Why are some ideas accepted by science and some not? Compare and contrast the acceptance by the "scientific establishment" of continental drift, homeopathy and one other controversial topic of your choice.

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This essay aims to show that the great strength of science is that it (eventually) accepts theories which have a provable use – simultaneously, it is also the great weakness of science that it holds such high empirically testable requirements which cause it to shy away from any theory which has existentially unpleasant consequences for those who hold it. It is my contention that in the future science has no choice but to accept a fundamental shift in how it values and judges theories in order to progress to the next plateau.

Firstly, I shall begin with the example of continental drift as a historical illustration of the process of acceptance; then I shall examine homeopathy which has not been accepted – then I shall illustrate a series of controversial alternative viewpoints in a series of disciplines which are all actually one and the same alternative viewpoint on reality.

Continental Drift

Continental Drift, also known as Plate Tectonic theory, is now so widely recognised as being obvious in today's society that it is hard to imagine it otherwise. First presented by Alfred Wegener in 1912, his 1915 book *Die Entstehung der Kontinente und Ozeane* (The Origin of Continents and Ocean) gave an explanation but not a mechanism for the perplexing problems which troubled the theories of the time. To summarise:

1. Mountains are high and comprised of folded and deformed rocks. There is clear vertical movement of rock.
2. Many sedimentary rock successions in these mountains showed repeated episodes of sea level changes. This implies that rock both moves upwards and downwards over time as the sea level could not change by so much.
3. The same fossil species were found on widely separated land masses which implies that at one time these regions of land were next to one another.
4. Furthermore as the 19th century progressed, it was realised that the Alps had moved horizontally significantly during the last 35m years[1].
5. Mountain ranges were not distributed randomly, but clustered together in a number of places.

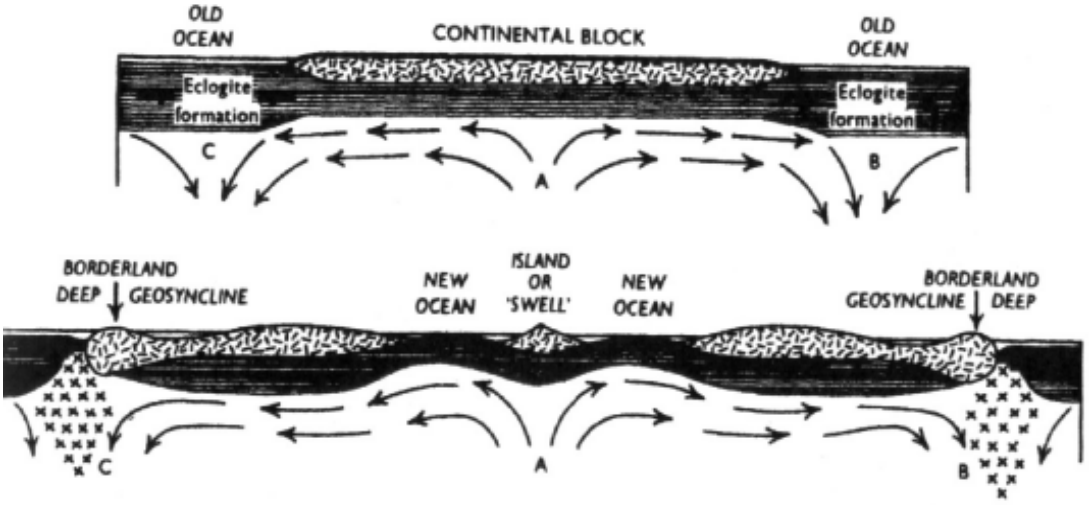
The prevalent theory of the 19th century, contractile theory, held that as the solid Earth was shrinking its "skin" was wrinkling much as when an apple dries out. Because this did not explain points 3, 4 and 5 (as well as the total height of mountains being too great for a simple shrinkage due to heat loss of Earth mass), this gave way to isostasy theory which held that the surface of the Earth floated on a liquid upon which it moved upwards and downwards.

