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## Misuses of biology in the context of the paranormal

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*Summary.* Public suspicion of science stems from science's challenging of perceptions and myths about reality, and a public fear of new technology. The result is a susceptibility to pseudoscience. In claiming that creation 'science' is as valid as evolution the creationists misquote scientists and seek to spread their own 'scientific' myths concerning a young age for the earth, an act of creation based on a particular literalist interpretation of the Christian Bible and a single worldwide flood. They use methods of debate and politics, rather than scientific research. A selection of their arguments is examined and the nature of the evidence for evolution is discussed. Problems with the creation 'science' model are noted. In the myth of the hundredth monkey phenomenon, original research is misquoted to denigrate scientific research and support sentimental ideas of paranormal events. The misuse of science is seen as damaging to society because it reduces the effective gathering and application of scientific information. However, pseudoscience provides a valuable guide to gaps in public scientific education.
*Key words.* Biology; creation science; creationism; evolution; hundredth monkey phenomenon; paranormal; pseudoscience.

### *Public attitudes to science*

It is understandable that people cast a jaundiced eye over science. Partly this is because scientists have provided the knowledge that unleashed the nuclear bomb which puts us all in such severe danger. However, many people would accept that the decision to produce so many bombs was taken by politicians not scientists, and that giving us an average life expectancy of about 70 years, rather than 30–40, helps balance that account. Less easy to forgive is the way science has destroyed people's fantasy about their place in the Universe. For example the astronomers have taken us from being at the very centre, to a place in the spiral arm of an insignificant galaxy, just one of hundreds of millions in a Universe at least $3 \times 10^{23}$ km across[2, 47]. Truth does not seem, to many, to be an adequate reason for this destruction of our fantasy of being people at the centre of the Universe.

It is not surprising that there has been a backlash. This has made people susceptible to the use of biological and other scientific research to support the misuse of science for political or religious reasons and to sentimental attempts to establish paranormal effects. Use of what seems to be science to support closed systems, based on belief, and with an ultimate appeal to a doctrine, can be called pseudoscience[43]. I want

to illustrate the nature of pseudoscience with two very different examples: 'scientific' creationism and the myth of the hundredth monkey.

*Evolution and 'scientific' creationism*

I suppose that the greatest claim of paranormal action a person can make is that the whole of creation is the product of a paranormal act. This is the claim of the exponents of creation 'science'.

An act of creation implies that a supernatural event took place in which the normal laws of science were broken in order for something new to emerge from nothing. Most groups have beliefs involving creation. Sproul[48] quotes 134 different myths about how the universe came into being, most of them involving creation events of one kind or another.

Many scientists believe in a creation, often as a result of their religious conviction. They believe that conventional science is demonstrating how creation occurred, through the laws of science including those of evolution. There is, however, a group in the United States for whom evolution is a scapegoat for all current (and historical) problems of mankind. In the January 1982 edition of *Life,* a U.S. judge from Georgia, Braswell Dean, is quoted as saying: "This monkey mythology of Darwin is the cause of permissiveness, promiscuity, pills, prophylactics, perversions, pregnancies, abortions, pornography, pollution, poisoning and proliferation of crimes of all types."

Creation 'science', that is, the claim that creation as detailed in the first book of the Christian Bible is proveable by scientific means, rather than as an act of faith, is a recent invention. It originated in the Southern fundamentalist parts of the U.S. and is based on much earlier attempts to disprove evolution[4, 31, 37, 41]. The centre for the dissemination of these views is the Institute for Creation Research in San Diego, California.

Supporters of these views have attempted to have legislation passed to get them taught in schools and in two states they succeeded. These state laws have since been successfully appealed to the United States Supreme Court[34, 39], which has ruled that 'Creation Science' is religion, not science, and thus may not be taught in United States public schools. An appeal against this decision is pending**. In reaction to this appeal, 72 Nobel laureates, 17 U.S. state academies and 7 other scientific organisations put forward an amicus curiae brief to the Supreme Court[50]. They argue in their brief that the term 'Creation Science' in the Louisiana equal time law 'embodies religious dogma' and that, "By requiring that evolution be taught as a 'Theory' while permitting other scientific hypotheses and theories to be presented 'as proven scientific fact' the act demonstrates an impermissible preference for a particular religious belief."

