2 The attraction of non-rational archaeological hypotheses
The individual and sociological factors

N.C. Flemming

Introduction

The public seems to have an insatiable appetite for wild archaeological theories, even at a time when genuine archaeological information is more widely available than ever and is more exciting than ever. In practice, many non-experts are able to distinguish sharply between archaeology and pseudoarchaeology, but why do so many people fall for obviously unproven and unverifiable propositions, and why is a sector of the media industry so enthusiastic in promoting this junk? The reasons are powerful but not obvious, and in this chapter I investigate the nature of attraction to fringe archaeology. Throughout, pseudoarchaeology is viewed as standing on a continuum with pseudoscience, and examples are drawn from both genres (see also Chapters 11 and 12).

Pseudoarchaeology, like any pseudoscience, is always aimed at the non-expert and the non-professional interested in the discipline concerned. There are overt and covert reasons for persuading this audience to believe what is being propagated, perhaps political, religious, or commercial, and some of these reasons are explored in other chapters of this book. Three essential elements constitute the phenomenon: (1) a practitioner of the pseudo-activity; (2) a message to be transferred; and (3) a group of recipients or believers. The vehicle of transmission is usually a pseudo-text, which is related in ways yet to be described to a real sector of science and archaeology. The message and the pseudo-text may also be amplified and promoted widely in the modern commercialized media such as television, the Internet, theme parks, and mass promotion of popular book sales.

The practitioner designs the pseudo-product in such a way as to have maximum appeal to the target audience. The subject of this chapter is to try to understand what is implied by that word “appeal.” Why do pseudo-subjects have such a strong appeal to a certain audience? What is the practitioner playing on when he/she designs a product to be so seductive? Why does the practitioner not simply present the message as would a politician or scientist presenting a well-thought-out argument? Why do the media so enthusiastically promote pseudoscience and pseudoarchaeology, seldom acknowledging their profound difference from real science and real
archaeology? What are the defining tricks and symptoms of a pseudo-presentation (see Chapter 1)? What is the relationship between the pseudo-practitioner and the professional in the disciplines that are being exploited? Why do scientists and archaeologists find it so difficult to refute pseudo-texts and get so angry and frustrated by their inability to do so? Why does the average believer in the pseudo-text find it so difficult to detect the trick and reject it?

Pseudoscience and pseudoarchaeology corrupt the basis of factual knowledge available to the public, and particularly to students. They also corrupt and debase the methodology of establishing empirical evidence for past events (in fields such as geology, archaeology, cosmology, or history), and hence the ability of students or the lay reader to distinguish fact from fantasy or invention. It follows that, in order to combat the slow but apparently remorseless growth of pseudoarchaeology, we must understand its appeal. It is impossible to provide the believer with an antidote if we do not comprehend the nature of the belief and the strength of its attraction.

To achieve this understanding, we will have to calculate when a rational person basing decisions and conduct on evidence and experience may reasonably demand a full empirical proof of a statement, and when he/she is justified in taking statements on trust, that is, in categorizing them as useful and useable but not empirically tested and verified. This is a second-order empiricism, where past experience has shown that the source of the information can be relied upon, even if the information itself has not been checked empirically by the recipient before using it each time.

The puzzle about the flow of “contrarian” pseudo-information is that it claims to be empirically based and founded on scientific and academic methods, even as it contravenes the methods used by the overwhelming majority of scientists and academics. If we can understand the strange and surprising appeal of this kind of statement, and the mechanism by which it appeals, then we can start to disentangle its structure of persuasion and develop an antidote. This is important, because one of the pervasive characteristics of the conflict between archaeology and pseudoarchaeology is the extraordinary sense of helplessness that professionals experience. Their first instinct is to assume that the pseudo-subject is so absurd that no one could possibly be convinced by its arguments. This tempts the critic into an undignified condemnation by invective. On second thoughts, the knowledgeable critic may then attempt to refute the statements in the pseudo-text one by one, but this usually leads to an expenditure of effort that appears almost unending. The critic eventually abandons the task for more creative work, baffled by a cloud of woolly counter-counter-claims hurled back by the believers.