The ground was now set for Continental Drift Theory (as it would seem obvious from physics that a buoyant surface would move under a hotter liquid[2]) and one would have thought that as no other

[1] Argand, E., 1922, *Tectonics de l'Asia*

[2] A simple experiment can show this:- Simply pour some candle wax into a pan full of water until it sets. Now heat the pan of water until the wax begins to melt. If you get the temperature just right, you will see a breakup of the wax into solid sections which slowly move against one another, constantly melting and reforming at the points where the convective forces in the water concentrate the escape of the heat energy. Interestingly, the size of the sections follow a

theory satisfied point 3, it would simply be accepted. Indeed, Arthur Holmes' 1929 diagram of plate tectonics[3] is almost identical to the modern one:



ɟure 4.14. Arthur Holmes's model of continental drift by subcrustal convection. (From ɔlmes 1929b.) Reproduced with permission of the Geological Society of Glasgow.

However, as it turned out, majority acceptance of the theory was to take quite a lot longer, indeed right into the 1970's when the empirical evidence yielded by new technology made it impossible to ignore. Most contemporary explanations of why this was so mention noted authorities of the day opposing it, or that there was bias against the nationalities and backgrounds of the supporters of the theory, or that it was an American vs. European thing. However, all of these I think miss the overall point which this essay shall explain – for now, just note that the early theories were very *static* in nature with the Earth seen as a mostly unchanging firmament and that Continental Drift was entirely *dynamic* in nature, with the Earth being constantly remade – or even self-making – over time[4].

Homeopathy

Modern Homeopathy begins with Dr. Samuel Hahnemann whose 1810 *Organon of Rational Healing* laid out the foundations of homeopathy:

1. That symptoms are often the manifestation of natural processes attempting to return the organism to homeostasis. Where those symptoms persist continually, it is because those processes are missing their target due an imbalance (suppression or miasma) or lack of training on how to correctly deal with the problem.
2. One can train the immune system by treating like with like (the law of similars) by administrating substances which provoke the same symptoms as those of the malady being treated. Thus one can provoke the immune system to better consider the problem at hand.
3. Furthermore, it was found through a process of 'provings' (empirical testings) that very dilute amounts generated better healing (the law of infinitesimals). Indeed, treatments so

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Pareto style power rule distribution (such that there are few big plates and many small ones) which arise from the chaotic turbulence behaviour emerged by the entropisation of energy flow in a liquid (Stewart, I., 1997, *Does God Play Dice?* 2nd ed, Penguin Books, London).

[3] Holmes, A., 1929, 'Radioactivity and earth movements', *Transactions of the Geological Society Glasgow* 18, 559 - 606.

[4] Indeed, there is some reason to suggest that the continents have continually joined up and resplit apart several times during the Earth's 4.6bn year history.

dilute that on average less than one molecule of the original substance would remain in a dose are typical in homeopathy. It is this element of homeopathy, more than any other, which generates the antipathy felt by the conventional Western medical profession[5].

Homeopathy was initially very popular in the 19th century when it had proven success especially against cholera outbreaks, though this was probably more due to superior sterilisation techniques. It waned in the early 20th before resurging in the 1970's, a timeline to which we shall return shortly.

One notable part of homeopathy is that the whole organism is treated – personality traits, conditions such as stress at work or home, or psychological issues such as experience of intense emotions or grief are taken into account – something only very recently recognised by the biomedical school. Furthermore, it was taken as given that there are recurrent cycles and drives within the body which naturally vary over time – against, something only recently recognised by the biomedical school which previously and still does try to enforce an "ideal" state. In these and other ways, homeopathy has strong similarities to Eastern medicine.

What is interesting is the parallels with Continental Drift – once again, the human body was (and still mostly is) viewed by the biomedical school as a *static* machine who when in health, "ran like clockwork". The fact that humans obviously grow and change over time, ie; are *dynamic*, has always run counter to biomedical philosophy which still views death as failure rather than something to be welcomed – as only from death can come new life[6]. Furthermore, as in the rest of Western society from the Cartesian mechanism paradigm shift of the 17th century[7] onwards, mind was (and still is) viewed as very much being separate from body[8]. Once again, when faced with a self-making dynamic system, Western thought has tended to react very negatively[9].

As we shall see, this is a pattern which is repeated again and again during the last few hundred years.