The Australian counterpart of the Institute for Creation Research, the Creation Science Foundation, which has had some impact in Queensland[51], is no less political but may be less sincerely motivated. This latter organisation makes large sums of money from donations and publications and there have been serious doubts raised about its financial affairs[5, 52]. Even many dedicated creationists distance themselves from the views of these two extreme groups[22].

To decide whether creation 'scientists' are scientists we must observe their methods. Scientists operate by publishing papers which are exposed to peer review before (and after) publication and by presenting papers at conferences which can be criticised by their peers. The creationists operate by public debate, and their tactic is one of hiding their own views as far as possible while attacking evolutionary views. This is of course a standard debating tactic. When challenged they claim that they are prevented from publishing by prejudice. The evidence does not support this claim. Scott and Cole[44] recently studied 135,000 submissions to 68 journals to which creationists were likely to submit papers. A total of only 18 creationist papers had been submitted, 12 to a journal devoted to science education. Of the 15 that had been refereed, all had been rejected on the grounds that the degree of scholarship shown was clearly below that required for publication. Twenty-eight prominent creationists were also studied over 45 months. Only six published anything in the scientific literature; these six produced 52 articles. All were professional or technical, and none dealt with theoretical support for the concepts of creationism.

*Arguments used by creation 'scientists'*

Creation 'scientists' try to establish that scientists doubt that evolution occurred. They quote such people as Gould, Simpson, Huxley, Dobzhansky, and Mayr[35, 36, 55] as critical of evolution or of important aspects of evolution. These men are respected biologists who not only accept the fact that evolution must have occurred but have made significant contributions to our understanding of evolutionary processes. What all have said, at various times, is that we still need to improve our understanding of how evolution has occurred. Creation 'scientists' get great debating benefit by confusing the issue of *whether* evolution has occurred with the issue of *how* evolution occurred.

As an example, Morris[38] recently quoted Gould as saying, "I regard the failure to find a clear 'vector of progress' in life's history as the most puzzling of the fossil record... we have sought to impose a pattern that we hoped to find on a world that does not really display it." Quoted out of context Gould is made to sound as though he doubts evolution, since 'vector of progress', out of context sounds like a general reference to evolution. In fact, Gould is doubting gradual change, as opposed to the periods of stasis and sudden bursts of evolution which he detected in the fossil record. Reading his original article[17] makes this clear.

Creationists do not quote Gould on the creationists. At a talk in Auckland in July, 1986, Gould talked about creationism. After the talk a creationist told Gould his talk was 5% fact and 95% ridicule. His response was that this was appropriate since creationism is 95% ridiculous.

Creationists claim[15, 55] that evolution is not science since it cannot be proved by experiment. Gould[18] makes it clear that historical science is as valid as any other kind. This matter is discussed further when we turn to the evidence that shows that evolution has occurred.

Misuse of statistics is evident in some rather silly postulates put forward by the creation 'scientists' and in similar calculations put forward by Hoyle and Wickramasinghe, often quoted by creationists. Hoyle and Wickramasinghe[23] put the change of life evolving as 1 in $10^{40,000}$ in order to justify their theory that life comes from outer space on meteors. This theory seems unlikely although further data is needed before we can be sure. Evidence that these authors don't mind wild speculation is shown by their assertion that insects are really highly intelligent but are hiding the fact from us[23].

Morris[32] has stated that since the simplest protein has 400 separate amino acids, the chance of these falling into the right order is $400! = 6 \times 10^{868}$, but elsewhere[35] gives estimates from $1/10^{107}$ to $1/10^{299,843}$.

If one is willing to play this game, the data of Senapathy[45] is interesting. The actual coding sequences of DNA are called introns. Their length depends on when a 'stop' codon occurs. The products of several introns are usually needed to produce one enzyme or other gene product. Senapathy's model shows that the length of these introns averages 600 nucleotide pairs which is exactly the length one would expect if coding sequences are obtained randomly.

Even some scientists don't realise that, in fact such post hoc calculations should be treated with caution. For example, we can calculate that the reader doesn't exist. The chance of any one chromosome of a parental pair being passed on is 1:2. Thus the probability of getting exactly the 46 the reader received is $(1/2)^{46} = 1/7 \times 10^{-13}$. Everyone on earth is thus statistically nonexistent if we accept these kinds of argument!

