Outline of a New Science, v3

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Introduction

Why would we want a new science? What's wrong with the old one?

According to John Horgan, author of "The End of Science"[1], nothing. The big discoveries have all been made, and all that's left to do is fill in the details, a job we'll eventually pass on to our smart computers.

We've heard this kind of talk before, usually just before a scientific revolution. Suddenly the brightest minds realize that what had appeared to be the edge of the world is in fact the limitation of our knowledge. It also begins to dawn on reflective people that they are not only ignorant but *confused*. One of our major tasks, then, becomes to clarify our thinking. By so doing, we simplify and focus our basic concepts, and this, despite our old habits of thought, leads us to unexpected insights hidden within what we already know. Eventually our whole intellectual landscape is transformed, and we now are not only thinking new thoughts, but thinking itself has become a new kind of activity.

That was the story of the new science that arose in the 17th Century. On a lesser scale it was been the story of 20th Century science. I believe that on an even greater scale will be the story of the science of the 21st.

I should hasten to add that I am far from being the only one today saying such things, and indeed the new science spirit has found quite a variety of voices. Here, for example, is a quote from Willis Harmon in the Noetic Science Review[2]:

> "A new science is arising, a science of the human mind much broader than psychology has been to date. We have called it "noetic" science, after the Greek word for intuitive knowing. Perhaps it is somewhat inaccurate to speak of it as though it were totally new; it might be better to refer to a noetic emphasis in the human sciences. But the radical nature of the developments should not be underestimated."

What I shall discuss here is, I believe, an enterprise in the spirit of Harmon's noetic science, but different in emphasis. The science I envision and am working on is one that presents us with a more *radically grounded* understanding of the *unity* of the physical world and the life world, and at the same time with a more *radically unified* mathematics as a part of the "connective tissue" of this new understanding.

Here again I am in good company. Jung challenged Pauli to come up with a more fundamental theory that would unite his depth psychology with modern physics. Pauli never published anything systematic on his efforts in this direction, but he left some fascinating hints in a variety of private communications[3]. One such was in what he called a "meditation" written for his friend the psychoanalyst Maria von Franz[4]. Drawn from reflections on his dreams and visions, it chronicles his Jungian struggle to unify the opposites in his own nature. It ends with a striking vision in which a woman presents him with a golden ring called the "ring of i", referring to the unit circle in the complex plane. On the mundane level, this is the plane of *quantum amplitudes*, but on the mystical level, the ring in the plane is the secret that will enable us to unify our inner life with our understanding of the outer world. There is no way in which the science of his time, or of our own, can make much sense of this vision. But, as we'll see in Section 4, it may actually have been a premonition of a certain crucial piece of the science to come.

There has been much talk in recent years about "quantum mind", and the word "quantum" has become something of a buzzword in popular science writing. One is reminded of a similar time when Einstein's theory of relativity was all the rage, and everything became "relative". But there is there may be a bit more substance behind today's quantum fluff, since there is growing evidence that quantum mechanics, unlike relativity, may actually have something to do with the workings of the brain. One must be careful, however, not to confuse *advanced* science with *fundamental* science. To say, as some have, that quantum mechanics *explains* the *mind*, is nonsense. It's like saying that the electrical activity of the brain explains the mind. Correlation is not identity – the dinner bell is not the dinner. Pauli understood very well that quantum mechanics would not be at the foundational level of his new science, but would emerge alongside of his new science of psychology from a more fundamental order.

Fundamental science is simple-minded. Advanced science measures its progress by its success in solving ever harder and more complicated problems, but fundamental science likes to focus on the obvious. It stoops to look at what is *beneath notice*, takes the trouble to says what *goes without saying* – and then turns the world upside down. Geometry was an advanced science at the time of Euclid, and most of the theorems and constructions in his Elements were already well known. What made the Elements a milestone of human thought is that it *founded* all of this complex knowledge on completely obvious statements like "Equals of equals are equal", and "Two lines can meet in at most one point." To take a more recent example, the theory of numbers was a very advanced science by the mid-nineteenth century, as exemplified by Gauss's remarkable conjecture that we now call the prime number theorem. During that same period, mathematicians were starting to take a serious interest in the question of just what we mean by the word "number". There were no doubt those at the time who believed that by proving Gauss's conjecture and going on to even better things we would get ever closer to the answer. The prime number theorem was indeed proved, and it indeed did give us a new and deeper understanding of numbers. It was Cantor, however, who gave us the *fundamental* answer: A number is what is common to sets whose members can be put in one-one correspondence. Of course so, obvious, trivial, everyone knows that. But then why did no one before Cantor take the trouble to say it? It was by bothering to say

it, and then thinking through the consequences of what he said, that Cantor came to be known as the founder of modern abstract mathematics.