Physics

Probably the two pinnacles of scientific advancement in classical physics, the trunk of all physical sciences[10], were the invention of Newtonian mechanics and Relativistic mechanics. Both were highly dependent on the Cartesian mechanism paradigm shift of the 17th century – ironically, the first cemented its triumph while the latter marked the beginning of its end.

Cartesian mechanism has several key characteristics:

1. To understand something complex, break it down into smaller parts. Keep doing so until it's simple enough to understand. This is called *reductionism*.
2. To build something complex, design small parts and fit them together. Good examples would be cars, factories, computers and buildings.

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[5] An excellent example of this is at QuackWatch's http://www.quackwatch.org/01QuackeryRelatedTopics/homeo.html. From now on this essay shall refer to the conventional Western medical profession as the 'biomedical school'.

[6] Capra, F., 1983, *The Turning Point*, Flamingo Books, London explores the biomedical and alternative medical systems in some detail.

[7] This was the last major civilisation-wide paradigm shift of Western civilisation. It more than anything else has been responsible for our cultural, military and technological dominance over the rest of the planet ever since.

[8] Partially this comes from Christianity, but it also comes from the more eminent of Greek philosophy.

[9] This is not to say I agree with homeopathy, but I do think medicine must include whatever makes the patient better – whether one can find a scientific cause or not.

[10] As Descartes said, "All philosophy is like a tree. The roots are metaphysics, the trunk is physics, and the branches are all the other sciences".

Newtonian mechanics break everything down into forces and differentials, while Relativistic mechanics breaks everything down to particles, forces and differentials operating inside lightcones in a four dimensional Minkowskian spacetime geometry[11]. In both, matter is always predictable.

The discovery of Quantum mechanics very much upset this apple cart. As Werner Heisenburg said:

> I remember discussions with [Niels] Bohr which went through many hours till very late at night and ended almost in despair; and when at the end of the discussion I went alone for a walk in the neighbouring park I repeated to myself again and again the question: Can nature be so absurd as it seemed to us in these atomic experiments? [Capra, F., *The Tao of Physics*]

The problem was that at the quantum level only *relationships* definitely exist, and the very act of examining those relationships causes them to change. Thus, the results of your experiment depend entirely on how you are experimenting. Furthermore, at the quantum level there is no individual predictability – the particles are no more than wave probabilities which can be at most, statistically determined by abduction into likelihoods of occurrence – which is no guarantee of occurrence. Worst of all, solid matter is almost entirely empty space filled with these probabilistic potentials, and from breaking things down to the quantum level one receives no guide as to why matter should be anything other than empty space at the macro level. Therefore, physics had finally come face to face with the reality that a system is more than the sum of its parts[12].

This process culminated eventually in most of the founding quantum physicists turning to Eastern spirituality to salve the existential crisis their discoveries had caused[13]. Furthermore, the knock-on effect of these discoveries on other disciplines was profound – if physics could have been so wrong, so could all the other physical sciences.

The 1970's

In the 1970's, it became recognised that a major paradigm shift[14] was underway which would equal or even surpass the Cartesian mechanism shift of the 17th century. In the time since the discovery of quantum mechanics and what it must mean, cybernetics, the McCulloch-Pitts model neuron and the new ability to investigate fractal geometries[15] by the arrival of the computer had conclusively shown the existence of *emergent properties*. These realisations were rapidly capturing the imagination of very capable minds.

Books such as the 1979 Pulitzer Prize winning *Gödel Escher Bach* by Douglas R. Hofstadter and Erich Jansch's 1980 *The Self Organising Universe*[16] were among the first of many to appear in increasing volume bringing news of the change to the masses. Before long, so great was the volume of new material that anthology books began to appear of which Fritjof Capra's series of books are probably the most widely known.

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[11] I am somewhat simplifying here, but nevertheless Newton would have been more or less familiar with the internals of Relativity once he got past the fourth dimension part and field theory, which would have been new to him. It is very doubtful if he could have ever have accepted Quantum mechanics. See Roger Penrose's *The Road for Reality* for a succinct description of all three kinds of mechanics.

[12] This is not to say it hadn't faced this before eg; Boyle's Gas Law or Poincaré's three body collision problem. However, never before had progress been so absolutely prevented at such a fundamental level – for the first time, reductionism had been shown to have very definite limits.