In what follows, we shall proceed from a preliminary definition of pseudo-archaeology to a consideration of why and when people use rational judgments and empirical proofs; a review of the fragility of empirical
pseudoscience works; an examination of the motives of pseudo-practitioners; and, finally, a survey of the target audience.

A preliminary definition

The very categories "pseudoarchaeology" and "pseudoscience" are puzzling. Surely the result of empirical enquiry is either demonstrably correct or an unproven but credible hypothesis, or demonstrably wrong? We all make mistakes, theories come and go, dates are revised, stratigraphy is improved, new evidence persuades us to change our mind. This is normal. Science progresses by refining and improving previous approximations to an idealized but testable description of the outside world. Sometimes major discoveries or new theories cause a radical upset and restructuring of previous thought (Kuhn 1996), but this is rare, and it seldom proves that previously accepted ideas were wrong, rather that there are conditions that were not foreseen and that the revised laws apply in this area of new conditions as well as in the old one. Although occasional false dead-end theories are necessarily abandoned, much of the best science and archaeology is a continuous extension of horizons, increasing accuracy, explanation of causality, extending and refining existing laws and accepted facts into new territory, literally or figuratively.¹

Pseudoscience is not hoaxing, a form of deceptive fraud designed to fool experts. Examples of hoaxing include the Piltdown Man fake human skull and jaw, several famous examples of faked discovery of fossils (usually genuine fossils that the geologist claims to have found in wildly unlikely locations), or phony Chinese dinosaurs made by joining fossils together. In all these cases the perpetrator, a professional scientist, faked data and wrote up the results in the standard academic way in the professional journals. The intention of the fraud was to achieve perfect camouflage by presenting the data as real science. While the villains were seeking to advance their status and fame, they did not appeal to the public but sought to deceive their colleagues.

In contrast, pseudoscience is almost never written in standard academic journals and is designed to be read by, and to mislead, the public and the media. The faker or forger seeks the approval of professionals: the pseudo-writer is delighted, as we shall see, when professionals ridicule his/her work. The pseudo loves the limelight, seeks publicity by whatever means, and often challenges the boffins and nerds to come out of their laboratories and conduct the debate in public.

I have sometimes encountered the suggestion that pseudoscience or pseudo-archaeology performs the valuable function of testing fringe ideas in a speculative and acceptable way, and that the attitudes or beliefs that are now regarded as pseudo will be filtered by time and experience so that some of them will join the complement of recognized academic tenets. This proposal
in the professional academic world that are clearly labeled as unproven and that are well recognized as good science or good archaeology in waiting. In mathematics, there are conjectures such as the Goldbach conjecture or the Riemann hypothesis, which have been researched but remain unproven for over a century (Sabbagh 2002). In physics, we have string theory, which has been studied by some of the best physicists in the world for more than a decade but has not been proved to represent any part of the objective universe and could still turn out to be an intellectual blind alley (Greene 1999). In geology, the theory of continental drift was held in suspension for forty years until the mechanism of plate tectonics was discovered in the late 1960s. In archaeology (and palaeo-anthropology), theories about human origins, genetics, and migrations are proposed, tested, and often abandoned within a timescale of a few decades. Archaeology now is in a state of rapid growth and change as theories are tested based on new isotope technologies, the decoding of human DNA, linguistics, evolutionary models, cultural models, palaeo-climatology, and new discoveries at sites around the world (Cunliffe et al. 2002). Some of the new theories will prosper as they seem to fit the facts, and some will die. This process is not about bad science or sloppy intellectual practices. It is the way academics work. They are quite happy to live with ideas and hypotheses that remain unproven, in limbo, for many years. The correct frame of mind is therefore to suspend judgment until the evidence is convincing. Nor do they think ill of the proponents of abandoned ideas, unless they irrationally promote a pet theory that has been widely recognized as disproved. For example, the late Fred Hoyle, who was greatly respected as an astronomer, attracted humorous criticism for clinging to the idea of continuous creation of matter in the universe long after the Big Bang theory was generally accepted as fitting the facts much better.