Creationists often claim that evolution contravenes the second law of thermodynamics[35]. Creationists claim that things, left to themselves, run down (the law of entropy). In this they overlook the thermodynamic law of enthalpy, which states that there is a tendency to loss of heat (and this may produce increase in structure in order to facilitate heat loss). Thus frozen haemoglobin has less entropy than a glowing lump of plain carbon from a fireplace, but a great deal more information. The laws of entropy and enthalpy are in constant conflict and the world we see about us is the result of this conflict. And having said that, one should acknowledge that the situation is complex. Thus Csányi[9] argues that energy passing through an open system like Earth 'organises it' and thus lowers its entropy, while Brooks and Wiley[7] argue that energy flows are unlimited for biological organisms (since more energy arrives from the sun that can be used by organisms) and thus energy flow cannot be used to explain evolution. These latter authors argue that genetic and epigenetic constraints make living organisms at least a partially closed system and that organisms are 'individualized dissipative structures' whose non-reversible evolution is to be explained in a unified manner by reference to the increase in entropy they produce.

*Historical science and the evidence for evolution*

As Gould[18] has recently pointed out, science is not just experimental science. A great deal, particularly of biology and geology, is historical science, and Gould suggests that the methodology of this science was spelt out by example by Darwin. Gould suggests three major research programs. The first is inference from current process extrapolated backwards. Darwin used this method superbly in his work on earthworms[11] in which he showed how the face of England was transformed by their slow action. In applying this methodology to evolution, Darwin[10, 12] was particularly impressed by the results of farmers' breeding programs. He saw their results, and the changes he observed in the wild, as the result of artificial or natural selection removing those organisms that did not use their environment as efficiently as other variants of the same species. Thus these variants increased in frequency while others decreased. There is currently much constructive argument on other possible mechanisms of evolution[49].

The second method is to draw inferences from classification. When we examine any organism, we find we can put them into groups according to their differences and their similarities. When we do this we see a range of complexity from bacteria to insects and vertebrates which suggests a natural progression. This process gives clues to historical relationships but must be used with caution, since even the simplest of forms have had 3.5 billion years of evolutionary history.

A similar methodology at the level of structure rather than of the whole organism is the study of homology. Generally organisms that occupy similar habitats will look similar in some ways. For example, pterodactyls, bats and birds all have wings to fly with (analogous structures). However, if we look at the detailed structure of these organisms we find fundamental differences. Pterodactyls are clearly reptiles, birds are a group on their own, though very similar to reptiles, and bats are mammals. Then when we go into the detail of, for example, bone structure, we find similarities again, but not apparently associated with the function of flight. We start then to think that the more we look at detail, the clearer it is that organisms with a common history (homologous) as vertebrates have developed different adaptations for flying after they had separated out (evolved) into reptiles, mammals and birds. More recently, even more detail is available as the DNA code is gradually deciphered, and the same message of a common history again seems self-evident.

*Is the creationist alternative to evolution viable?*

'Scientific' creationists require that the Universe should be no more than 6000 to 10,000 years old. We can see $1.5 \times 10^{23}$ km into space. Light travels at $3.4 \times 10^{5}$ km/s so light from the furthest stars takes about $1.3 \times 10^{10}$ years to get here. The creationist Setterfield[46] has attempted to show that the speed of light has slowed down using suspect mathematics and an indefensible elimination of data which does not fit his theory[6]. Radioactive chemicals decay at constant rates. Those that take longest to decay all indicate that they were laid down in rock and fossils often much, much older than anything the 'scientific' creationists will allow. Hayward[19], himself a creationist, gives an excellent summary of the arguments against a recent date for the origin of the Earth.

The first scientists to accept that the earth is old were, of course, creationists. Cuvier's studies of fossils in the 18th century led him to a view that the earth was old, though he did not doubt creation, and opposed Lamarck's evolutionary ideas partly on this score[16].

