a more complex and efficient culture to emerge.”¹ *Pulse*, by Robert Frenay, not only outlines why and how the machine-age is failing, it also gives optimistic solutions using today’s latest technologies. The problem is not with the machine-age advances themselves, according to Frenay, but with the linear system that was created by the machine-age based on incomplete knowledge of biology and the earth’s ecosystems. He believes that trying to define nature as a machine-like process instead of an interactive web of interconnecting systems balancing off of each other has had detrimental effects to all aspects of life.

The book begins with a historical overview of the theories of biology, before and after the Industrial Revolution. While necessary for a complete understanding of the shifts in thought throughout history, at times this section was too comprehensive, bordering on dull. Frenay soon leaves this section behind and jumps into a discussion of today’s developing technology that feels like pages from a science fiction novel. He explains the science behind nanotechnology in a way that is accessible by the average reader, enumerating its many possible uses both for good and bad. The search for a fountain of youth has been the obsession of numerous writers throughout history, and nanotechnology has the potential to make this a reality by stripping away

¹ Robert Frenay, *Pulse* at 178 (University of Nebraska Press, Lincoln Nebraska, 2006).

the aging agents from cells.² On the other hand, Frenay mentions the potential dangers that may come with the development of this technology including weapons as well as toxic side effects. The market for nanotechnology will likely reach \$1 trillion by 2015, according to Frenay, making the advances we see now only a “snapshot of an explosion.”³

Frenay next begins to tackle the subject of human germ-line engineering. This massive topic easily can be—and has been—the subject matter of entire books. He succinctly explains the engineering and the possible advances once this technology has been implemented effectively. The explanation of the technology is both easy to read and extremely interesting because he does not go too in depth, only giving a basic overview of the topic. Frenay also includes a discussion of the development of supercomputers from clever machines that could hold conversations with people based on the person’s input to the new age supercomputers based on parallel systems that have been able to come the closest to the pure human thought process. Once again he keeps this highly complex topic both interesting and accessible.

The final technology discussed in part one is the creation of increasingly complex robots. Recently, attempts by scientists to create robots that closely mirror artificial life are becoming more and more sophisticated. Scientists have created robots that are similar to their animal or fish counterpart—such as a robotic fish at MIT that has close to the same efficiency of a tuna swimming in water—as well as robots that imitate human functions. The uses for these human-like machines range from a robot designed to pick up empty cans in an office to robots used by the military to detect enemy combatants. The use of robots in the military is expected to increase drastically, backed by the largest military contract in history—Future Combat Systems—which

² *Id.* at 45.

³ *Id.* at 48.

grants \$127 billion to engineers to design this new fighting force.⁴ Once again Frenay does not hesitate to expound on the dangers of these technological advances especially with regard to the fear written about in Mary Shelley's novel, *Frankenstein*: that robots will become smarter than humans and the scientists that created the machines will no longer be able to control them.

Frenay's part two, titled "Natural Connections," delves into the issues surrounding the machine-age approach in the world's ecosystems, specifically the lack of sustainability in the agricultural methods used to bring about the so-called Green Revolution. The revolution through the use of pesticides, artificial fertilizers, and genetically modified crops has drastically increased the world's production of agricultural crops. This has been, however, at the expense of the health of the ecosystems. Noticeably affecting the earth's ecosystems detrimentally are both soil erosion as well as what Frenay calls the rebound effect; Darwin's survival of the fittest coupled with organisms' drive to reproduce has created super bacteria and pests that are becoming increasingly resistant to any form of chemical control. Simply put, "what kills them makes them stronger."⁵

Frenay also points to the lack of diversity in crops created by the machine-age which is vital to the stability of the food supply. He gives examples of how the lack of diversity can create disaster; the largest example, of course, being the potato famine in Ireland. Farmers grew only two types of potatoes, both of which were susceptible to the bacteria that destroyed the entire crop. One million people starved to death, and many more left Ireland for other countries. Frenay sees hope for the future, however, through the increasing development of organic farming techniques, with Cuba being the first national economy based on scientific organic farming.

⁴ *Id.* at 118.

⁵ Frenay, *supra* n. 1 at 173.

Diversifying crops has allowed farmers to both decrease the use of pesticides and increase their production, as seen in the rice paddies in China. Scientists have also designed a way to reverse the extension of the world's deserts, by using tarps that simulate cloud cover, vegetation once again can grow effectively reclaiming the desert.

Finally, Frenay's part three, titled "Global Designs," addresses the issues of global warming and waste management along with the lack of sustainability for today's energy sources. He begins with a statement that seems ludicrous to an everyday consumer, but is actually commonplace in today's society:

The current system views it as realistic to cut down a tree in Alaska that took centuries to grow, sell it for the price of a pizza, ship it three thousand miles to Japan, where it's rendered into snack chip bags, then ship those three thousand miles back to the US for sale.⁶

Frenay introduces evidence that global warming is occurring—the declining salinity of the ocean as well as the growing fierceness of storms. Waste management is another problem facing the machine-age-based world of today. The growing amount of waste—especially waste toxic to the environment—is a problem that can only be addressed by following ecological principles. Frenay once again shows the reader that hope exists by using the companies in Kalundborg, Denmark as an example. In this small town one company's waste material is the raw material of another, a normal occurrence in nature. This was not done with a conscious attempt to protect the environment, but instead it was done to save money.⁷ Frenay believes that eventually companies will realize that the most economical method is also the one that is best for the environment.

