

Chapter 12

Scientific Testing of Chi (*Qi*) Claims

It is noteworthy that feng shui, such an ancient and still wide-spread belief about something so all pervasive, powerful, and supposedly a part of nature, is never examined in science programmes. The previous chapter showed that this foregoes an opportunity for students to learn about science, its methodology, its scope, its cultural import, and its utility. It is also noteworthy that despite the centrality of chi claims through all of feng shui theory and practice, including in all variants of Traditional Chinese Medicine (TCM), there has been precious little effort expended in scientifically testing these claims. This chapter will survey such efforts as there have been; and will draw conclusions about the scientificity of the construct.

Remarkable Qigong Claims

There have been some embryonic steps towards scientific validation of chi claims. Of special interest were those made by Dr Yan Xin, a former TCM practitioner who had worked in or visited different Chinese and US universities. He was a celebrity super-Qigongist with a national reputation for healing thousands of patients at a distance by generating and casting his own *qi* over them; he made and sold personalised *qi*-ised healing water for them to drink; he was able to increase the alcohol content of wine by *qi* power; and was reported in the papers doing many other astonishing things (Lin et al. 2000, p.113ff). Some of his lectures were attended by tens of thousands. His followers have founded the International Yan Xin Qigong Association. In 1986 he was attached to the Qigong Cooperative Research Group at the prestigious Tsinghua Technical University in Beijing, and while connected there with established Professors Lu Zuyiin and Li Shjengping he put *qi* claims to a scientific test. Yan's claims were not modest. He said that:

the mind power or *Qi* emitted by a trained Qigong master can influence or change the molecular structure of many test samples, including those of DNA and RNA, even if these test samples are 6 to 2,000 kilometers away from the master. *Qi* can also affect the half-life of radioactive isotopes and the polarization plane of a beam of light as emitted from a Helium-Neon laser.¹

This is certainly a stunning claim and, as Karl Popper would say, Yan should be commended for putting his theory's neck on the experimental block. To his credit he conducted these chi-confirming and Qigong-master demonstrating experiments. He, with colleagues, published papers purportedly showing how the external *qi* (chi) that he generated could travel distances of several kilometres and bring about phase changes in liquids and change infra-red absorption spectra in biological media. Ten of his 'scientific' papers are reproduced in the Yan Xin Qigong Association handbook (Wozniak, Wu & Wang 2001, chap.3), while a number are reproduced and discussed in Lu (1997). One study, for example was 'The Study of Qigong Effect on Bacteria Strain Improvement' which showed,

¹ See: www.item-bioenergy.com/infocenter/chinesechiresearch.doc

predictably, that the ‘high-yield strain produced by this method showed promising potential for industry’ (Wozniak, Wu & Wang 2001, p.123).

One famous paper was: ‘Experimental Research on the External Qigong Effect on Substances Over a Distance of 2,000 Kilometers’. This made the front-page of Chinese newspapers and into TV News Bulletins. Not surprisingly Yan became even more of a sensation lecturing to packed auditoriums throughout China, and in 1990 to the USA where his Qigong lectures were, for their enthusiasm and credulity, matched only by those of auditorium-filling fundamentalist preachers.

Yan’s US tour was a series of highs: In San Francisco Yan lectured to ‘a thousand admirers’ at the Pasadena Hilton, one scheduled 25 minute presentation was extended to three and a half hours; he made a presentation at the Massachusetts Institute of Technology (MIT) on how he used his *qi* power to change the molecular structure of water, and in this presentation he was supported by Dr Lu, a prominent Chinese nuclear physicist;² in Washington the Chinese Ambassador attended a lecture; at a San Francisco banquet Yan projected his *qi* power to make two wheelchair-bound people walk for the first time in many years, an event so dramatic that a businessman took out his credit card and paid for the whole banquet; President George H.W. Bush invited Yan to a formal dinner, described him as ‘a contemporary sage’, and praised his ‘research on the scientific principles behind qigong healing’; and he was photographed with President Clinton.³

A biography of Yan was written, in which it was mused that the spreading of Yan’s powers among all citizens would put China on top of the world: ‘everyone could do things by thought, move objects, control the cosmos with our minds’ (Lin et al. 2000, p.103). The consequences of any of this even being remotely true, are staggering. So staggering that scientific testing of the claims should be not just a Chinese priority, but an international one.

Yan’s followers straight-facedly maintain that: ‘His discoveries are changing the way modern science is viewed and challenging many of its assumptions’.⁴ For some gullible people, with minimal grasp of science, such claims might, sadly, change *their* view of modern science. What is less understandable, but of significance, is that many of his followers have sophisticated scientific and technical backgrounds, including PhD degrees in science. But his astonishing *qi* claims need to be proved, and there was ample evidence that they were false.

Professor Chao Nanming, Head of the Biology Department at Tsinghua University who had agreed to the 1986 studies being conducted has made troubling comments about the Qigong Cooperative Research Group, saying: the Chi Research Group had no formal connection to the university but were merely using its name without authority; there were just three experiments conducted and Yan would not repeat any of them; the distance from Yan to the samples was 100 metres not 2,000 kilometers; a Raman laser machine was supposedly

² Lu Zuyin was a renowned professor of nuclear physics at the Institute of High Energy Physics, Chinese Academy of Science as well as a physics professor at Tsinghua University. He was responsible for the comprehensive planning of nuclear physics parameter measurements during China’s nuclear tests, and he led the effort of measuring the forces, neutron fields, and gamma fields of atomic bombs in China.