Darwin[10] himself did not consider the fossils gave good evidence for or against evolution. Now, with many more fossils we can look at two separate issues: the completeness of the fossil record and the order in which fossils occur in the sequential strata. The creationists argue that there are no known intermediates between major groups and that these 'gaps' in the fossil record are a fatal problem for evolution. To consider this argument at all ignores the obvious point that if there were no gaps there could be no groups, and we would have only one species with a wide range of variation. For all that, some living intermediates do occur and are a great trouble for those that classify organisms. Where do we classify *Peripatus* (intermediate between worms and insects)? If we go back into the fossil record, gaps between groups break down even more, as evolution would predict, and when we choose groups that leave good fossils the gaps almost disappear.

Land animals leave few fossils because potential fossil remains must survive scavengers and bacteria and then the forces of erosion. The best fossils have been left by small hard-shelled marine organisms such as the Foraminifera (hard-shelled protozoa), and particularly the families Fusulinidae, Camerinidae, Orbitoididae and Cycloclypeidae[14, 21]. When we look at groups that leave good fossils and when we find more fossils of any group, we find that we fill in the gaps. Creationism would demand that the gaps should become clearer.

The clear ordering of fossils in the Earth's crust, from apparent ancestors in deeper layers to recent forms in shallow deposits, is a terrible problem for 'scientific' creationists. Wysong[55] lists 22 apparent cases of the fossil record being in the 'wrong' order from an evolutionist's point of view. An analysis of the original sources by Hewitt[20] shows that none of these can be taken seriously. Remember that if Creationist theories were correct, then the mixing of modern fossils with extinct forms should be commonplace. Instead it just does not occur. Occasionally we find a form, whose close relatives are old fossils, but which has managed to survive to the present day. Tuataras and coelocanths are good examples.