⁶ *Id.* at 292.

⁷ *Id.* at 302.

The problem of fossil fuels is expounded upon in this section of the book as well. Frenay startles the reader with a statistic that the total amount of energy from fossil fuels on the earth never was equal to more than two months of the energy that hits the earth's surface from the sun.⁸ He explores different alternative energy sources—especially the hydrogen fuel cell. Frenay is far too optimistic in this exploration, and while he does admit the expensive nature of this fuel source, both the actual fuel cell and the lack of infrastructure necessary for it to work, he does not think those issues will be a major deterrent, which seems highly questionable.

Frenay finishes his book with a tirade on the ill effects of multinational corporations which he sees as controlling all aspects of life from granting funds to universities for scientific research to corporate lobbyists in the government controlling the policies. He focuses mainly on the effect of the PR firms in influencing government policies, epitomized by the US's involvement in the Kuwait War. Corporations use Adam Smith's famous book *The Wealth of Nations* to support their opinions for the lessening of government regulations in the economy, but as Frenay smartly points out, Smith not only warned against big government, but big business as well. He considered both to be hindrances to the true spirit of capitalism.

Frenay very interestingly ends with the importance of the Supreme Court in this matter, to take care of what he calls the "feedback problem" and maintain democracy and capitalism. It is only the Supreme Court that can overturn the precedent set by the case *Santa Clara County v. Southern Pacific Railroad Company* granting corporations the same protections under the Fourteenth Amendment as United States citizens.⁹ It was this case's summary written by the court reporter J. C. Bancroft Davis that established this precedent, although the ruling of the

⁸ *Id.* at 360.

⁹ *Santa Clara County v. Southern Pac. R.R. Co.*, 118 U.S. 394, 6 S.Ct. 1132, 30 L.Ed. 118, (1886).

court was based specifically on a lesser issue than the constitutional one proffered. After *Santa Clara* was decided until 1910, over 300 Fourteenth Amendment claims reached the Supreme Court; of those only 19 were brought by African Americans, while the remaining 288 were corporate claims.¹⁰ No law was passed by Congress verifying this new status, no roots for this idea exist in English common law, and no court has ever stated that corporations are “persons” protected by the Fourteenth Amendment.¹¹ As Frenay quite bluntly states:

What proverbial man on the corner, standing on his proverbial soapbox, could think to match the sway of a global corporation like General Electric, which has its own television network and two cable news channels plus assorted law firms, ad agencies, PR agencies, and a small army of lobbyists in Washington and around the world?¹²

Congress and the executive branch, greatly pressured by corporate lobbyists, have done almost nothing to curb the control that corporations exercise in today’s society. Frenay sees hope, however, in the Supreme Court—the branch of the government, he alleges, is most protected from the influence of corporate lobbyists. Analogizing the members of the Court to heroes in numerous fiction novels, “the small, heroic band of humans thrown by fate into the path of this juggernaut are the nine members of the US Supreme Court. Our fate, in a very real sense, lies in their hands.”¹³ Frenay, as evidenced throughout his book, acknowledges the damaging aspects of the new age technology and problems in the world, but leaves the reader with a feeling of hope for the future. While at times his optimism may seem unrealistic, he uses real life examples

¹⁰ Frenay, *supra* n. 1 at 430.

¹¹ *Id.* at 431.

¹² *Id.*

¹³ *Id.* at 434.

of his points and overall his description of what the world needs to be to maintain human life seems like it is on target.

Pulse is a book that is appropriate for all levels of adult readers, especially those interested in engineering and environmental issues. The book touches on numerous hot topics in these areas that are still unresolved, so that even though the book was published in 2006, its ideas are still crucial topics of debate in today's scientific community. Books and articles dealing with topics such as nanotechnology and environmental sustainability are constantly published, almost as quickly as new advances in these areas are made.¹⁴

¹⁴ See, e.g., Ulf Stahl, Ute E.B. Donalies, & Elke Nevoigt, *Food Biotechnology: Advances in Biochemical Engineering / Biotechnology*, (Springer 2008); David D. Friedman, *Future Imperfect: Technology and Freedom in an Uncertain World*, (Cambridge Univ. Press 2008); Karen Murcia, *Scientific Literacy for Sustainability: Educating Citizens for the 21st Century*, (VDM Verlag 2008); Roger Brownsword, *Rights, Regulation and the Technological Revolution*, (Oxford Univ. Press 2008); Daniel A. Vallero & Chris Brasier, *Sustainable Design: The Science of Sustainability and Green Engineering*, (Wiley 2008).