Pseudoscience and pseudoarchaeology do not fit into this framework of good theories in waiting. I cannot think of a single example where a “fringe” idea from the world of pseudoscience has been gradually established as proved and has been integrated into the academic textbooks. The only area where this kind of shift may have occurred is in medicine, where cures depending on peculiar skills such as acupuncture and osteopathy have been progressively proved to work on some afflictions by empirical testing and have been accepted into the medical community. Even in these examples, the practitioners tended to work quietly and soberly at their jobs before recognition and did not trumpet excessive claims in the manner of alternative medicine.

Equally, the lack of recognition for pseudo-topics should not be confused with the contemporary reservations about the obsessive determination of some scientists or archaeologists — for example, Marie Curie or Heinrich Schliemann — who pursued convictions toward obscure goals when more normal people would have given up. In both cases, the protagonist was backing a hunch with long odds against them, but they were not working in a way that was counter-factual or denying the established principles of their disciplines.
There are therefore traits about the conduct of pseudoscience and pseudo-archaeology that distinguish them from outright professional frauds, from research into unproven theories, or from scientists who cling to abandoned old theories or mistakes. The next section will attempt to identify some of these traits and how we may detect them.

The use and abuse of rational judgments and empirical proofs

The motto of the Royal Society, founded in 1660, is *nullius in verba*, meaning "on the word of no one." That is, do not believe a story because the speaker sounds convincing, or is important, but check the empirical evidence. This is splendid in principle, but in practice people cannot realistically check every claim put before them. In science and scholarship, conventions and disciplines have been built up so that people working in the same field respect agreed methodologies and tests. A laboratory obtains a high reputation for consistently conducting certain analyses or tests to verifiable accuracy. An archaeologist shows the stratigraphic survey and data-logging methods used on a site. If the report is presented in the standard way, convention says that a third party does not actually have to go to the store-room or check the field notes and the accuracy of the tape measures before believing the published article.

If there is a big scandal – an accusation of plagiarism or forgery of data – then critics do go back and check the original sources. In my own research (in marine archaeology) I have visited coastal sites described by researchers perhaps 50–100 years earlier and reached quite different conclusions. Before diving equipment was widely used, researchers who saw rectangular stones in the shallow sea usually assumed that such deposits were explicable by a relative change of sea level. Close inspection by divers can reveal whether a structure beneath the water was part of a house, or a fish tank, or a dock, and can thus sometimes show that the structure was originally built in the water, without any subsequent change of level. Divers can identify from its function the depth at which the building was originally constructed, to within an error of 5–10 cm (Flemming 1978, 1998; Flemming and Webb 1986). Since my early research was published in the 1960s and 1970s, some of the sites I worked on have been visited by younger researchers, who write and tell me what they have discovered. This is very gratifying. If they discover something that forces a reassessment of the site, I accept their revision with good grace.

Since I surveyed my first submerged ruins at Apollonia, Libya, in 1958, I have faced continuous questioning about the myth of Atlantis; or whether particular submerged ruins prove or disprove some myth or theory about floods, earthquakes, and other catastrophes; or how one can distinguish genuine archaeological materials under the sea from natural rock formations. Over the decades, I have worked on more than 300 archaeological sites,
built structure or artefact was submerged in the sea. I have had to be aware of the popular obsessions with flood myths, local legends, factual data on earthquakes and Ice Age sea-level changes, and sensationalist stories and exaggerations. All my results have been published in refereed international academic journals, or conference proceedings, with occasional writing for the popular market.

This balance of professional standards, ethics, reliability, and checkability in principle, combined with a strong element of trust and convention, is how the scientific, archaeological, and other academic communities work. In addition, the writing style used in professional publications should not be persuasive or hectoring. Fine writing or glowing sentences rich in adjectives and superlatives is strongly discouraged. A deadpan factual presentation with the highest degree of simplicity and clarity compatible with the subject is the ideal. If this were not the case, a bad scientist with a persuasive line of talk could get his/her observations taken seriously for a long time before the errors were detected. Furthermore, it is forbidden in scientific and archaeological circles to publish the same facts more than once in an academic journal, or in different journals. Each journal insists that what is published in its pages is original and has never been published elsewhere. You get one shot to make your case, and you cannot launch a repetitive publicity campaign to sell your ideas. (Some academics do revise papers slightly and re-submit them to other journals, but this gradually diminishes their respect in the community.)