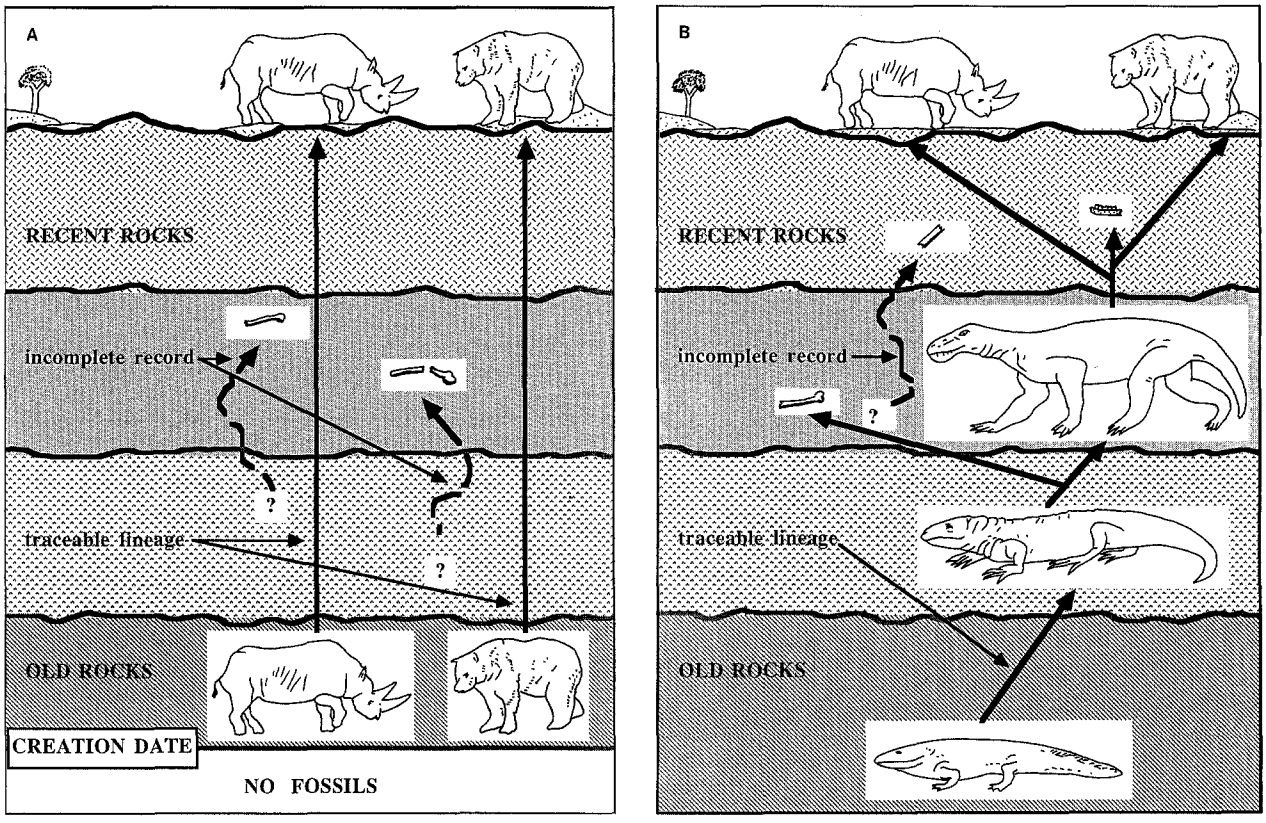


Figure 1. Fossil records that could be expected following a creation event (*A*) and evolutionary origins (*B*). In (*A*) modern organisms are found back through time with little change. In (*B*) modern organisms differ from fossil ancestors. Some fossil lineages converge toward common ancestors. Both records suffer from incomplete preservation of most lineages. After Milne [33] by permission of the author.

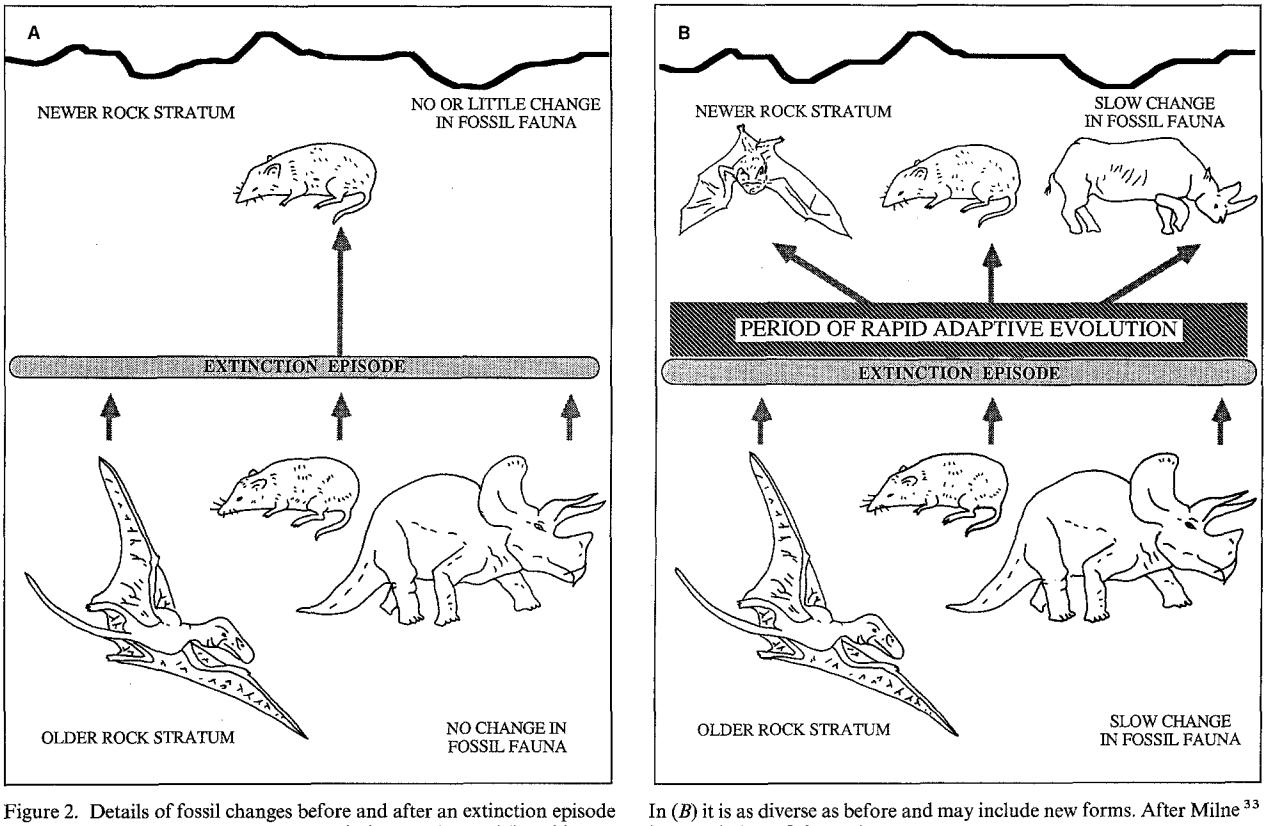


Figure 2. Details of fossil changes before and after an extinction episode as reflected in a lineage incapable of evolutionary change (*A*) and in one capable of evolutionary change (*B*). In (*A*) the fauna is severely depleted. In (*B*) it is as diverse as before and may include new forms. After Milne [33] by permission of the author.