³ All of these, and more, extraordinary things are related by Vicente Ongtenco, a Council Member of the World Medical Qigong Association, and detailed in Wozniak, Wu & Wang, 2001, pp.127-132.

⁴ See: www.item-bioenergy.com/infocenter/chinesechiresearch.doc

used but Yan did not know how to operate it; and water was used from different sources so its molecular composition was not controlled. Chao's doctoral student who had a role in the experiments reported the all standard experimental care and control was neglected. Finally, the initial papers were published with Chao's name among the authors, but not with his permission. Professor Chao thought the studies were worthless (Lin et al. 2000, pp.62-65). This did not affect Yan's Chinese, then international, stardom; devotees flocked to learn more.

On 7 March 1990, the *Xinmin Evening Paper* reported that at the 18,000 seat Shanghai auditorium:

The great super-Qigongist, Yan Xin, was delivering a six-hour Qigong lecture in one session. By means of the microphone and 48 loudspeakers, his voice resounded through the whole conference hall. ...He talked slowly, telling the meaning of Qigong, and mentioned some diseases that can be cured. ... Less than five minutes into the lecture, some in the audience began to shout, laugh, cry, and swing to and fro as if they were drunk. (Lin et al. 2000, pp.56-57)

Dr Yan's 'research' career continued. In a 30-page 2002 paper in *The Journal of Scientific Exploration*, co-authored with ten Chinese and US scientists,⁵ the claim is made that:

This paper reviews a portion of the data generated via the external *qi* emitted by Dr. Yan Xin. Included here are (1) strong responses developed in LiF thermoluminescent dosimeters, (2) strong responses in aqueous solution structure as probed with laser Raman spectroscopy and (3) alterations in the half-life of ²⁴¹Am as probed with both ray spectroscopy and a solid-state nuclear track detector. According to the different circumstances, external *qi* of Dr. Yan Xin can display different attributes such as being distance transcending, bi-directional, reversible or targeting. Although external *qi* of Yan Xin Life Science Technology has not been identified with any of the four known and accepted fundamental physical forces, its influence on physical reality is robustly confirmed. (Yan et al. 2002, p.381)

All of this is very impressive. The study reports a 3-hour *qi*-emitting lecture by Dr Yan to a packed Chinese Academy of Science (CAS) auditorium in Beijing where sophisticated monitors were set up everywhere to record the audience's positive changes after being radiated by Yan's *qi*; and to measure the increase of auditorium 'high-energy' *qi*. Different locations recorded a five to ten-fold increase in the latter, comparable to the impact of 'gamma rays and neutrons'. Similar results are reported from an 11-hour *qi*-emitting lecture of Dr Yan at the Red Flag Avenue Auditorium in Beijing.

The study includes page-after-page of highly technical detail, and mathematical tables. It has all the appearance of sophisticated science. But among the pages is the above-reported 1986 'study' done at Tsinghua University where the Head of Biology's name was included among the authors though he thought the study was worthless. Of this discredited study, the new 2002 study says:

The results [1986 study] on liquid water provided the first direct evidence that Yan Xin Life Science Technology healing is physical and external *qi* from Dr. Yan may cause physical

⁵ The authors' institutional affiliations included: Harvard University, Mass General Hospital, University of Oklahoma, MIT, and the Institute of High Energy Physics, Chinese Academy of Sciences, Beijing.

adjustments in the human body since water makes up about 65% of human body weight. (Yan et al. 2002, p.389)

After still more pages of molecular formulae, atomic weights, spectrometer specifications, Raman laser spectra readings, and much more, we are told that:

The *qi*-effects on the structure and properties of liquid water were also observed using a different technique later in 1991. Changes were repeatedly observed in the ultraviolet (UV) absorption of de-ionized water treated by external *qi* emitted by Dr. Yan from the US to Beijing, China. (Yan et al. 2002, p.392)

So, now Yan's self-generated *qi* affects molecular structure and behaviour at a distance of 10,000 kms, across a continent and across the Pacific Ocean. Remarkably scientists from half-a-dozen reputable universities signed off on this, and it was published in a supposedly scientific journal. The International Yan Xin Qigong Association was formed. The authors were confident enough to conclude that: 'Yan Xin Life Science Technology has already emerged as an important scientific discipline deserving more substantive exploration' (Yan et al. 2002, p.408). This is truly something for scientists and serious sociologists of science to examine: how can such a scandalous state of affairs come to be? Is it a scaled-down version of the USSR's Lysenkoism which also sustained its own journals and supposed experimental culture (Joravsky 1970)?

Yan's *qi* powers interfere not just at the difficult-to-see micro-levels but at the easy-to-see macro-levels. He speaks of moving cups of tea by his *qi* power, and 'when friends come, transporting a pot of tea for them', and if a lot of people come, qigong masters can 'convert earth to cups' but he cautions that the last 'demands a lot of *Qi*' and that 'the energy of the human body is limited and should be used ingeniously' (Wozniak, Wu & Wang 2001, pp.74-75). He especially does not like to use his precious *Qi* when video equipment is present, and he relates how during a 1986 visit to Japan someone, against his instructions, tried to videotape his use of transport powers but 'their video camera stopped working' (Wozniak, Wu & Wang 2001, p.73).

These, and other such papers by Yan and colleagues, certainly warrant 'more substantive exploration' by established biophysical and biochemical researchers. But the claims are so outrageous and so contrary to all established scientific knowledge, that the obvious questions are: Why have these exceptional, revolutionary claims not been published in any mainstream, established, peer-reviewed journal? And, are we here examining good science, bad science or pseudoscience?