These strict conventions tie the professional hand and foot when compared with the free-ranging pseudo. The pseudo can use language of the most exaggerated and persuasive nature, appear on television, write in newspapers, and publish the same ideas as often as he/she likes. Such activities contribute directly to the goals of the pseudo, which is to persuade the general public and to gain converts (see below). In contrast, for the professional scientist to combat the pseudo, he/she has to abandon their main work to engage in a fruitless and demeaning struggle with wordplay. The purpose of the pseudo in the repeated requests for debate is exactly to produce this situation in public, making the professional look silly, unprepared, and a quitter.

Writers who encourage the popular cause of good science and the rejection of pseudoscience, pseudoarchaeology, and superstition sometimes claim that the average reader/viewer should reject the non-scientific pseudo-writing because it does not stand up to the tests of scientific checkability, proof, and logic. These writers assert that we obviously check things in daily life and imply that pseudo-writings can be detected in the same way. Superficially this is true, but it leaves most people with a helpless feeling of inadequacy, that they are failing to be sensible or purposeful. They find it difficult to see why so much effort is needed to detect pseudo-writing when everyday life seems so much simpler.

They have a good point. The exhortation to check statements for their
Not only do we accept and value the communications in list 1, but even when we ask for information of the kind in list 2, we tend to believe what we are told, basing our assumption on the respectability of the atlas, directory, manufacturer, and so on. We very seldom perform a scientific test of correctness on a telephone number, or an atlas, or even a book of chemical formulae. Yet this acceptance of authority as the validity of information is exactly counter to the allegedly true spirit of science — *nullius in verba*. We are supposed to doubt and test. But the social structures of responsibility, accuracy, and accountability are such that it is rational most of the time not

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to express that doubt. (Occasionally a map is wrong, or a price label is incorrect, but not so often as to make us check every time). Life would be impossible if we asked every time for evidence that a train timetable was the true one, or every number in a telephone directory was correct. We do accept authoritative information on the basis of the reputation of the source.
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When a document claims to be science or archaeology, whether professional academic literature or derived popular interpretation, it is proclaiming loudly “Check me! I am making the claims of science. The facts that I am giving you should be testable and checkable layer after layer, back as far as you want to go, until we get to the very basis of ‘What is knowledge?’ Here are the references. Check me! You should be able to check my assertions through the literature, or if you wish, you can perform experiments, or go to the laboratories or companies where they do these things, visit the excavation trenches, and see the processes at work. This is empirical truth to my best ability.”

We are invited to check, and given sufficient information so that checks would be easy, even if in general we do not choose to make them. The structure of the argument and the presentation of data is done in such a way as to make checking extremely easy if we wished to do so. To the professional, the ease of checking should be blatantly obvious.

Pseudoscience is laying claim to the same testable authority as real science or real archaeology and uses some of the same jargon as camouflage, but then it makes assertions of the kind that should appear only in list 1. This is why many pseudo-works have the dramatic qualities of a novel, detective story, religious tract, or self-aggrandizing autobiography. The language and plot have the appeal and drama of the genres in list 1, which helps to spread the ideas and has the advantage that the language appeals to non-scientific reviewers who write for the Sunday newspaper magazines.

All the items in list 2 share the characteristic of being blindingly boring as literature or as expressive use of language. Good professional scientific writing is clear, logical, easy to follow, grammatical, well constructed, efficient, maybe even elegant, but it should not be persuasive or enticing. In this writing, jargon is essential to express ideas unambiguously and concisely. There is an obvious dilemma here, a fuzzy boundary, since some scientists write so badly that, even when their experiments are correct, their work is unpublishable. However, I think this is just bad luck and does not invalidate the general point. A scientific truth should stand up because it is verifiably true, not because it reads with the scintillating beauty of Shakespeare or the superficial verbal glitter of Nabokov.

Is the offence in pseudo-texts, then, to combine elements of list 1 and list 2 in an unacceptable way? We can note that there are several legitimate ways of combining genres. For example, valuable work is done using high-tech physics and chemistry to study old master paintings and manuscripts. Interesting research has been conducted on the neurobiology of how humans
archaeologists and scientists combine historical dramatization with a solid understanding of the subject's achievements, which must not be distorted. There is a lighter note in the kind of jokes that you find in specialist science communities.

