**Darwin among the Machines**

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"**Darwin among the Machines**" appeared as the heading of an article published in [*The Press*](http://en.wikipedia.org/wiki/The_Press) newspaper on 13 June 1863 in [Christchurch](http://en.wikipedia.org/wiki/Christchurch), [New Zealand](http://en.wikipedia.org/wiki/New_Zealand). Written by [Samuel Butler](http://en.wikipedia.org/wiki/Samuel_Butler_%28novelist%29) but signed [Cellarius](http://en.wikipedia.org/wiki/Samuel_Butler_%28novelist%29), the article raised the possibility that machines were a kind of "mechanical life" undergoing constant [evolution](http://en.wikipedia.org/wiki/Evolution), and that eventually machines might supplant humans as the dominant species:

We refer to the question: What sort of creature man’s next successor in the supremacy of the earth is likely to be. We have often heard this debated; but it appears to us that we are ourselves creating our own successors; we are daily adding to the beauty and delicacy of their physical organisation; we are daily giving them greater power and supplying by all sorts of ingenious contrivances that self-regulating, self-acting power which will be to them what intellect has been to the human race. In the course of ages we shall find ourselves the inferior race.

...

Day by day, however, the machines are gaining ground upon us; day by day we are becoming more subservient to them; more men are daily bound down as slaves to tend them, more men are daily devoting the energies of their whole lives to the development of mechanical life. The upshot is simply a question of time, but that the time will come when the machines will hold the real supremacy over the world and its inhabitants is what no person of a truly philosophic mind can for a moment question.

The article ended by urging that "war to the death should be instantly proclaimed against them. Every machine of every sort should be destroyed by the well-wisher of his species. Let there be no exceptions made, no quarter shown; let us at once go back to the primeval condition of the race." This article, along with later writings by Butler on "machine evolution", was probably largely satirical in intent, although he may have been using these fanciful writings to explore some real philosophical issues like the question of whether biological life and evolution can be explained in purely [mechanical](http://en.wikipedia.org/wiki/Mechanism_%28philosophy%29) terms (see the discussion at the end of the 'Book of the Machines' section below).

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***Book of the Machines***

Butler developed this and subsequent articles into *The Book of the Machines*, three chapters of [*Erewhon*](http://en.wikipedia.org/wiki/Erewhon), published anonymously in 1872. The Erewhonian society envisioned by Butler was one that had long ago undergone a revolution in which most mechanical inventions had been destroyed, and the narrator of the story finds a book detailing the reasons for this revolution, which he translates for the reader. In chapter xxiii: the book of the machines, a number of quotes from this imaginary book discuss the possibility of machine consciousness:

"There is no security"--to quote his own words--"against the ultimate development of mechanical consciousness, in the fact of machines possessing little consciousness now. A mollusc has not much consciousness. Reflect upon the extraordinary advance which machines have made during the last few hundred years, and note how slowly the animal and vegetable kingdoms are advancing. The more highly organized machines are creatures not so much of yesterday, as of the last five minutes, so to speak, in comparison with past time.

...

“Either,” he proceeds, “a great deal of action that has been called purely mechanical and unconscious must be admitted to contain more elements of consciousness than has been allowed hitherto (and in this case germs of consciousness will be found in many actions of the higher machines)—Or (assuming the theory of evolution but at the same time denying the consciousness of vegetable and crystalline action) the race of man has descended from things which had no consciousness at all. In this case there is no *à priori* improbability in the descent of conscious (and more than conscious) machines from those which now exist, except that which is suggested by the apparent absence of anything like a reproductive system in the mechanical kingdom.

