matter what atrocities individuals or states performed in the name of evolution.

Instead of blaming Darwinism for racism we need evolutionary theory to study and understand why humans in all parts of the world can be so racist. This leads us into the third part of *Darwin's Spectre*, where the author considers how evolutionary theory can be used to better understand primate nature, from baboons to bishops. Here again we find the clash between two major themes from the 18th century's Enlightenment: universal plasticity of the human mind versus evolutionary limitations. This is a crucial part of the book, but I will not give the story away. You need to 'throwim way leg', and start your own journey into *Darwin's Spectre*.

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The natural war

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The Biology of Doom

by Ed Regis

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'The great mystery of biological warfare, in the end, was why it had never been used.' This sentence is near the end of *The Biology of Doom*, where the author gives us a series of explanations for this affirmation: boomerang effect, irreproducibility of combat missions, moral repugnance... And he demonstrates that none of these hold true. Unfortunately, it is known—and the author indeed reports it—that biological warfare using plague and smallpox has been used not only in the past, but also more recently by the Japanese army in World War II.

Ed Regis seems to consider biological weapons as an advance rather than a threat as he writes: "Why was it worse to die from a disease (which people did continually in the normal course of

events) than from bullets, bombs or nuclear radiation? [...] Indeed the case could be made that biological weapons were less morally objectionable than other types since they were in an obvious way far more 'natural' than high explosives or nuclear bombs, neither of which existed in nature. Pathogens were component parts of planet Earth, items that contributed to, expanded, and enlarged the sum total of planet Earth's biodiversity. Biological warfare was in effect 'green' warfare (sic)...."

But precisely because it is so 'natural', it is difficult to tell whether it has been used on many more unpublicized occasions. This is the greatest danger of biological warfare: it can be started unobtrusively, it can be a war without a name, without a declaration of war, and without any means to stop it. But the author repeatedly alludes to the 'natural' aspect of biological warfare as if to find excuses for this most dangerous type of weapon. People are always more afraid of artifice than of nature, while the latter can be the most dangerous, because it is pre-adapted to life. Regis uses the code words 'biodiversity' and 'green' to tame the idea of deadly nature.

In fact, this book, written in the lively style of an American investigative journalist, does not convey the horror it pretends to feel against the biology of doom, but tends to display it as a milder form of war. It is a book that is a pleasure to read, unfortunately. The Japanese effort is depicted as an evil deed of the same type as Mengele's atrocities. The American effort, however, while considered morally objectionable, is mainly displayed as a technical undertaking, which would fit very well in a Spielberg movie. The reader is fascinated by the accounts of the extraordinary 8-ball sphere at Fort Detrick in Maryland where real scale experiments were made with animals and even human volunteers. In spite of vivid descriptions of the tests and the effects of bacterial diseases (mostly anthrax), plenty of anecdotes make the account easy to read... as a fiction. The reader is entertained by stories of the CIA, illegal drugs, a suicide, stolen documents, code names, American spies saving horrible Japanese agents to get their hand on their secrets—all the elements of a Graham Greene novel.

No real horror in Regis's book, but it is common that books are written with sales in mind rather than for the sake of their

intellectual content. However, the subject of biological warfare is a serious one, and I would have expected the author to have taken a more objective view with a real discussion of ethical issues. What should or can be done when we face a situation where biological warfare becomes increasingly easier to carry out? What role does the scientist play in helping to develop biological weapons? These moral questions are not even mentioned.

The book is limited to the Japanese and American bio-warfare programs on bacteria—not viruses—and even so the author is at pains to demonstrate that the pathogens can be used in a controlled way. But the book also demonstrates the irreproducibility of the results obtained. Living organisms, in contrast to chemicals or radioactive materials, multiply and it is extremely difficult to keep them at bay. At Gruinard island, which had been used as a test site for *Bacillus anthracis*, spores survived for more than 40 years. The soil had to be decontaminated with extremely reactive sporicidal chemicals, thus demonstrating that biological warfare is, in fact, not such a 'green' type of war after all. Finally, bio-weapons recombine and change their properties, which could render them uncontrollable even for their creators.

The story told is from the past as if nothing went on after President Nixon killed the American bio-warfare program and signed the biological weapons treaty in early 1975. But the reader is left unsatisfied, with many open questions. Why were scientists at Fort Detrick still working with *B. anthracis* until as late as 1988? Where are the viruses in this story? What about the Russian and the Iraqi programs? And what about the consequences of publishing the sequence of the smallpox virus genome on the world-wide-web, making it readily available to everybody interested in developing bio-weapons?—the last was again excused with arguments including the preservation of biodiversity. It is this attitude of being righteous—the same that we find in *The Biology of Doom*—that is leading to disaster. The road to hell is paved with good intentions.

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