For example: a hydrogen atom goes into a police station and reports that someone has stolen his electron. The sergeant behind the desk enters the case in his book and then asks "Are you sure?" The hydrogen atom replies: "Yes, I'm positive." This is an absurd fantasy, with no shred of redeeming truth in it. Yet many scientists will laugh at the absurdity, because of the adjacent truth that a hydrogen atom with its single electron missing is electrically positive. But no offence has been caused, no deception, no lie. Everybody knows this is a statement in the category "joke."

More briefly, for mathematicians: $2 + 2 = 5$, provided that 2 is a sufficiently large number. This plays on the fact that some mathematical theorems are known to be true only when the numbers involved are almost unimaginably large. Again, no offence or deception has been caused by this trivial joke (Sabbagh 2002: 213).

Popular science writers and science journalists legitimately use some of the features of list 1. They highlight the human characteristics of the scientists, slip in jokes and ironic asides, point out coincidences, and dramatize competition between research teams, but they do all this in a way that will stand the scrutiny of their professional colleagues. Popularizing books are regularly reviewed in magazines such as Nature, Science, New Scientist, Scientific American, or Science et Vie, and errors are ruthlessly exposed. The genre and the conventions are understood by the writer, the publisher, the reviewer, and, one hopes, the reader. If a book of this kind has been well reviewed in the professional journals, then it can be trusted as reliable by the general public. In practice, other archaeologists and scientists who are working on closely related sites or experiments will usually be able to judge if a researcher is telling the truth, and if new finds and unlikely discoveries are genuinely possible and significant or are the results of error. They may undertake checks, ask the author for explanations, or try to repeat the work themselves. Academics in nearby fields will tend to take on trust papers published in journals of high academic repute that have strict standards of review and invite changes before publication. Others may try to keep a broad familiarity with topics outside their field by reading magazines such as Scientific American or Archaeology, where they will trust the repute of professional archaeological journalists.

Umberto Eco, writing on the nature of knowledge and designation of the names of concepts (semiotics and epistemology; Eco 2000) eloquently describes how the conveying of reliable knowledge is always set about with conventions and assumptions, agreed rules that must not be broken. This is quite different from those basic tenets of philosophy and logic that are intended to be true independent of context. When real people are conveying information to one another, there are always unwritten rules about assumptions, what it
is honest to say or not say. That is why the pseudoarchaeologist or pseudoscientist is so reviled by professionals, because, whether the pseudo is aware of it or not, the rules of communication are being broken.

Pseudoscientists are, deliberately or inadvertently, distorting and exploiting the conventions in a way that deceives the reader who is not an expert in the subject. They dazzle and entice the reader with dramatic tricks from list 1. They raise the temperature by creating an appearance of a battle, conflict, suppressed ideas, censorship, and conspiracy in high places. They pick a few scientific facts from the core of a discipline, throw in a few fringe “facts” from marginal scientists or archaeologists who support maverick ideas but are by no means frauds, and then plunge into the wild blue yonder. They claim to be describing a world of true events, things and occurrences that really happened in the verifiable sense that fossil layers can be dated by species, pollen used to indicate climate, or bones dated with carbon-14, but they misquote or select biased sources, blind the amateur reader with unnecessary jargon, misuse jargon, move so quickly from topic to topic that nobody can keep up, and exploit the rules of science against science itself (see Chapter 1).

My analysis of logic and truth here is not meant to replicate serious philosophical analysis. I am trying to describe how people behave and how they react. If this appeal to common sense is regarded as avoiding the tricky philosophical or linguistic bits of the argument, please remember, as Noam Chomsky implies (Chomsky 1972: 19–20), a dog knows perfectly well the difference between a cat and a rabbit, and between a triangle and a circle, without having words for any of them. At this level of discussion, common sense and appeal to simple logic are sufficient.