This should not be confused with the need for the Creationists to show that modern forms like bears and rhinoceroses existed along with dinosaurs and trilobites (see figs 1 and 2) if their claim that all these forms lived together before the flood is to be taken seriously.

The 'scientific' creationists argue that fossils are the result of a worldwide flood[54], even though there is a great deal of evidence that the flood described in the Christian Bible was a localised Mesopotamian disaster[42]. For the creation 'scientists' there are difficult questions about how the marine organisms didn't perish in so much fresh water, the origin of the water (at least 60% more than is currently found in the atmosphere, seas, rivers and ice caps) and where it disappeared to. These aside, it is easy to calculate that if Mount Ararat was covered, the waters needed to be 15,000 ft high. This amount of rain in 40 days and nights equals a constant rainfall of 187.5 inches of rain per hour. It is hard to see how this could: a) allow recognisable remains of sometimes fragile creatures to survive, and b) fail to leave a clear worldwide record. Newell[40] gives photographs of the giant 'ripples' of boulders and gravel left by the Great Spokane Flood at the end of the last ice age. This should be the predominant landscape of Earth if the flood were worldwide and of this magnitude.

Then, to allow for any survivors of this flood, the 'scientific' creationists evoke an ark. The ark is said to have been 300 cubits long by 50 cubits wide by 30 cubits high (Genesis 6:15). This is 150 m × 25 m × 15 m, i.e. 56,250 $m^3$ at most (assuming it is rectilinear, not boat-shaped, and internal partitions have no size). If plants are taken as seed and their usual volume neglected, this leaves the following space for each of the 1.12 million animal species: 0.05 $m^3$, or one third the capacity of a domestic oven (McGowan[32]). Even given that 75% of species are insects, space would be at a premium. And, furthermore, McGowan's calculation is very generous since he allows the use of the total volume and does not take into account that there are only three decks. Even if the animals and seeds can be stacked aboard, it is hard to see how a year's supply of food could be included. Two elephants would eat three bales of hay each day, needing about 1000 bales for the voyage. The amount of faeces that Noah's sons must have shoveled is awesome. More recent estimates that there are between 10 and 30 million species of animal would make the problem worse.

The claims that creationism is science cannot be substantiated on the basis of its basic supernatural nature, nor on the basis of the evidence put forward by its proponents, nor by the kind of activities in which its 'scientists' indulge. How should scientists respond to 'scientific' creationists? I suggest that we need to recognise that the 'scientific' creationists are debators and politicians in their methodology and not scientists. In the past scientists have been willing to debate forcefully in areas where they think they have a contribution to make. Scientists need to learn once more the appropriate tactics[33].

### *The hundredth monkey phenomenon*

The idea of the one hundredth monkey phenomenon was put forward by Lyall Watson in his book *Lifetide*[53], on the basis of research into Japanese macaques on the offshore islands of Japan by a group of researchers including Masao Kawai[24, 25]. Watson's interpretation of this work was criticised by Amundson[1].

In 1952, researchers began to give potatoes and wheat to the monkeys in order to stop them from raiding farms and to make them easier to observe by attracting them to one place. In 1953, a young female, 'Imo', began washing her potatoes, and her playmates and others began learning this activity from her.

Watson describes what happened next as follows: "One has to gather the rest of the story from personal anecdotes and bits of folklore among primate researchers, because most of them are still not quite sure what happened. And those that do suspect the truth are reluctant to publish it for fear of ridicule. So I am forced to improvise the details, but as near as I can tell, this is what seems to have happened. In autumn of that year an unspecified number of monkeys on Koshima were washing sweet potatoes in the sea... Let us say for argument's sake, that the number was 99 and that at 11 o'clock on a Tuesday morning, one further convert was added to the fold in the usual way.