In support of the pseudoscience answer, it is worth noting that during Dr Yan's triumphant US tour in 1990, a tour during which he constantly asked the scientific establishment to seriously investigate qigong claims, the British Columbia Skeptics Group invited him to demonstrate his *qi*-healing and molecular-changing powers. The invitation was turned down by his assistant, a Chinese professor of agriculture, who wrote:

Dr. Yan Xin and I are not interested in the very low-level test which was very popular in China ten or fifteen years ago. He is busy on some cooperating research subjects with several important organizations in U.S. (Beyerstein & Sampson 1996b)

One of the ‘cooperating research subjects’ was the study of ‘subtle’ energy that might be the physicists’ chi. It can be assumed that a ‘low-level test’ is one of those objective, controlled, and repeatable tests preferred by bothersome scientists.⁶

Dr Hui Lin, of the Chinese Chi Research Centre, and co-author with Yan of the above study, offers the following striking example of chi power:

Consider a simple experiment on Qigong potential. In this experiment people used their qi to shake pills out of a sealed bottle. However, the intermediate process was undetectable by any available means. The pills passed through the bottle (analogous to conducted experiments in which a person passes through a solid wall), even though the bottle is completely sealed and intact, without any possibility of tampering.⁷

Accepting at face value the results, he concludes that:

This demonstrates the probable existence of a form of energy associated with qi which transcends the three or four [gravitational, electromagnetic, strong and weak interaction] fundamental forces. (ibid)

This all sounds very scientific and certainly would cause a revision in our understanding of science and of the world picture that science has given us. But in Hui Lin’s ‘experiment’, no independent witness to such ‘transportation’ is noted; and no replication study is reported. Independent observation and replication should be the beginning of any effort to bring these ‘truly remarkable results’ into the scientific fold.⁸ They should be among the first things that any scientifically literate student or adult asks of the remarkable experiment. Their absence is a powerful indicator that the whole feng shui practice is pseudoscientific.

Zhang Xiangyu was another scientist cum Qigongist who shot into national and international fame on the back of her ‘scientific’ proof of external *qi* power. She graduated from the Tongji Medical University and persuaded Professor Bi of its Biology Department to allow her to test her claim that her self-generated chi energy could affect the phagocytic function of macrophages in the abdominal cavity fluid of mice. Seemingly a thoroughly scientific hypothesis. Her experimental mouse, the one she radiated with her self-generated *qi*, was reported to live longer than those in the control group, and the relevant molecular structure in its cavity fluid did change. The result confirmed the claim, but the experiment was not repeated. She wrote a report, sent it to the Qigong Science Institute of China, titled herself a ‘supernatural being’, and enjoyed the celebrity, fame and money that followed (Lin et al 2000, pp.65-67).

But as with Dr Yan, things were not quite as they appeared. Zhang’s paper was published as being from the Tongji Biology Department despite Professor Bi rejecting the entire methodology, pointing out that the surviving mouse was the one in the group that had a heart transplant, and that only Zhang’s students could see the molecular change. Bi, and

⁶ Unfortunately Dr Yan seems unable to take further part in such testing. At some time around 2000 he was made a ‘National Treasure’ by the Chinese government and his travel and appearances have been constrained. How much this was a result of doing bad science, and how much it was the Party’s fear of a mass qigong movement, is unknown.

See: <https://www.thedaobums.com/topic/30754-what-became-of-qigong-master-yan-xin/>

⁷ See, www.item-bioenergy.com/infocenter/chinesechiresearch.doc

⁸ The magician (illusionist), James Randi, has rendered a great public service by replicating, exposing and debunking these sorts of claims (Randi 1987, 1992, 1995).

others, said that: ‘imperfect experimental design’ was coupled with ‘fraudulent evaluation of results’ (Lin et al 2000, p.66).

Lu Zuyin, the nuclear physicist collaborator of Yan Xin, and one-time senior figure in China’s atomic bomb project, went to the USA and subsequently published his own 404-page book *Scientific Qigong Exploration: The Wonders and Mysteries of Chi* (Lu 1997).⁹ The book concentrates on the remarkable *External Qigong* (EQ) energies created, and ‘thrown’ by Yan Xin and other qigong masters. A review of the book by Kevin Chen, a US professor of psychiatry and enthusiast for qigong, notes that:

The subjects of the book cover the major findings in physical, chemical and biological studies of EQ phenomenon, and the distance effect of EQ. The discussed experiments of EQ include infrared radiation effects, magnetic effects, electromagnetic wave and infrasonic wave effects, bi-directional effects, multi-functionality and target adaptability, spatial characteristics (distance effect) and automatic targeting capacity, temporal characteristics (two after-effects), as well as the ability to affect matter at a microcosmic scale (such as molecules and atomic nuclei). (Chen 2002, p.484)

And he observes that: ‘In some ways, studying EQ is similar to studying PSI phenomenon since many well-trained qigong masters have both psychokinetic and ESP capabilities’ (Chen 2002, p.486). He also notes that the Chinese Society of Qigong Science has tried to bring order and consistency to the scientific study of qigong by restricting genuine EQ to that produced by ‘a well-trained qigong practitioner under the qigong state, and so is tied to the intention, *yi*, of the practitioner’. Consequently, as Chen announces: ‘effective study of EQ requires new methodology and new scientific framework’ (Chen 2002, p.486). Yan Xin had said the same thing: ‘Currently, the essential qualities of qigong and *qi* are difficult to study in a detailed, qualitative, and quantitative manner’.¹⁰

This is, of course, completely mistaken: the remarkable claims are easy to study in a detailed, qualitative and quantitative manner. It is just takes textbook experimental design and control of variables. The onus is on the qigong practitioners to specify the variables and set measurable outcomes. If the latter cannot be done, then the pretence of scientificity should be abandoned.