Each discipline or skill (medicine, archaeology, science, juggling) has its own conventions. When we go to a display of conjuring and juggling we do not expect the artiste to explain afterwards that he/she was able to juggle sixteen billiard balls because he/she can project an anti-gravity field. We respect the incredible skill, artistry, and illusion of a trick, but we do not want to be treated as fools. In each skill or profession there are rules of communication. If you stick to the rules of communication, you can save time and convey more information in a small space, using formulae and symbols. Experts tend to trust texts written according to the rules, and this is why there is such condemnation when a scientific fraud is perpetrated by an insider (but fraud is not pseudoscience).

The fragility and vulnerability of the scientific method

The established status of science, archaeology, and the other academic disciplines is often assumed to be almost unassailable. There is a tendency, actively encouraged by pseudo-writers, to see academics as the “big battalions,” while pseudos represent the “little man,” protesting in vain. In this section, I want to show that, in the conflict with pseudoscience and pseudo-
archaeology, this is not the case. If academics marshal their ideas and arguments carefully, they can construct strong defenses; but a casual assumption of superiority leaves them open to major damage.

There are three principle reasons for this: (1) a broad weakening of confidence in academic explanations resulting from the growth in relativism and postmodernist deconstruction; (2) the inherent principle of science that its proofs cannot be absolute but are subject to revision; and (3) a deeply felt perception among many people that science and academic methods are crushingly restrictive and pedantic.

Relativism, uncertainty, and doubt

The authority of science and respect for academic integrity have been reduced in recent years by several trends, including partisan controversies about major issues such as global warming, HIV, and genetic engineering, as well as archaeological and historical controversies over educational syllabuses, creationism, racial stereotypes, and evolutionary psychology. There is, in addition, a more pervasive attitude, not based on solid intellectual learning, that the foundations of knowledge have become more relativistic during the twentieth century. I am not questioning here the genuine discoveries and debates about quantum statistics, Heisenberg’s uncertainty principle, Gödel's theorem, or philosophical deconstruction of texts, historical relativism, or the social basis of science. But these intellectual studies have diffused into the middlebrow community as, in some cases, a feeling that anything goes. Science becomes purely a social construct. There is no such thing as proof; truth is just the opinion of the majority; multiple conflicting truths may all be valid at the same time. This attitude, which in reality is a cover for sloppy thinking, can be used by pseudos as the first stage of undermining criticism from archaeologists.

I stress that I am not analysing here the validity of these intellectual forces (Penrose 1991) but trying to understand how people behave who often have not studied them and are tempted to use or misuse them at second hand. This attitude is brilliantly dissected by Sokal and Bricmont (2003) and further discussed by Sokal (Chapter 12). At the level of attitudes and behavior, which is the subject of this chapter, refutation of the “all versions of knowledge and truth are equally tenable” is fairly simple. Whatever degree of subversion twentieth-century research and philosophy may have launched against empirical science and the basis of knowledge, it must apply to all versions of the truth at the intellectual level that is relevant. This applies as much to pseudo-theories as to accepted academic ones. That being the case, the discoveries do not favor one or the other version, and we are forced back on to common sense and day-to-day estimates of probability. Is it more likely that one train is late or that the whole printed
or that one enthusiast cannot get his/her facts straight? Do pyramids represent a telekinetic power source of mysterious origins that was transmitted secretly in different cultures around the world 12,000 years ago, or is it just easier for people with no cement to make buildings that are narrower at the top than they are at the bottom?

This counter-argument still leaves the defender of the academic view with a fight on their hands, but at least the fight is on level ground. The appeal to strange discoveries that purport to show that multiple truths apply can be dismissed as irrelevant. Common sense is sufficient for this debate.

Science, archaeology, and self-criticism

Science and the time-dependent disciplines (history, archaeology, geology, cosmology) all use the fundamental technique of error detection, criticism, repeated observation, and revision, which has sustained the accumulation of knowledge through several centuries. This process of speculative search and innovation, followed by self-validation, focusing on errors, followed by correction and revision, is the glory of science. It is laborious, often frustrating, but it works, and knowledge is integrated and cross-connected endlessly with flashes of insight and occasional completeness, which, to the insider, provide profound pleasure.

However, to the untrained mind, the search for errors, the acceptance that the best theory in the world is imperfect or incomplete, and the frequent hesitation of experts to commit themselves with absolute certainty on matters of fact, leaves a baffling impression. Why can't they just say yes or no?