Later, in chapter xxiv: the machines—continued, the imaginary book also discusses the notion that machines can "reproduce" like living organisms:

“But the machines which reproduce machinery do not reproduce machines after their own kind. A thimble may be made by machinery, but it was not made by, neither will it ever make, a thimble. Here, again, if we turn to nature we shall find abundance of analogies which will teach us that a reproductive system may be in full force without the thing produced being of the same kind as that which produced it. Very few creatures reproduce after their own kind; they reproduce something which has the potentiality of becoming that which their parents were. Thus the butterfly lays an egg, which egg can become a caterpillar, which caterpillar can become a chrysalis, which chrysalis can become a butterfly; and though I freely grant that the machines cannot be said to have more than the germ of a true reproductive system at present, have we not just seen that they have only recently obtained the germs of a mouth and stomach? And may not some stride be made in the direction of true reproduction which shall be as great as that which has been recently taken in the direction of true feeding?

“It is possible that the system when developed may be in many cases a vicarious thing. Certain classes of machines may be alone fertile, while the rest discharge other functions in the mechanical system, just as the great majority of ants and bees have nothing to do with the continuation of their species, but get food and store it, without thought of breeding. One cannot expect the parallel to be complete or nearly so; certainly not now, and probably never; but is there not enough analogy existing at the present moment, to make us feel seriously uneasy about the future, and to render it our duty to check the evil while we can still do so? Machines can within certain limits beget machines of any class, no matter how different to themselves. Every class of machines will probably have its special mechanical breeders, and all the higher ones will owe their existence to a large number of parents and not to two only.

“Complex now, but how much simpler and more intelligibly organised may it not become in another hundred thousand years? or in twenty thousand? For man at present believes that his interest lies in that direction; he spends an incalculable amount of labour and time and thought in making machines breed always better and better; he has already succeeded in effecting much that at one time appeared impossible, and there seem no limits to the results of accumulated improvements if they are allowed to descend with modification from generation to generation.

This notion of machine "reproduction" anticipates the later notion of [self-replicating machines](http://en.wikipedia.org/wiki/Self-replicating_machine), although in chapter xxv: the machines—concluded, the imaginary book supposes that while there is a danger that humans will become subservient to machines, the machines will still need humans to assist in their reproduction and maintenance:

“Herein lies our danger. For many seem inclined to acquiesce in so dishonourable a future. They say that although man should become to the machines what the horse and dog are to us, yet that he will continue to exist, and will probably be better off in a state of domestication under the beneficent rule of the machines than in his present wild condition. We treat our domestic animals with much kindness. We give them whatever we believe to be the best for them; and there can be no doubt that our use of meat has increased their happiness rather than detracted from it. In like manner there is reason to hope that the machines will use us kindly, for their existence will be in a great measure dependent upon ours; they will rule us with a rod of iron, but they will not eat us; they will not only require our services in the reproduction and education of their young, but also in waiting upon them as servants; in gathering food for them, and feeding them; in restoring them to health when they are sick; and in either burying their dead or working up their deceased members into new forms of mechanical existence.

The author of the imaginary book goes on to say that while life under [machine rule](http://en.wikipedia.org/wiki/Machine_rule) might be materially comfortable for humans, the thought of the human race being superseded in the future is just as horrifying to him as the thought that his distant ancestors were anything other than fully human (apparently Butler imagines the author to be an [anti-evolutionist](http://en.wikipedia.org/wiki/Anti-evolution)), so he urges that all machines which have been in use for less than 300 years be destroyed to prevent this future from coming to pass:

“The power of custom is enormous, and so gradual will be the change, that man’s sense of what is due to himself will be at no time rudely shocked; our bondage will steal upon us noiselessly and by imperceptible approaches; nor will there ever be such a clashing of desires between man and the machines as will lead to an encounter between them. Among themselves the machines will war eternally, but they will still require man as the being through whose agency the struggle will be principally conducted. In point of fact there is no occasion for anxiety about the future happiness of man so long as he continues to be in any way profitable to the machines; he may become the inferior race, but he will be infinitely better off than he is now. Is it not then both absurd and unreasonable to be envious of our benefactors? And should we not be guilty of consummate folly if we were to reject advantages which we cannot obtain otherwise, merely because they involve a greater gain to others than to ourselves? “With those who can argue in this way I have nothing in common. I shrink with as much horror from believing that my race can ever be superseded or surpassed, as I should do from believing that even at the remotest period my ancestors were other than human beings. Could I believe that ten hundred thousand years ago a single one of my ancestors was another kind of being to myself, I should lose all self-respect, and take no further pleasure or interest in life. I have the same feeling with regard to my descendants, and believe it to be one that will be felt so generally that the country will resolve upon putting an immediate stop to all further mechanical progress, and upon destroying all improvements that have been made for the last three hundred years. I would not urge more than this. We may trust ourselves to deal with those that remain, and though I should prefer to have seen the destruction include another two hundred years, I am aware of the necessity for compromising, and would so far sacrifice my own individual convictions as to be content with three hundred. Less than this will be insufficient.”

Erewhonian society came to the conclusion "...that the machines were ultimately destined to supplant the race of man, and to become instinct with a vitality as different from, and superior to, that of animals, as animal to vegetable life. So... they made a clean sweep of all machinery that had not been in use for more than two hundred and seventy-one years..." (from chapter ix: to the metropolis.)

Despite the initial popularity of *Erewhon*, Butler commented in the preface to the second edition that reviewers had "in some cases been inclined to treat the chapters on Machines as an attempt to reduce Mr. Darwin’s theory to an absurdity." He protested that "few things would be more distasteful to me than any attempt to laugh at Mr. Darwin", but also added "I am surprised, however, that the book at which such an example of the specious misuse of analogy would seem most naturally levelled should have occurred to no reviewer; neither shall I mention the name of the book here, though I should fancy that the hint given will suffice",[[1]](http://en.wikipedia.org/wiki/Darwin_Among_the_Machines#cite_note-0) which may suggest that the chapter on Machines was in fact a satire intended to illustrate the "specious misuse of analogy", even if the target was not Darwin; Butler, fearing that he had offended Darwin, wrote him a letter explaining that the actual target was [Joseph Butler](http://en.wikipedia.org/wiki/Joseph_Butler)'s 1736 *The Analogy of Religion, Natural and Revealed, to the Constitution and Course of Nature*. The [Victorian](http://en.wikipedia.org/wiki/Victorian_era) scholar Herbert Sussman has suggested that although Butler's exploration of machine evolution was intended to be whimsical, he may also have been genuinely interested in the notion that living organisms are a type of mechanism and was exploring this notion with his writings on machines,[[2]](http://en.wikipedia.org/wiki/Darwin_Among_the_Machines#cite_note-1) while the philosopher Louis Flaccus called it "a mixture of fun, satire, and thoughtful speculation."[[3]](http://en.wikipedia.org/wiki/Darwin_Among_the_Machines#cite_note-2)

***Evolution of Global Intelligence***

[George Dyson](http://en.wikipedia.org/wiki/George_Dyson_%28science_historian%29) applies Butler's original [premise](http://en.wikipedia.org/wiki/Premise) to the [artificial life](http://en.wikipedia.org/wiki/Artificial_life) and [intelligence](http://en.wikipedia.org/wiki/Artificial_intelligence) of [Alan Turing](http://en.wikipedia.org/wiki/Alan_Turing) in ***Darwin Among the Machines: The Evolution of Global Intelligence*** (1998) [ISBN 0-7382-0030-1](http://en.wikipedia.org/wiki/Special:BookSources/0738200301), to suggest coherently that the [internet](http://en.wikipedia.org/wiki/Internet) is a living, [sentient](http://en.wikipedia.org/wiki/Sentient) [being](http://en.wikipedia.org/wiki/Being).

Dyson's main claim is that the evolution of a conscious mind from today's technology is inevitable. It is not clear whether this will be a single mind or multiple minds, how smart that mind would be, and even if we will be able to communicate with it. He also clearly suggests that there are forms of intelligence on Earth that we are currently unable to understand. From the book: "What mind, if any, will become apprehensive of the great coiling of ideas now under way is not a meaningless question, but it is still too early in the game to expect an answer that is meaningful to us."[[4]](http://en.wikipedia.org/wiki/Darwin_Among_the_Machines#cite_note-3)

**See also**

* [All Watched Over by Machines of Loving Grace (TV series)](http://en.wikipedia.org/wiki/All_Watched_Over_by_Machines_of_Loving_Grace_%28TV_series%29)
* [The Adolescence of P-1](http://en.wikipedia.org/wiki/The_Adolescence_of_P-1)
* [Affordance](http://en.wikipedia.org/wiki/Affordance)
* [Artificial intelligence](http://en.wikipedia.org/wiki/Artificial_intelligence)
* [Butlerian Jihad](http://en.wikipedia.org/wiki/Butlerian_Jihad), a fictional historical event originally introduced in [Frank Herbert](http://en.wikipedia.org/wiki/Frank_Herbert)'s [*Dune*](http://en.wikipedia.org/wiki/Dune_%28novel%29) novels
* [Cyc](http://en.wikipedia.org/wiki/Cyc) artificial intelligence project
* [Darwin machine](http://en.wikipedia.org/wiki/Darwin_machine) utilizing all of the six essential features of a Darwinian process
* [Neo-Luddism](http://en.wikipedia.org/wiki/Neo-Luddism)
* [Never-Ending Language Learning](http://en.wikipedia.org/wiki/Never-Ending_Language_Learning) semantic computer system
* [Semantic Web](http://en.wikipedia.org/wiki/Semantic_Web)
* [Technological singularity](http://en.wikipedia.org/wiki/Technological_singularity)
* [Technophobia](http://en.wikipedia.org/wiki/Technophobia)

**Notes**

* 1. [**^**](http://en.wikipedia.org/wiki/Darwin_Among_the_Machines#cite_ref-0) [Project Gutenberg](http://en.wikipedia.org/wiki/Project_Gutenberg) eBook [*Erewhon* by Samuel Butler.](http://www.gutenberg.org/etext/1906)
  2. [**^**](http://en.wikipedia.org/wiki/Darwin_Among_the_Machines#cite_ref-1) Breuer, Hans-Peter. ['Samuel Butler's "the Book of the Machines" and the Argument from Design.'](http://www.jstor.org/pss/436868) Modern Philology, Vol. 72, No. 4 (May 1975), pp. 365-383
  3. [**^**](http://en.wikipedia.org/wiki/Darwin_Among_the_Machines#cite_ref-2) Flaccus, Louis. [University lectures delivered by members of the faculty in the free public lecture course](http://books.google.com/books?id=JigdAQAAIAAJ&pg=PA143#v=onepage&q&f=false), p. 143
  4. [**^**](http://en.wikipedia.org/wiki/Darwin_Among_the_Machines#cite_ref-3) [Excerpted from review](http://tal.forum2.org/darwin) by [Tal Cohen](http://tal.forum2.org/author_Tal%20Cohen), 30 September 1998.

**References**

* ["Darwin among the Machines" — (To the Editor of the Press, Christchurch, New Zealand, 13 June, 1863.)](http://www.nzetc.org/tm/scholarly/tei-ButFir-t1-g1-t1-g1-t4-body.html)
* [Project Gutenberg](http://en.wikipedia.org/wiki/Project_Gutenberg) eBook [*Erewhon* by Samuel Butler.](http://www.gutenberg.org/etext/1906)

**External links**

* ["Darwin among the Machines": A Review and Commentary](http://www.mikiko.net/library/weekly/aa060897.htm)
* ["*Machina sapiens* and Human Morality"](http://www.mikiko.net/library/weekly/aa092897.htm)
* ["What Can I, Robot, Do With That?"](http://www.sciencedaily.com/releases/2008/04/080421162714.htm)