
Science, Technology, Society: Prologue

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Bionics is commonly defined as the science of technical artefacts that resemble organic systems in both function and design. The 'philosophy' of bionics is to design systems and technology following nature's example. The similarities between technical artefacts and natural systems are indeed remarkable. Cobwebs appear to be the blueprint behind suspended structures and fishing nets; certain morphological features of plants and birds appear to have informed the lightweight sandwich structures now used in a range of technical products, including aircraft; the conduction of light along plant fibres resembles the way fibre-optic cables work – to mention just a few examples. Two areas of bionics are currently attracting a lot of media attention: one is the evolutionary strategy of the Berlin Group headed by Ingo Rechenberg, the other the genetic algorithm method. The former uses evolutionary methods such as mutation and selection, whose purpose is to enable organisms to adapt to their environment, to optimize technical systems. This does not have to be done manually, by working on a mechanical object, for example; it can also be done on a computer, as in the second case, where the model is the organic brain, or rather the notion of the self-organizing neuronal network that originated in the Cornell Group headed by Frank Rosenblatt. Parallel computers are already being used in an effort to overstep the boundaries of conventional sequential processors – so-called 'von Neumann computers' – and enter the realm of 'neuronal networks'.

'Learning from nature' and 'nature as template' are popular slogans that are fast gaining currency even outside engineering and the applied sciences. They alert us to a much more fundamental shift in how we are accustomed to seeing the world. Biology is beginning to take over from physics as the lead science. In view of the environmental disasters that humanity has caused, Frederic Vester writes, it is vital that we take our cues for all future technical and economic endeavour from the biosphere itself – from the one corporation that has been running for four billion

years without ever once going bankrupt. The theory of living systems developed by the Chilean biologist Humberto Maturana is becoming increasingly attractive as a scientific paradigm of holistic thinking. Maturana describes living systems as 'autopoietic' – as self-organizing machines. The principles guiding them should inform other dynamic systems, too. And indeed, scientists from the most diverse disciplines are now falling over themselves to prove that corporations, whole industries, schools and universities, hospitals and professional associations, ministries and even states really can function according to the same principles. I must confess that as a social scientist, I have difficulty following such an interpretation. New findings are generally attributed to the inexorable forward march of 'scientific progress'. It is 'scientific progress' that makes our knowledge of the world ever more congruent with the 'reality' of the world, that paints an ever truer likeness of its subject, as it were. But an alternative interpretation is also possible, namely that what we are dealing with is not actually nature per se, but a socially determined perception of nature.

After all, humans are not just biological but social creatures, too, who reflect and refract human society as a whole. Today, nature and society are more inseparable than ever, both factually and conceptually. Technology is the means by which they have become intertwined. The computer, as a machine processing symbols, has opened up new ways of organizing this process. By generating new possibilities it also generates a new worldview, projecting the social givens of the day into the realm of nature.

In the past, humans extrapolated their perception of nature, their notion of nature, from what little contact they had with it – as momentary and mediated through tools as it was; and this notion, which of course was something of their own invention, they then projected back onto themselves and society. This has not changed in any fundamental way. Heinz von Foerster describes such a process as 'anthropomorphic projection'. What is new is something else. What is new is that humans are beginning to imagine nature as a dynamic machine, as cybernetic. Instead of appropriating it piecemeal and through tools, we are using technology to remodel it to suit our needs. Knowledge is no longer so much an act of

contemplative perception as a construct on the part of the knowledge-seeking subject. The pursuit of truth is becoming a production process. Biology, for example, would be inconceivable today without either machines or computers, George Canguilhem writes. Knowledge has become dependent on machines, which in turn have become both tool and template.

New theories and models, like other concepts of nature before them, are giving rise to changed forms of human engagement with nature and to a new form of metabolism with nature. The complexity and dynamism they try to contain, the forms the processing takes – all of these things are manmade. To us, they appear to have been extrapolated from nature. But as the architect Frei Otto once pointed out, the design principles underlying our technologies are not copied from nature; in fact the exact opposite is true. The tent roof that he designed for the Olympic Stadium in Munich, for example, was not inspired by a cobweb, nor did the inventor of lightweight construction set out to mimic straw. What really happens is that, consciously or not, we project our design principles onto nature. It is the act of designing, figuratively speaking, that opens our eyes to the design principles at work in 'nature'. We find nothing in nature that we ourselves did not put there. And then, in a second step as it were, we retrieve the interpretations we have planted there and 'discover' them all over again in technical and social constructs both real and utopian, where they are henceforth legitimated, we tell ourselves, by 'nature itself'.

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