Not surprisingly, qigong has spawned a veritable army of fraudsters. Wang Lin a qigong multi-millionaire claimed to have spiritual powers enabling him to cure incurable blindness, cancer and most everything else; further, he could kill people at long distance. Clearly he is very marketable. He made his fortune from credulous citizens, and lived in a 5-storey luxurious mansion in Luxi. Chased out of China, he began teaching tai chi at Stanford University. Li Yi, the deputy head of the Chinese Taoist Association gained national, and probably international, attention by holding his breath underwater for two hours and 22 minutes. This was shown to be, of course, a pantomime, but hundreds of thousands of yuan poured into his account; and, predictably, he was accused of using his statue to exploit numerous young devotees. And on it all goes.¹¹

Science is simply incompatible with the truth of the foregoing, and other comparable bizarre claims. They would never be reported in any serious science research journal.

⁹ It should be noted that the publisher is ‘a small specialist publisher’.

¹⁰ See: www.item-bioenergy.com/infocenter/chinesechiresearch.doc

¹¹ For a report on these fraudsters, see *Chinese Global Times*, 19 August 2013.

Pleasingly serious scientific research journals require studies to be done in a ‘detailed, qualitative, and quantitative’ manner and so a high bar is set for publication of any research in reputable journals. This includes feng shui ‘research’. But inevitably unpublished and unpublishable feng shui and qigong research finds outlets in its own journals, book series and web sites. Dr Qian Zuesen (1911-2009), Chairman of the Chinese Association of Science and Technology (CAST) declared Dr Yan’s research to be scientific. This was a big boost to the qigong enterprise.

But it needs be noted that Chairman Qian gave ‘scientific’ support to Mao’s disastrous 1958-1962 Great Leap Forward by publishing a supposed ‘physics’ article in the *People’s Daily* ‘establishing’ that the number of calories of vegetable that can be produced per unit of land is far higher than what the Great Leapers had themselves been trumpeting. Qian held that cabbages weighing 250 kg and sweet potato harvests of 4,000 tons per acre were possible provided farmers dug deeper, worked harder and leapt higher. All of which they did to no effect except hastening the death by famine-created starvation of about 45 million Chinese citizens, and the deaths of about three million poor souls by beatings in gulags over the four disastrous ‘Great Leap’ years (Dikotter 2010). Mao’s personal physician subsequently wrote:

It was not until the Great Leap Forward, when millions of Chinese began dying during the famine, that I became fully aware of how much Mao resembled the ruthless emperors he so admired. Mao knew that people were dying by the millions. He did not care. (Zhisui 1994, p.125).

Yet Mao’s visage still beams down over Tiananmen Square, the site of the June Fourth 1989 student killings and arrests; and the official CCP verdict is that Mao was only 30% wrong.

The dissident astrophysicist, Fang Lizhi, who was being ‘rehabilitated’ by farm work at the time – counter-productively digging deeper and deeper furrows for planting - saw that the physics was all wrong and that Qian was merely a scientific gun for hire by deluded CCP ideologues and thugs. Fang in his autobiography makes a telling comment on this episode:

Freedom is vital to science; science dies without it. When Qian’s ridiculous article came out, Chinese physicists could see it for what it was, but no one had the freedom to say so. Not even purely scientific criticisms were possible, because this author was a favorite of Mao Zedong and this article’s conclusions supported the Great Leap Forward. But the even more baleful fact is that the dictator of a mammoth political party could be so benighted and reckless as to use obsequious ‘science’ to make policies that affected nearly a billion people. How can a country that imprisons science expect anything but disaster? (Fang 2016, p.101)

The foregoing roll-call of fanciful claims, and the enthusiasm with which they are greeted, is reminiscent of what Matteo Ricci wrote of feng shui some four hundred years ago, and which has been cited in Chapter 5: ‘Fraud is so common and new methods of deceiving are of such daily occurrence that a simple and credulous people are easily led into error’ (Ricci 1615/1953, pp.83). The modern cases may not be conscious fraud; it might be that credulity is now so established even among professionals, that fraud and trickery are no longer required. The commonplace academic constructivist ontology of ‘alternative realities’ and ‘many worlds’, and its associated relativist epistemology, lessens the ‘need to deceive’. The more so when any correction can be dismissed as ‘realists would say that’, or more directly ignored, as with the current President of the USA, as ‘fake news’.

After dismissing qigong as superstitious and one of the ‘four olds’, the CCP has now embraced it as a way of better connecting the Party to the Chinese tradition. Over 20,000 Health Qigong Management Centers have been established with 1.5 million practitioners. They are committed to the thesis that qigong is scientific not superstitious, and that its practice has the widest range of health benefits.

Paucity of Tests

But after two hundred years of modern scientific study of energy,¹² with pressing contemporary universal concern with clean energy production and use, and with numerous major international energy summits and conferences, it is noteworthy that feng shui energy is yet to be identified and measured in any reputable laboratory. There are many putative such measures, providing ‘convincing’ evidence for the efficacy of chi, but as with the above cases from the China Chi Research Centre, they do not bear close scrutiny.