"But the addition of the hundredth monkey apparently carried the number across some sort of threshold, pushing it through some kind of critical mass, because by that evening almost everyone was doing it. Not only that, but the habit seems to have jumped natural barriers and to have appeared spontaneously, like glycerine crystals in sealed laboratory jars, on colonies on other islands and on the mainland in a troupe at Takasakiyama."

As Amundson points out, this has all the characteristics which people suspicious of science so enjoy. Hidden sources of information, and scientists hiding information because they can't explain it. And Amundson goes on to point out that successive versions get more and more miraculous.

Watson's idea has been used by Ken Keyes in his anti-nuclear book called *The Hundredth Monkey*[26] to suggest that all that is necessary to get rid of nuclear arms is to convince some critical number of people that nuclear arms should be done away with, and suddenly everyone will agree. This is a very appealing idea. Unfortunately it has the corollary that when enough people believe a lie then the lie becomes universally believed. The events surrounding the development of Nazism suggest that this is not true. Even at the height of fascist fanaticism some remained skeptical and did their best to reduce the worst effects of Hitler and his supporters.

Furthermore an examination of the actual data given by Kawai suggests something different from Watson's interpretation. In fact Kawai gives a great deal of information (with no sign of a reluctance to publish), and we can graph the rate at which monkeys learned potato washing (fig. 3). In the year that Watson says the 'phenomenon' occurred, 1958, two more monkeys learned to wash potatoes compared to an average of three per year up to that time. There was no need for Watson to invent a 'hundredth monkey', since Kawai states that in 1958 the troupe numbered 30, of whom 17 knew how to wash potatoes. Watson seems to have been misled by Kawai's statement that after 1958 a change occurred. However the change, as Kawai makes clear, was that the original youngsters matured and started teaching their young (the usual pattern) while up to that time the youngsters who first discovered the skill had been teaching the older monkeys.

As well as Keyes book, the theory of the hundredth monkey has been used in an article, a film, in journal articles and quoted at length in *Science Digest*, all on the basis of Watson's misrepresentation of Kawai. We can observe a modern pseudoscientific myth in the making.

### *Is misuse of biology dangerous?*

Some scientists would rather ignore the 'scientific' creationists and other misusers of science such as Watson, in the hope that they will go away. I think they are too dangerous to ignore. If mankind is to survive in this often dangerous Universe, then we need to encourage the kind of imaginative thinking which gives rise to the new age myths, such as the hundredth monkey and we also need the kind of commitment to a cause which 'scientific' creationists possess. And for our safety they must be tempered by scientific skepticism.

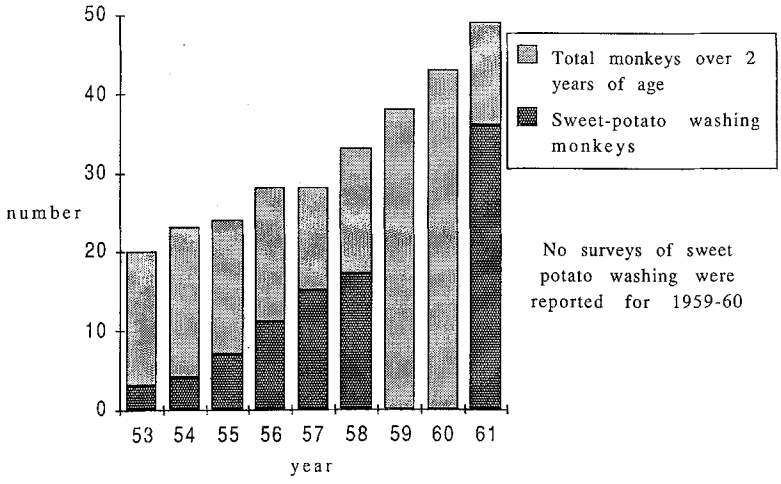


Figure 3. Sweet-potato eating in Japanese monkeys. Data from Kawai[25].

Science gives society a large measure of its increases in productivity. Where science is held in smaller regard, then productivity may drop[27]. When budgets are set, the long-term goals that are involved in scientific research will only be given adequate attention when science is understood and respected. Without that respect, short-term pragmatism can easily prevail.