Advanced science takes its basic *concepts* for granted, just as a chess master takes his allowed vocabulary of moves for granted. Fundamental science, however, challenges basic concepts as well as basic beliefs. It invents new concepts that distinguish among things that have been mistakenly lumped together, and it invents new concepts to capture the essential sameness of things mistakenly thought to be unrelated. Galileo, for the first time in history, distinguished between acceleration as the change of velocity with *time*, and acceleration as the change of velocity with *distance*, and by so doing made it possible for Newton to formulate his laws of physics. Einstein did not make new distinctions, but dissolved old distinctions: he discovered the essential unity of space and time, and of mass and energy, and by so doing revealed undreamed of unities in the laws of physics. Though everyone today applauds science for its ability to expand our knowledge and correct our mistaken beliefs, few people realize how much this owes to the fundamental thinkers who give us the very words we think with.

We like to think in dichotomies, and the dichotomy of inner and outer life has many variants, perhaps best summed up in C. P. Snow's broad dichotomy between the so-called two cultures. We don't *have* to think in dichotomies, though. Harmon speaks of phases one and phase two of science, the first being the older materialistic phase, the second the currently developing *noetic* phase which is "centrally concerned with subjective experience". This second phase explicitly acknowledges our purposes and values and goals, and it does not exclude the mysteries that surround our very being. As he remarks, though, it is also a continuation of the great humanist tradition that tries to make sense of *all* experience. Thus, it does not so much present us with a dichotomy as with a contrast between a part and a whole. What we call hard or objective science is a hypertrophied part, or to draw a biological analogy, a hypertrophied *organ,* of human culture as a whole.

What, then is the *new* science? To stay with the biological analogy, is it a new organ that replaces the old? Or is it a a new harmony, a new partnership, between hard science and the rest of the body of culture? Neither quite captures what I envision. What I see happening is more like a *metamorphosis* of culture as a whole, in which everything is reconfigured, and the part we call hard science is *transformed*, much as the forelegs of the dinosaur were transformed into wings.

Let me conclude with a very brief outline of my outline of the new science.

Section 1 is about the old science, by which is meant the science that came into being in around 1600 and is essentially the science we practice today. This section focuses on several fundamental things in the old science that I believe will endure and remain fundamental in the new science, including the nature of theory.

Section 2 presents a mathematical generalization of the concept of *process* that is found nowhere in the old science. Grounded in the mathematical logic of relations,

which in turn has recently been grounded in the mathematics of pure identity, this new conception formally encompasses classical and quantum in a single domain. It also describes other processes that may well characterize psi phenomena. It is not actually a theory of psi, however, since it does not bridge mind and body. But despite its limited scope, it is almost certainly a prerequisite for any theory of psi that has a chance. By the same token, without its new *concepts*, without the meaning it gives to certain new *words*, the passage will remain blocked to that much larger conceptual domain in which the basic principles of the new science can actually be *stated*; in this respect it is to mind-body science as geometry is to physics.

Section 3 turns to the subject-object relation. This is presented as a *polarity*, like the polarity of up and down or of past and future, rather than as a *contrast* between two different kinds of things called a subject and an object. The main source of ideas here is the Husserlian tradition of phenomenology, and in particular, Husserl's notion of *intentionality*. The aim, however, is not to just incorporate this tradition into the new science. That would simply make a mess. What we must do here is what Euclid did with geometry: to define "points and lines" that organize the insights of phenomenology into a structure that can take its place in the theoretical framework of the new science.

Section 4 is a first pass at a formalizing a new fundamental theory that encompasses subject and object within a unified theory of mind and body. Curiously enough, and rather at odds with what I have been saying so far, one of the main insights in this new theory does come from advanced science, including Hamilton's analytical mechanics and Mackey's "real" interpretation of complex quantum amplitudes. My hope is that this particular rather devious journey from technical physics to the ground level of the new science may turn out to be the key to the secret of Pauli's golden ring of i.

1. John Horgan *The End of Science*, Addison-Wesley 1996
2. Willis Harmon "What is Noetic Science?" in Noetic Sciences Review, Vol. 47, Winter 1998 pages 32-33, also at www.noetic.org/ions/about/harmanarchive.asp.
3. K. V. Laurikainen *Beyond the Atom: The Philosophical Thought of Wolfgang Pauli*, Springer-Verlag 1988
4. Herbert van Erkelens "Wolfgang Pauli's Dialogue with the Spirit of Matter" in Psychological Perspectives, Issue 24, Spring-Summer 1991