What constitutes ‘close scrutiny’ is something that can be taught in science classes when teachers have a modicum of HPS competence and interest. Students can read the texts, and follow the experimental footsteps of Galileo, Newton, Huygens, Priestley, Darwin, Rutherford, and many others, and see and appreciate the difference between on the one hand close scrutiny, careful measurement, appraisal of alternative hypotheses; and on the other, the lazy uncritical holding of original and perhaps prejudicial opinions.

Feng shui ‘research’ has the appearance and trappings of science and promotes itself as such. Some practitioners might function in ‘research centres’; but nevertheless, feng shui is not science. It is not just mistaken science, in the way that phlogiston accounts of combustion, Lamarckian accounts of evolution or behaviourist accounts of learning were mistaken; feng shui, as will be shown in Chapter 12, is simply not science; it lacks a number of the crucial necessary features of genuine science. The foregoing discussion of the China Chi Research Centre’s research does introduce an added layer to the identification of pseudoscience. One mark of the latter is non-engagement with the scientific community and failure to publish research in scientific journals; but once a group starts its own journal, with a scientific name, then the designation ‘scientific journal’ cannot be settled just by name alone. There is some disciplinary/sociological dimension that needs feed into the naming.

Examination of feng shui, and more generally any other substantial yet mistaken account of nature, in science classes enables other educational goals to be advanced: Appreciating the difference between science and pseudoscience; understanding the impact of science on culture; understanding scientific experiment and methodology; and learning features of the nature of science. As with all fields in science, an appreciation of the history of feng shui, prepares the way for wider philosophical and cultural understanding of the field; for seeing how disciplinary understanding has been intertwined with philosophy and culture.

Much is rightly made of the under-determination of scientific theory by evidence - the Duhem-Quine thesis (Harding 1976, Weinert 1995). More specifically there is serious argument, initiated by Ernst Mach in the late nineteenth century, about premature realist inferences to the reality of hypothetical constructs or entities in explanatory scientific theories (Matthews 2015, chap.9). There were, and still are, detailed philosophical and scientific debates about the ontological status of phlogiston, caloric, atoms, genes, fields, electron

¹² See at least Bevilacqua (2014b), Coopersmith (2010), Harman (1982) and Sherman (2018).

shells, forces, and so on.¹³ Nothing comparable occurs in the uncritical, unreflective feng shui move from rural farming practice or architectural commonsense to the putative reality of chi. The mere juxtaposition of debates about realism in science and in feng shui can illustrate important features of science and of pseudoscience.

Philosophical Insulation of Feng Shui

Lillian Too, the earlier mentioned feng shui consultant, identifies the reason for the exponential growth of western interest in feng shui as the fact that:

[people are] ... beginning to realize that there are alternative ways and methods of viewing the Universe, of understanding the way energy moves and works, and how these energies affect our well-being. (Too 1998, p.17)

There are of course 'alternative ways and methods of viewing the Universe', there can be no dispute about this anthropological and sociological claim.¹⁴ But that leaves the obvious question of whether these 'alternative ways and methods' are equally correct, good, or equally productive of truth about the 'way energy moves and works'. Are the alternative methods just different but equal sciences? Are they non-science? Are they pseudoscience? The persistent question is whether the alternative perceptions of reality, or alternative systems, are true or false; do they connect or not-connect to reality?

Persistently, these questions have not been asked in multicultural, or cultural studies, science education debates. Indeed, it is a matter of educational principle that they are not to be asked; and for such educators, it is a matter of philosophical principle that they cannot be asked (McCarthy 2018). Ken Tobin thus 'insulates' his TCM and acupuncture claims against such persistent questions by citing Ted Kaptchuk:

Chinese medicine is a coherent system of thought that does not require validation by the West as an intellectual construct. Intellectually, the way to approach Chinese concepts is to see whether they are internally logical and consistent, not to disguise them as Western concepts or dismiss them because they do not conform to Western notions. (Kaptchuk 2000, p.77)

The editor of the journal *Alternative Therapies* had earlier claimed such philosophical insulation, or protection, in these terms:

New forms of evaluation will have to be developed if alternative therapies are to be fairly assessed. (in Sampson 1996, p.195)

It might be sufficient to ask, as Tobin, Kaptchuk and the journal editor do, of random systems of concepts that they be 'internally logical and consistent'. That is the least that can be expected. But if the conceptual system relates to medicine, then more than just conceptual consistency is required; some demonstrable connection to the world, to bodily systems, and to improvement in health is required. It is a contradiction to admit that alternative medicine does not conform to Western notions yet at the same time to want them to be regarded as scientific and deserving of the social support (licences and degrees) and government money given to science.

¹³ See essays in any anthology on the realism/instrumentalism debate in philosophy of science. For a recent collection, see Agazzi (2017).

¹⁴ See at least the 23 chapters in Selin (2003).

Given that mega-million-dollar state health subsidies and private insurance payments in nearly all countries of the world, hinge on assessment of these putative practices, then they need to be rigorous and removed from both philosophical faddism and economic opportunism. Merely being internally consistent does not cut either the philosophical or economic mustard. Pouring money and resources into unproved or bad medicine, is in no one's interest. This should be obvious even in wealthy countries, much more so for poor countries where social resources are limited.