[13] As is beautifully captured in Capra, F., 1976, *The Tao of Physics*, Flamingo, London.

[14] When reflecting in 1962 on the changes in physics in the early 20th century, the philosopher Thomas Kuhn called such discontinuous, revolutionary breaks 'paradigm shifts'.

[15] Mandelbrot, B., 1975, *The Fractal Geometry of Nature* (in French).

[16] This book is virtually unfindable, yet the few who read it have spoken strongly of how it changed their lives.

What is interesting is that it was precisely at the **same time** that Continental Drift was accepted and Homeopathy began its resurgence.

The Scientific Establishment

What is interesting is that despite all the mounting evidence of a coming major paradigm shift, the scientific establishment remains firmly rooted in Cartesian mechanism. Below are a number of examples where the "new paradigm" model is clearly superior (by Occam's Razor) to the establishment model, yet they refuse to accept it:

1. The 'standard model' of subatomic particle physics holds that there are a bewildering array of subatomic particles which are categorised much as elements in a periodic table. Most of these particles are held to be comprised of varying proportions of even smaller particles such as quarks and neutrinos, and that these particles have 'spin', 'colour' and a whole range of different attributes. Yet, the bigger the atom smashers they build, the smaller the subatomic particles they observe become!

   The "new paradigm" model is quite different – there are no smallest particles! The fact one expects there to be a 'smallest particle' is a fallacy of Cartesian mechanism and its associated reductionism. According to Geoffrey Chew's bootstrap hypothesis[17], strongly interacting particles continually create other particles which in turn create it. Therefore, there is nothing other than a dynamic multitude of feedback loops (relationships) whose emergent properties define electrons, protons, neutrons and thus the atoms of the macro-universe.

   It's not that the standard model does not recognise the dynamic relationships (quantum entanglement). It's rather that it refuses to stop searching for smaller particles[18] which leads to a lot of mental effort on things like string theory which are in my opinion a waste of time (and incompatible with bootstrap theory).

2. Science still does not know what creates time! The only thing that science can offer is its Second Law of Thermodynamics which states that entropy in a system increases over time. At Newtonian, Relativistic and Quantum levels all of the equations are time-reversible[19] and absolutely none of them attempt to explain why time moves forwards rather than backwards. One only reaches the inclusion of irreversible interactions when we reach chemistry where the cause is still not explained.

   Of course this problem matters more to us existentially that to science – humans would rather like to know where time comes from as it causes aging and our deaths. A good example of a parallel to Continental Drift was Ilya Prigogine's Theory of Dissipative Chemical Structures[20] for which he earned a Nobel prize in 1977. This theory holds that cell walls of organisms are continually self-making as chemical systems far from energetic equilibrium. Such a process is fundamentally chaotic in nature as it relies on new properties emerging from the dynamic system. Despite that this theory is very much a new paradigm theory, this was only (reluctantly) accepted because it could conclusively explain something which had puzzled biologists since the 19th century.

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[17] Chew, G.F., 1974, 'Impasse for the Elementary Particle Concept', *The Great Ideas Today*, William Benton, Chicago, p. 99

[18] Rather cynically, many have suggested that the lure of research grants from politicians who better understand the reductionist way of thinking may actually drive this search rather than any belief in its eventual success.

[19] In fairness, Roger Penrose in *The Road for Reality* has an entire chapter on this problem.

[20] Prigogine, I., and Glansdorff, P., 1971, *Thermodynamic Theory of Structure, Stability and Fluctuations*, Wiley, New York.

Far more interesting though was that the establishment steadfastly refused to accept a certain implication of Prigogine's theory – that time is created by the increase of entropy. Prigogine has since spent much of his time modifying quantum mechanics to include the creation of entropy, but as this involves introducing substantial non-linear chaotic behaviour and removing much of the randomness, his contributions have not been welcomed[21].

3. The Cartesian split of mind and body still strongly impacts modern science where a psychology textbook will tell you that mind somehow comes from the brain which works somewhat like a computer[22]. Philosophy is equally vague with Cartesian style statements such as that one can only trust one's mind and not one's senses.