To the pseudo-practitioner, this hesitation and the acceptance of possible non-eliminated errors is an irresistible target. I have observed that a clever debater with well-prepared thrusts and one-line put-downs can make mincemeat of the average academic in minutes on a radio or TV show. The scientist or archaeologist is forced to concede repeatedly that "I could be wrong, of course, it depends on the conditions, nothing is absolutely certain," and before he or she has recovered the lost ground, the show is over. Throughout, the pseudo radiates an almost religious conviction and certainty.

The critic of academia who relishes the freedom of alternative thinking is happy to regard the second law of thermodynamics, or the measurement of the charge on the electron, as easily subject to instant revision on the same scale as the latest speculative theory of the formation of cosmic wormholes or the estimated date for the eruption that destroyed the Bronze Age towns on Santorini (Hardy et al. 1990). By skipping quickly from topic to topic and proposing several erroneous grand ideas that the expert has to tackle in sequence, the pseudo makes the expert look like a nit-picking, humorless, narrow-minded pedant, afraid of the vision that awaits the brave person who lets go of such old-fashioned constraints. The pseudo accuses the professional of having a closed mind, having made up their mind without checking the new evidence, and avoiding debate. He/she suggests that every accepted
principle of science or archaeology is “only a theory” that needs to be proved and demonstrated afresh. Principles and standards that the professional has accepted for decades now have to be explained and explained again, not because they are in any real doubt but because the pseudo demands genuine empirical proof, now, on this occasion, beyond the personal doubt of this observer. This insistence is made in the name of science. Thus the pseudo reduces the scientific system to paralysis. It is in effect a public request for recapitulation of the five to ten years of study and proof of principles that the professional has mastered but that the pseudo never learned. From the professional’s point of view it is a waste of time, since, even if every explanation is given, an audience would never sit through it, and the pseudo would not change his/her mind.

There is no space in this chapter to suggest the detailed tactics for coping with this type of vulnerability, but archaeologists who are challenged to open debate must review with enormous care the lines of evidence that they would use from their own area of expertise to defend the verifiability and proven status of core concepts. Some areas or items of knowledge are much more soundly based than others. The date of the Battle of Hastings, or the signing of the American Constitution, and the half-life of carbon-14 will not be revised by further research (or not much). The date for the eruption on Santorini may be. The charge on the electron and the speed of light in a vacuum are both known to one part in tens of millions. Further research may increase the accuracy to one part in thousands of millions, but the figures will not be doubled or halved. Acceptance of possible error or susceptibility to revision ranges from “Yes, that may be completely changed within five years” to “This is known with an accuracy of one part in so many million, and has been tested millions of times.” The academic must make this distinction calmly but very firmly. You must be able to say with conviction that the Chinese did not circumnavigate the globe before the Magellan/Elcano expedition, even if the book on this pseudo-theory (Menzies 2002) were to sell a million copies. Popularity is not proof.

In extreme cases, academics may have to band together to refute anti-intellectual, anti-science campaigns, and a superb example of this is given by the battle against creation science in the USA, which went all the way to the Supreme Court (Shermer 1997: 154–72).

Public distaste for science and academic methods

The third reason for the fragility of science is that its principles repel many people at a psychological level. Science seems to be a prison, a restriction, a straitjacket. It forbids. It proscribes hundreds of impossible and forbidden systems and processes that must never be believed. This is a provocation and a mental prison to many people. Scientists who are caught up in the magic of discovery of what does work, who live with those incredible transitions
many people react, because, psychologically, they, the non-expert public, see science as a straitjacket. "Why can't I have perpetual motion, or anti-gravity, or thought transference, or precognition, or levitation, or messages from the dead, or Atlantis, or magic pyramids, or Noah's ark, or go faster than light? Why can't I have people hunting dinosaurs?" It all seems so puritanical and restrictive. The laws of thermodynamics are totally pessimistic: entropy and chaos always increase; knowledge and information are always lost. Life is merely a local decrease of entropy. And we evolved from a common ancestor with the chimpanzee. And the universe will cool down for ever and go dark and utterly lifeless.