For constructivists, even ones who have 'moved on', there is not even a speed bump on the road to 'alternative ways and methods of viewing the Universe', or to 'alternative medicines' (Tobin 1993, 2000). Indeed, there are no speed bumps at all in the constructivist and postmodernist roads to 'different but equal' viewing platforms; smooth constructivist motorways lead to each.¹⁵ Tobin, speaking for many, insulates his claims by recourse to 'multilogicality':

In contrast to the mainstream of research in science education, I advocate a multilogical methodology that embraces incommensurability, polysemia, subjectivity, and polyphonia as a means of preserving the integrity and potential of knowledge systems to generate and maintain disparate perspectives, outcomes, and implications for practice. In such a multilogical model, power discourses such as Western medicine carry no greater weight than complementary knowledge systems that may have been marginalized in a social world in which monosemia is dominant. (Tobin 2015, p.3)

What the first 45-word sentence might possibly mean can be left aside. 'Multilogical methodology' does sound akin to Paul Feyerabend's much-criticized 'no methodology' (Feyerabend 1975). But that modern medicine - that is successfully treating illness and disease, and underwriting heart, lung, knee, kidney transplants, and so much else, is adopted in all countries that are in a position to do so - is called a 'power discourse', is indicative of the standing and regard for science in the multicultural and cultural studies academic communities. So also is Tobin's sloganizing claim that it is: 'Scientism, crypto-positivism, neoliberalism, and meritocracy, among other factors' that enable such 'power discourse'. Clearly the above 'multilogical' claim is meant to function as philosophical insulation. But not all philosophical insulation works, sometimes criticism gets through, and this particular Kuhnian-inspired incommensurable insulation has been gotten through.

Perhaps in anticipation of the standard truth-related criticisms that are raised against his and other such claims, Tobin avers that:

The components of a multilogical bricolage are not systems of truth but are ways of seeing the world and making sense of what happens. By heightening awareness in new ways, possibilities for action are expanded and new directions are forged. (Tobin 2015)

But taking LSD also 'heightens awareness and opens expanded possibilities for action'. Science requires something more than just this. Leaving aside what 'multilogical bricolage' might mean, the idea of truth as a putative relation between an assertion (proposition, belief, or statement) and the world is not a monopoly of the West; all cultures are concerned with the separation of correct claims from fantasy. Wang Chong, the esteemed early Chinese

¹⁵ For philosophical appraisals of constructivism, see Matthews (2000, 2012, 2015 chap.8), and contributions to Matthews (1998).

naturalist philosopher of the Han Dynasty wrote in his *Discourses Weighed in the Balance* (ca. 80 AD) that: ‘no discussion which lacks facts and fails the test of facts can be convincing, no matter how appealingly it is phrased’. He constantly appealed to this principle to dismiss much of the Daoist superstitious and magical thought that had engulfed China in his time.¹⁶ Despite a long line of impatient undertakers, the correspondence theory of truth is still alive and far from being buried (Alston 1996, Devitt 1991).

All societies have a real interest in the separation of truth from falsehood; and more fundamentally, the separation of reliable truth-seeking processes (science) from unreliable, imitative, masquerading truth-seeking processes (pseudoscience). The interest of all cultures is ultimately served by knowing whether claims about the natural and social worlds are true or not true, correct or fanciful: Is the next village *really* one or is it ten miles distant? Is my brother *really* living here or not? Is this plant *really* poisonous or not? Are crocodiles *really* in the river or not? Sometimes these simple questions are not so easy to answer, but to say that such questions are a Western monopoly is nonsense. Repressive and obscurantist dictatorships of both Western and Eastern strip do not like the distinction between truth and fantasy being made as truth is a persistent enemy of power, but ultimately across all cultures, such questions demand to be asked. To say that they are Western or Eastern is nonsense.

Methodological Naturalism

Assertions made about the kinds, distribution, and powers of chi can be appraised by science. This is an inescapable conclusion of adopting ‘methodological naturalism’ (MN) in science; and such adoption, at least in pragmatic form, is required for any investigation to be scientific. The minimal claim that is widely accepted by philosophers, scientists and curriculum writers is that adopting MN is a requirement for any inquiry and explanation to be scientific. In Robert Pennock’s words:

... science does not have a special rule just to keep out divine interventions, but rather a general rule that it does not handle any supernatural agents or powers since these are taken by definition to be above natural laws. (Pennock 1999, 284)

The National Academy of Sciences in the USA affirms the same position: ‘Because science is limited to explaining the natural world by means of natural processes, it cannot use supernatural causation in its explanations’ (NAS 1998, appendix C).

Consistent with this historical and sociological reality, Stephen Jay Gould made his much-repeated declaration that science and religion occupy two independent non-overlapping magisteria (NOMA), with the magisteria of science concerned with the workings of the natural world, and the magisterial of religion or faith being concerned with the supernatural world and/or the realm of value and life’s ultimate meaning (Gould 1997). So, one cannot judge the other; the non-science domain is insulated from scientific appraisal. This became an almost universal dogma in science education debate and research. But it has been cogently criticized.¹⁷ As soon as a supposed ‘off limits’ body of beliefs makes claims about worldly processes and events, then science can appraise the claim. And chi beliefs have for thousands of years, as they do today, make claims about the natural world.

¹⁶ See, at least, Graham (1989).

¹⁷ See at least Boudry et al. (2012), Fishman (2009), Slezak (2012), and Stenger (1990, 2007).

While methodological naturalism (MN) has been widely supported,¹⁸ some have argued the stronger claim that ontological naturalism (ON) is a requirement of science. For Martin Mahner:

... metaphysical naturalism [ON] is a constitutive ontological principle of science in that the general empirical methods of science, such as observation, measurement and experiment, and thus the very production of empirical evidence, presuppose a no-supernature principle. (Mahner 2012, p.1437)

The simple reading of an instrument assumes that no supernatural entity or process is interfering with the causal chains linking the instrument to the natural process or event it is responding to. So not only does science require MN it also requires ON.

Whilst other philosophers have argued that it is a mistake to try to identify *any* presuppositions for science. For instance, Yonatan Fishman and Maarten Boudry argue that:

... science presupposes neither MN nor ON and that science can indeed investigate supernatural hypotheses via standard methodological approaches used to evaluate any 'non-supernatural' claim. Science, at least ideally, is committed to the pursuit of truth about the nature of reality, whatever it may be, and hence cannot exclude the existence of the supernatural *a priori*, be it on methodological or metaphysical ground, without artificially limiting its scope and power. (Fishman & Boudry 2013, p.921)

It needs be recognized that methodological naturalism (MN) is neither methodological nor ontological *materialism*. The latter characterized the Mechanical Worldview of the seventeenth and eighteenth centuries,¹⁹ but with the progress of nineteenth and twentieth century science, where there was recourse to stable, yet non-material, explanatory and causal entities (non-contact forces, fields, radiation, gravitational waves, etc.) materialist ontology became a hindrance rather than an asset for science; and such novel non-material entities became 'naturalised' and so a part of orthodox science.

The term 'physicalism' was coined for the methodology that allowed non-material, but scientifically verified entities to figure in scientific explanations; this term was also used for the ontological position that claimed only such scientifically verified entities actually existed (Stoljar 2010). Physicalism is proposed against vulgar materialism. Unfortunately, physicalism is standardly understood as 'vulgar materialism + extras', where the extras are fields, attractive forces, photons, and so on for all the other legitimate, accepted scientific explanatory entities. This still leaves matter as inert; a contention that needs be separately argued.

Mario Bunge has advanced and defended a detailed *emergent* materialist ontology that has the scientific gains of physicalism without its defects (Bunge 2003 chap.1, 2006 chap.1, 2009, 2012 chap.2). On the limitations of naturalism as historically conceived, he writes:

The great merit of naturalism is that it rejects magical thinking, in particular, supernaturalism. But naturalism is limited, for it denies the emergence of qualitative

¹⁸ The rich philosophical literature on the methodological and ontological presuppositions, if any, of science is reviewed in Fishman & Boudry (2013).

¹⁹ See at least Dijksterhuis (1961/1986), Harré (1964), Schofield (1970), and Westfall (1971).

novelty and consequently the qualitative distinctions among levels of organization – physical, biological, and social, among others. In particular, naturalism does not account for the specificities of the social and the technological. ... This alone suggests that naturalism should be expanded to encompass the artificial and the social. (Bunge 2009, pp.60-61).

In Bunge's amended naturalist ontology, *all* scientific entities have 'emergent properties'; when entities join, the aggregate has properties that the components do not have. No viable natural or social scientific ontology can be reductionist. At every level there are more complicated, but still natural, entities; and at each level – atoms, molecules, cells, organisms, people, populations, societies – the behavior of the whole cannot be resolved into the behavior of the parts. Reductionism is an un-scientific programme (Bunge 2001, chap.3).

Some maintain that scientific naturalism, of both methodological and ontological kinds, bias the appraisal of chi. Liu JeeLoo argues for a distinctive chi-naturalism, writing:

By emphasizing its *naturalistic* dimension, this chapter aims to show that even though this whole tradition of *qi*-cosmology falls outside the scope of contemporary natural sciences, it is nonetheless a rational, coherent and respectable view of nature. (Liu 2015, p.33)

He advocates a more relaxed 'Liberal Naturalism', and specifically a 'Humanistic Naturalism', that gives legitimacy to chi talk. Such a naturalism legitimizes chi-ontological claims such as:

Furthermore, the flow of *qi* runs freely within and without a person's body, hence one's bodily conditions are constantly affected by changes in the external environment. (Liu 2015, p.37)

But the argument has never been about legitimacy; all manner and means of views might be legitimate, the issue is whether the chi view of nature is 'rational, coherent and respectable', to use Liu's words. The argument of this book is that the chi view fails on each ground. And Liu's own proposed Humanistic Naturalism does not rescue the patient. He says that for Humanistic Naturalism:

The world consists of nothing but entities of the natural world and humans are part of this natural world. Furthermore, there can be no supernatural interactions with entities in the natural world. Natural entities are accessible to humans' cognitive capacities, and statements about the existence and nature of natural entities are truth-apt. (Liu 2015, p.36)

Scientific naturalism concurs with all of this; there is nothing specifically 'humanistic' about the characterization. Mario Bunge, a defender of scientific naturalism, is explicit in saying, against all reductionist programmes, that 'naturalism should be expanded to encompass the artificial and the social' (Bunge 2009, p.61). The issue with Liu's argument is whether the truth of 'truth-apt' claims about natural entities can be determined outside of science.

Chi as an Intervening Variable

One fall-back option for chi-theorists who wish to maintain the scientificity of their system and of the chi construct, yet who also acknowledge the reality that chi has never yet been found or measured, is to abandon the referential dimension of chi; to give up even muted-

realism about chi, and to swing over to seeing chi as an intervening variable not a hypothetical construct.