   Yet mankind has been searching for the source of cognition almost since the dawn of time. Once again, in the 1970's a new theory began to emerge from the work of Gregory Bateson[23] which supposed that the process of cognition is **identical** to the process of life. This was further expanded upon by Humberto Maturana and Francisco Varela whose first year reader *A Tree Of Knowledge* has been hailed by people such as the late Oxford biologist Prof. J.Z. Young as the next step forward in neuroscience. Now colloquially known as 'The Santiago Theory of Cognition', a living organism continually brings forth a world which is a representation of reality based on an acquired memory (either learned or genetic) of experience. This process is identical to being alive. Among the advantages are a clear explanation of emotions, learning, conditioning, free will, model building, problem solving, language, abstract thought, the immune system and even the causes of cancer and not just for humans, but even for an amoeba. It also meshes extremely well with all other new paradigm models and is probably the most profound of all of them.

   Yet it is probably this profoundness which has meant that mainstream science won't even attack it let alone publish it. It is virtually unknown outside the very top level of neuroscience where most cannot find a flaw in the reasoning, yet consider its implications too hard to consider at this time. That said, even those who believe in its truth also find it hard to think as it must mandate – it simply is currently a very hard box to think inside.

In my opinion, the major reason why Continental Drift is accepted while any of the above are not is *testability*. Had the Cold War never occurred and the sea bed not so closely mapped, it is entirely possible that I would have Continental Drift theory in that list above as well. Similarly, until we see something obvious to **everyone** in Nature that can only be explained by one of the above theories and not by any of the existing ones, the establishment will continue to choose the Cartesian biased one as the safe choice, at least until the paradigm shift has reached a critical mass.

Conclusion

One cannot halt progress and there is a remarkable synergy between these new ways of seeing things, from which a great spiritual and existential contentment arises[24]. The founders of Quantum Theory waited until retirement before daring to speak too loudly about the personal transformations their discoveries had caused for fear of ridicule, and even then their spiritual works have been treated by many as symptoms of the onset of senility.

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[21] For example in Prigogine, I., 1997, *The End of Certainty: Time, Chaos and the New Laws of Nature*, The Free Press.
[22] I used Hilgard's *Introduction to Psychology* 13th ed. I have never found in the entire book a clear definition of where mind comes from other than through "processes of the brain".
[23] Bateson, G., 1979, *Mind And Nature – A Necessary Unity*, Dutton, New York.
[24] I speak of myself personally, though many others have said so as well.

In this essay I have only examined developments from the 19th century onwards. There are many reasons why the scientific establishment dismisses good theories and accepts bad ones, but as the Santiago Theory of Cognition implies an entire population must progress together as one with some leading the vanguard while others remind us of the folly of progressing too far too fast for adequate reflection. While in the past this was dealt with by Inquisitions, now peer reviewed journals ignore, exclude or attack.

The major problem for science in the next paradigm shift is going to be testability. How can one test one's relationship with God? Yet, we now know that science cannot lead anywhere other than God[25]. How can one test untestables? Yet the Santiago Theory of Cognition proves the same as Gödel's Incompleteness Theorem[26] – that there are inherent, uncircumventable limits to our understanding. Put simply, our future progress requires *leaps of faith* – and faith is entirely untestable.

I hold that the scientific establishment is our collective consciousnesses doing its best in an uncertain world. Like any individual, it makes mistakes, but it is still clearly moving forwards rather than backwards. Thus we can still be hopeful that the coming Economic crash[27] will not mean the end of our civilisation.

[25] If you think about this, it becomes obvious though that would be an essay in itself. The now out-of-print Capra, F., 1991, *Belonging to the Universe – New Thinking About God and Nature*, Penguin Books, London goes into considerable more detail.

[26] Gödel's Incompleteness Theorem simply states that anything based on number theory can never represent everything. Or rather, maths cannot represent nor model everything in the Universe.

[27] The rise and growing strength of the heterodox Economics movement is showing clearly that there is now a wide acceptance that orthodox Neo-Classical Economic theory is leading our planet to collapse. Not that it is said too loudly outside the Economic journals, but they are now in a race against time. See http://www.paecon.net/.

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