The harm that could be done by the success of the creation 'scientists' should not be underestimated. There are disturbing similarities between the way the creation 'scientists' are seeking political support for their views and the activities of Lysenko[30] and his followers in the Soviet Union in the 1940s, which resulted in the catastrophic failure of Soviet cereal crops[8,29]. The full extent of the damage done will never be known since the records that are available are unreliable. We do know that people starved. Political decisions made on the basis of pseudoscience may be not only inefficient but lethal. Small and developing nations may be particularly susceptible to religious and political interference in science and the very practical dangers involved. The Institute for Creation Research is active in places distant from the United States and some of which may not have the resources to evaluate their ideas. For example, in late 1985, the Institute was busy advising on the science curriculum for a College on the South Pacific island kingdom of Tonga[3].

What can we learn from the 'scientific' creationists and the new age myth creators? People will be such less open to such nonsense if they are taught scientific method. Too often people are taught science as though it were a series of revealed truths. We need to concentrate on the method, that is, the generation of an open system of knowledge based on skeptical enquiry. A study of some of the nonsense that scientists themselves have elevated to the level of doctrine (see Klotz[28], for example) would help our students develop this type of skepticism.

I think that scientists and teachers need to do more to help people understand that branch of science that has to do with history. Students need to be taught to classify; to discover and distinguish analogies and homologies; to study current processes and then extrapolate them backwards to uncover the history which lies behind land forms, living things and indeed the whole Universe. Without these tools, students have great difficulty separating science from pseudoscience[13].

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** Since this paper was submitted the original Supreme Court decision has been upheld.

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## Paranormal health claims

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*Summary.* Faith in paranormal cures has always been the last hope of many sufferers from chronic or incurable diseases. Magico-religious rituals of healing are still around, but some have been replaced by pseudo-scientific systems, thinly disguising old superstitions in new obscurantism, more appealing to the half-educated. In medical quackery, inventiveness seems to be limitless, and only the main paranormal healing systems can be reviewed here. The increasing popularity of 'alternative' healing indicates the extent of dissatisfaction with dehumanising aspects of modern, technological medicine and its preoccupation with curing the curable at the expense of caring for the incurable. This leaves the sufferers, and also healthy people labelled with non-existent diseases, bleeding prey for the sharks roving the seas of medical ignorance.
*Key words.* Faith healing; Christian Science; psychic surgery; miracles; radiesthesia; psionic medicine; homoeopathy; Bach's flower remedies; acupuncture; reflexology; osteopathy; chiropractic; quackery; placebo.

*Medicine came into the world with a twin brother called Charlatanism.* – Lavoisier

### *Introduction*

Throughout history, medicine and magic have been closely linked and, at times, indistinguishable. Pliny thought that magic originally had sprung from medicine. Even now, the boundary between rational medicine and quackery is fuzzy, partly because medical education does not provide criteria for the demarcation of the absurd,[58] and partly because some 'alternative' practitioners, eager to be recognised and to infiltrate the enemy, present their fancies in a form superficially resembling the scientific approach (with statistics and trials, terms borrowed from science) which beguile the gullible.

As suffering from disease is universal, and the stride of medicine slow, the false promises of medical messiahs are lapped up with reverence, and quackery is rife. Yet, most diseases improve without any treatment, and naturally also with any harmless placebo, for which quacks are quick to take credit, and so are many doctors. Regrettably, not all doctors practice rational medicine, and conversely, not all healers are quacks, if by quackery we mean deliberate deception for gain. I shall not discuss the fine distinction as to whether the paranormal healers are fools or frauds. In the end, it matters little whether a healer believes that he acts as a channel for God, or that he is an unrecognised Galileo who discovered natural healing energy, or whether he deceives deliberately: the means employed are the same.

One reason why paranormal health claims cannot be evaluated is the lack of accurate diagnosis. Some healers deny the existence of disease altogether (Christian Science), others heal without diagnosing (faith healers), and many have developed their own disease classification which is meaningless outside their system (e.g., the pulse or tongue diagnosis, homoeopathy, auricular acupuncture, Voll's electrodermal diagnosis, osteopathy and chiropractic, iridology, Kirlian photography, medical dowsing).

Paranormal health claims can be divided into several categories; they often overlap, and it is common that 'alternative' practitioners embrace several healing methods in their 'holistic' approach[5, 59]: