

The End of Reductionism

SCIENCE AND THE 21ST CENTURY

by William F. Brinton

***“Now that we know the world is [physically] lawful,
we have to go on to other things...”***

Physicist Leo Kadonoff, 1992

***“We need to keep manipulating creation,
if only to save ourselves from ourselves...”***

Dr. Hubert Markl

Director, Max-Planck Institut, 1997¹

Prophesied at the beginning of the century by German Oswald Spengler in his *Decline of the West* (1918), and now confirmed at the end in a series of stimulating essay-interviews with 44 of the world's leading scientists (Horgan, *The End of Science* (1995)), science appears to have passed its zenith and is in decline, victim of its own success. A participant at a 1989 symposium on science intoned:

There is an increasing feeling that science as a unified, universal, objective endeavor is over.²

The really essential discoveries have all been made. It is unlikely that we are going to re-discover chemistry, DNA, or electricity.

We are like explorers of a great continent who have penetrated to its margins ... and have mapped the major mountain chains and rivers. There are still some details to fill in, but the endless horizons no longer exist.³

Where exactly is this going? Is this the long awaited end of materialistic science and birth of something new? Or, is there a hidden trap in this thinking?

It is very apparent that a century of pounding, non-stop discoveries covering matter,

energy, and DNA is now behind us. The question for many is whether it could or should ever happen again. What we have gained is the unprecedented ability to predict and control events—possibly to a fault. What we have inevitably lost is the sense of anticipation and excitement of original research. The sense of wholeness is completely gone, fractionated into tiny parts. Gone too is the expectation of seeing the results of ground-breaking science turn into fundamentally new products and define new life-styles. We can't say we weren't warned:

The dizzy rate at which progress is now proceeding makes it seem very likely that progress must come to a stop soon...⁴

The sheer notion of progress itself has wanted examination:

In the wake of Darwin... the idea of progress was raised to a level of scientific religion. This optimistic view... is so widely embraced in industrialized nations... that the claim that progress could come to an end is regarded as outlandish...⁵

Now comes the feeling of diminishing returns, which all of us employed in science

careers experience each time we tote up the cost of yet another research project, and then request the needed, though limited funds:

We have been so impressed by the undeniable...[and] .. magnificent achievements, that we have scarcely noticed we are well into the era of diminishing returns... more and more effort and expenditure of money must be allocated to sustain our progress.⁶

It is a familiar agricultural theme. Farmers more than doubled their farm yields with the first 40 pounds of chemical fertilizer that went down early in the century. The second 40 pound increment increased the yield perhaps only another 25%. The third and now fourth and fifth 40 pound increments brought successively smaller gains and hugely increased costs, not to mention the fact that they became almost universally damaging the environment.⁷

The explanation for diminishing returns in science is found not so much in monetary inflation or labor cost increases that have accompanied the rise of western science and technology, but in the nature of the modern reductionistic scientific principle itself:

Scientific innovation is going to become more and more difficult as we push out further and further toward remote frontiers...

Continuing,

... as we must push into regions never investigated before.... that requires ever more elaborate and expensive apparatuses.⁸

The underlying problem is revealed in the potential high costs of continued scientific reductionism. For example, Congress cancelled the completion of the underground super-collider-accelerator in 1993, as a result of genuine concern for the merit of the excruciatingly detailed research that was to be undertaken there relative to the large cost.

The picture can be made very simple: Anyone setting out to count all the marbles in the world must know this to be a finite but increasingly expensive task. Here, perhaps the first generation counts 90% of the world's marbles at a cost of only N dollars. The 2nd generation comes along and undertakes to enlarge the count to 95%, but at a cost of N x

100 dollars. The 3rd generation insists on improving the precision by another 3%, to 98%, but now at N x 10000 dollars. Finally, the 4th generation at an absurd cost of N x 1000000 dollars carries the precision to 99%— a non-event, since despite the cost it has not added or changed any fundamental view of the world implicit in knowing that there are marbles out there. From this standpoint, much of modern science falls into this 4th generation category: hair-splitting *ad expensum* projects.

The idea of scientific progress spiraling into ever more unmanageable costs is clearly disappointing. According to some, we scientists are

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... whistling to keep ... courage up in the face of what for most practitioners of science is a bleak and imminent prospect..⁹

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If we ask, what do science and scientists look like the morning after?.. the prognosis is poor: miserable. As Horgan collectively paraphrases his subjects: "...science will continue to raise new questions. Most are trivial..." This means, he states, "... scientists may have less incentive to pursue research and society less inclined to pay for it". It bodes poorly with agriculture where potentially futile but very expensive efforts to achieve bio-technology breakthroughs means that simpler more holistic solutions to pressing problems languish by the way-side.

But people, including scientists, need something to do, and if reductionism is boring and too expensive, try turning to meta-science and religion. "Irrationality will replace the age of science", complains a scientist interviewed in Horgan's work. Indeed, earlier Spengler predicted an "age of irrationality" would supercede science at the end of the century. Curiously, he felt that in fact society would ultimately rebel against the arrogance and lack of tolerance intrinsic to modern science, an interesting and typical early view. The author thinks the debacle can be avoided. In Spengler's and others' views, science made a Faustian bargain to acquire detailed knowledge of the world, and must pay the price.

Whatever you predict, it is obvious that:

Long ago, some very bright people ... invented science. If you go into the future, what we call science won't be the same anymore...¹⁰

Just what it will look like is hard to say. Insult may have been added to injury by the addition of another dimension: the loss, thanks to physics, of certainty itself:

..we have arrived at the end of certitude...
If science is not able to give certitude,
what should you believe?¹¹

It is not mere speculation that a downturn in science R&D will result from the present situation. It is confirmed: spending for science has declined. Japan tops the world with science R&D spending at a miserable 2.90% of GNP, and America has been steadily sinking over the past 10 years to a low of 2.45% (OECD 1995). Germany, which is surprisingly even lower than the US at about 2.25%, is anxiously wringing its hands wondering if it hasn't entirely lost the *Gründergeist*, meaning no new technological breakthroughs are likely to arise in the foreseeable future.¹²

A double twist now occurs. With the predicted continuing decline in science, it is possible, almost probable, that serious repercussions will ensue. Politicians like to emphasize that certain countries will fall behind others in the global market, but this is a trivial point in the overall picture of things. Much worse, overall readiness to confront serious new challenges like emerging diseases and environmental problems, could drop to a dangerous low. When preparedness drops as spending and interest declines— as has been apparent in the realm of food-quality monitoring, for example— then new problems arise (like *E. coli* 0157:H7). The result, of course, is that suddenly and consequently, more money must be allocated to the field, often times too late. It all turns into a chaotic, cyclical process that is very dissatisfying in the end.

Let us not also forget that there is an enormous and expensive science machine to maintain: when it and the interests behind it become threatened, there are also other likely consequences, not the least of which may be renewed doomsday prognoses and a little hysteria thrown in for good measure. Worse, junk science has reared its ugly head and grown rapidly in recent years. This is manipulative, disinformation-oriented science promulgated by parties who have too

much to lose from a change or improvement in understanding¹³. They may be happy throw in the towel on science.

At this point, who are we to believe? We can hardly afford to go on, yet we can't do without it, as Dr. Markl of the Max-Planck institute lamented. Stretched between two extremes we arrive at the *Russia House* syndrome (after John Le Carre's novel). Here, we are supplied with 2 pieces of brilliant but differing intelligence: on the one hand the necessary-end-of-science and on the other the danger-of-accepting-the-end-of-science view. Whether you support one side or the other, as in the cold war game from which the story *Russia House* derives, dire consequences are likely to result.

The ultimate denouement of any debate is when the acceptance of either of two arguments is potentially too risky or distasteful to make. True powerlessness results from opposing sides equally pointing to similarly absurd opposite outcomes. One side must cede to break the dilemma. This was the situation with the cold war between the US and Soviet Union (despite what each side may have said). It happens to be the situation presently between conventional farming and its sister, organic farming. To illustrate, at a recent agricultural forum, a would-be organic farmer stood up and commented... "the scientific data being generated in an attempt to elucidate biological methods is complicated or equivocal enough to justify postponing them..."¹⁴ We have indeed achieved a curious detente.

Perhaps the crucial trait and intrinsic problem with modern science is that the data it generates, while diminishingly complete, become too much to handle. Environmental scholar Wolfgang Sachs has warned that the emerging crisis in ecology, as it becomes swamped by data and technology, generated when ecology took on the model of reductionistic science in the first place. According to Sachs, a web of ecological-technology systems are being spawned worldwide by western nations and will "require a quantum leap in surveillance and technology" simply to maintain them. This culminates in an "ecocracy"— ecological bureaucracy¹⁵. The net effect is to undermine the ethical-moral origin of environmentalism, not to mention driving an enormous wedge between the northern/western hemisphere nations, who hold the new keys, and poorer southern countries.

I find myself fascinated with the probable outcome of this intense science: a state of consciousness enhanced by sheer if not complete

bewilderment. Surely that may be some kind of awakening, however bizarre. One thing is apparent: it may promote apathy for science and lethargy for new investigations— people will attempt to learn just what they basically need to know, and then pursue other directions, like entertainment and computers, hardly a worthwhile future. The large remaining vacuum in science will then most likely be filled by selfish interests, the same as those promoting junk science today, who have much to gain from it. Thus giving up too early on science may be just what we can not afford to do.

POSTSCRIPT

Science as we presently know it is reductionism, and vice versa, for all purposes. What this means is that what does not readily fit into a material orientation is simply ignored— thus far. Subjective human traits such as meaning, purpose, love and consciousness, have been categorically excluded from serious science. A science that includes them without brutalizing them in its scope has yet to be born.

It may be a worthwhile exercise to reflect on how, in contrast to scientific reductionism, these subjective traits develop. As science progresses, information tends to overwhelm, requiring one to increasingly narrow one's focus just to handle it. Consciousness, on the other hand, works in the opposite direction— it is naturally inclusive, not exclusive. As we become aware of more things in life, we do not naturally experience life as requiring rejection of other things. As we grow older and more mature, our heightened awareness of social concerns doesn't increase our confusion— on the contrary, it tends to reduce it. Just so, it is hard to imagine that an increase in love or compassion in the world would necessitate huge databanks and result in an increasing inability to determine what on earth to do with either. It is not that love or compassion wouldn't be enormously useful. Thusly, science and reductionism work in a mode that is curiously and inexplicably opposite to traditional human experience, in a way that enforces unreal abstractionism and by the way fosters brutalizing, manipulative economies. Is this to say, that a predicted end of science means that the traditional human has won; the abuse will stop? Perhaps not, since something has been lost/something gained in the process, not easily redone. We have become different persons from it, and will not readily

turn back to where we came from, if we could even find that place. The haunting mystery remains: why we did it in the first place. Rudolf Steiner is one who suggested an answer to the riddle:

It is the secret of materialism that humans turn to matter because of their spirituality.

Here we are posed a paradox that exceeds most: reductionism is born out of human spirituality- it and the technology it spawns is successful because we are more than matter. Yet, unlike biological evolution, it leads progressively to self-limitation if not self-destruction. Why? Steiner continues:

It is modern people's negation of their own spirituality.

In otherwords, we have a peculiar problem here resulting not only from what human beings are but from what they pursue outside of themselves that has tended both to free in the sense of lifting us from the past and yet to fractionate and potentially render powerless. Not giving in to the loss is what the end and the new beginning is all about.

NOTES

1. Quoted in *Der Spiegel*, January 20, Nr.4, 1997
2. Proceedings, Gustavas Adolphus symposium: *End of Science: Attack and Defense*. University Press of America Landham MD 1992
3. Bentley Glass, *Science: Endless Horizons or Golden Age?* in *Science* Jan 8 1971
4. Howard Stent in *The Coming of the Golden Age* (1969)
5. Gunther Stent, in *The Paradoxes of Progress* (1978)
6. Bentley Glass, op cit.
7. David Pimental in *Food , Energy, and Society* . 1979; John Wiley and Sons.
8. Nicholas Reschler, in *Scientific Progress* (1978)
9. Nicholas Reschler, interviewed by John Holgran in *End of Science*, 1995.
10. Freeman Dyson, interviewed in 1993
11. Physicist Ilya Prigogine, in *End of Science*, op cit.
12. *Der Spiegel*, Jan 20, 1997
13. *Junk Science: What You Should Know*. Union of Concerned Scientists, 1995
14. Long Island Agricultural Forum. January 23-24, 1997
15. Wolfgang Sachs, in *The Development Dictionary* (1994) Zed Books