To the expert, science works like a motorway, allowing trouble-free traverse through a maze of bogs, pitfalls, traps, and blind-alley diversions, taking you straight to the frontier with the unknown. There you find that science provides you with a range of tools and techniques for penetrating even further into the darkness and mapping out new roads into new worlds.

To the pseudoscience enthusiast, the question is "Why stay on the motorway? What lies on the land between the permitted theories? There are hundreds of questions and possible answers that the expert simply ignores as he/she charges off to that frontier of research that happens to be fashionable, or funded, just now. But what if ...?" Believing in any of the forbidden processes or reactions that have been shown by millions of tests and brilliantly derived theories and proofs to be impossible, or plain wrong, attracts instant opprobrium and condemnation from professionals.

Nevertheless, while scientists, historians, and archaeologists find the rigors of their discipline bracing, creative, stimulating, and beautiful in their complex structure, many people see only the restraints, the limitations, the narrowness created by so many rules, which seem to have developed over centuries of cabal-like esoteric thinking. Why does it take five to ten years for an intelligent teenager to learn enough physics to understand what is really happening at the frontiers of semiconductor research or the reactions of fundamental particles inside a star? Why does it take five to ten years to learn enough about archaeology to tackle genuinely fresh problems? Surely life is simpler than that? Human nature relishes a broad, simple, sweeping answer.

Then along comes a pseudoscientist, who brushes away all the dry rules, breaks out of the restrictive boundaries into an exciting terrain where anything is permitted. The professionals groan with derision, while the pseudos proclaim their great simple truth that ... (fill in the blank). No wonder this leap to freedom looks attractive, especially when combined with the melodrama of conflict, treachery, and self-aggrandizement that is typical of the genre.

Possible lines of defense

The apparent vulnerability of academic research that I have described here leads us to one of the natural lines of defense that the professions...
A principle of empirical academic statements is that they should be checkable, and that repeating the observation or the experiment would produce the same results or conclusions again and again when performed by different people. It also follows that the more easily a statement can be checked and proved wrong, the more powerful it is as a scientific statement if it survives such tests (Popper 1959: 108–9). Galileo's statement that all objects fall to Earth with the same acceleration is easily checked, and thus is a law of extraordinary power and generality (and it was demonstrated dramatically on the Moon by astronauts using a hammer and a feather).

It is a good habit of all scientists and archaeologists to check their own observations for faults, factual mistakes and errors, wishful thinking, and above all, for alternative explanations. It is one thing to show that event A is always followed by event B, but you cannot prove that A, and only A, actually causes B unless other possible causes have been eliminated and you have shown that B cannot exist unless it has been preceded by A. Preferably, there should be an actual verifiable mechanistic or probabilistic link to show why and how A causes B.

The failure of pseudo-writings to adhere to this principle of self-testing and self-rejection until arguments are necessary and rigorous is a definitive shortcoming in relation to real science and real archaeology. A work is publishable in the real world of science and archaeology when the conclusions presented at the end of the paper have been shown to be the most logical conclusions that follow from the starting information and the data. Referees for journals check that this is so. Pseudo-writings repeatedly rely for their effect on the assertion that "A could be so and, if this is accepted, B could be true also." The alternatives are not checked, and the concepts of greater probability, greatest logical simplicity, or greatest elegance are not even considered. The probability that the first proposition "A" could actually occur (or be wrong) is not estimated. For the scientist or professional archaeologist, the process of checking alternative explanations and eliminating them with evidence is not something that is just done in the back room and then taken on trust. Academic texts need to show overtly and consciously how alternative explanations have been checked and rejected.

The requirement for published self-criticism does not contradict my earlier point that in a developed community the lay person does not need to check all information. In professional publications, the author explains how they have checked alternatives that have been rejected, and the reader analyses the statements. We take the details on trust. Nevertheless, the fact that the process has been described is indicative of skepticism, care, and logic. We should always look for this habit of thinking in serious publications and look to see if it is present in suspected pseudoarchaeological works.

Finally, in the professional world, speculation is permitted at the end of a paper or book, provided that it is clearly labeled as such. Such free-ranging thought, based on previously proven facts, provides guidance for the next line of research.