The distinction between theoretical terms that are hypothetical constructs and those that are intervening variables can be traced to the positivist Ernst Mach. It was developed by the Logical Empiricists and given prominence by the psychologists Kenneth MacCorquodale and Paul Meehl in their much-cited 1948 *Psychological Review* paper 'On a Distinction between Hypothetical Constructs and Intervening Variables' (MacCorquodale & Meehl 1948). For two decades this paper dominated methodological discussion in psychology.²⁰

For MacCorquodale and Meehl, to see theoretical terms (atom, field, electron, intelligence, libido, class consciousness, conscience, drive, magnetism, habits, will-power, mind, and so on) as having referents, as referring to entities that though unseen nevertheless exist and exert influence, is to see them as 'hypothetical constructs'. This is the standard realist interpretation of theoretical terms. The referents may or may not exist, but if the term is a hypothetical construct, then they are supposed to exist. But there is an honorable scientific alternative, namely the empiricist interpretation of theoretical terms whereby the terms are seen not to be making existence claims at all, they are just shorthand for linking together measured variables of interest; they are 'intervening variables'.²¹ So it is a mistake to look for intelligence in a person; it will never be found because it is not there. To say of someone that they have intelligence is merely to say that performance on test X is regularly correlated with performance on test Y and maybe with performance on test Z. We take good scores on tests X, Y, Z to mean that they have intelligence. And all of this is a matter of professional negotiation over tests, cut-offs, preparation and everything else. Having or not having intelligence is not an issue settled by holding something in a hand or looking through a microscope. On this interpretation, people do not *have* intelligence, they just *do* intelligent things. Similarly, a person does not *have* a high libido; to go looking for libido is a mistake. Rather to say someone has a high libido means just that in certain defined situations they reliably do certain things. Once again, all this is open to social and professional negotiation. Notoriously, libido goes up and down depending on the expectations and culture of the investigator. Despite the name, intervening variables do not intervene in the world; to do so requires existence; rather they intervene or link mathematical variables. They have a conceptual role, not a causal role.

Intervening variables are akin to dispositional properties (Cross 2005). To say a glass is brittle just means that when dropped it breaks; it does not mean that the glass *has* brittleness that can be pointed to. In advance of the manifesting behavior, there is nothing to be seen, no matter how closely one looks. To say someone is biased does not mean that they *have* bias, it just means that when put in certain situations they will behave in particular ways.

The conversion of intervening variables, or dispositions, into hypothetical constructs is commonly called *Reification* and is something that needs to be done with caution. Realists have learnt to proceed slowly on that front; the history of science is littered with rash and premature reifications of constructs that seemed good at the time.

The intervening variable or disposition option might seem an attractive one to chi theorists. We do not have to believe in chi; we admit there is no chi, there are just certain

²⁰ In 1974 it was still required reading in the Sydney University honours Psychology programme.

²¹ Bas van Fraassen is one well-known defender of this position (Fraassen 2002).

things that uniformly go together and chi names the uniformity. Contentment goes along with living by a lake with nice views. To say there is good chi by the lake, and hence comfortable living, adds nothing to what is already known. Doing certain exercises goes along with feeling of mental and physical ease. To say that the exercises have manipulated internal chi adds nothing to what is already known. Chi is just shorthand, in the way that intelligence, habits and class consciousness is. This is the position of the numerous chi theorists who end up saying that chi talk is just commonsense. Here, chi occupies conceptual space but pays no rent.

So, for instance, consider Lau Tzu's 5th century BC account of Dao, (cited in Chapter 3):

We look at it and do not see it;
Its name is The Invisible.
We listen to it and do not hear it;
Its name is The Inaudible.
We touch it and do not find it;
Its name is The Subtle (formless).
These three cannot be further inquired into,
And hence merge into one.

Or the previously cited claim (Chapter 5) of two chi-theorists that:

Life is defined by *Qi* even though it is impossible to grasp, measure, quantify, see, or isolate. Immaterial yet essential, the material world is formed by it. An invisible force known only by its effects, *Qi* is recognized indirectly by what it fosters, generates, and protects. (Beinfeld & Korngold 1991, p.30)

A chi realist would say that what is being looked for but not found is a hypothetical construct and we just need better and more appropriate instruments. They can maintain the faith and keep looking, and eventually perhaps lose their faith. Alternatively, a chi empiricist would say that chi is an intervening variable and cannot, in principle, be touched, smelt, grasped or heard. But this does not make the construct unscientific. It is exactly in the same situation as intelligence, drive, libido, mind.

But this empiricist refuge has its own problems.

- (1) Intervening variables link measured variables, but notoriously chi theorising is never accompanied by stable, reliable measurement in the way that, over decades, has been achieved by, for instance, intelligence testing. There are no chi-relevant stable measured variables; everything is chaotic and unmeasured. The presence or absence of chi varies with every observer and theorist, and literally for many, on the time of day and the day of the year. This is complete chaos from which stable intervening variables could never be rescued.
- (2) The measured variables are no longer the effects of chi, they cannot be generated or protected by chi, this can only be said if chi is a hypothetical construct, so there is no reason to use the term 'chi' as the name of any particular correlation. An intervening variable cannot explain anything; it has no existence, so it cannot have any explanatory power or function.
- (3) To give up realism about chi, that is to say it is not a hypothetical construct, is to abandon the entire 3-4 millennium long cosmogenic tradition that underpins so much Chinese and

Asian culture. Chi supposedly is the ultimate explanation of everything; if it explains nothing, then it has lost its cultural value and purpose.

(4) The intervening variable option wipes out the ‘mysteriumism’ on which so much feng shui promotion is based; intervening variable talk is bad for business. Recall Ernest Eitel’s observation (Chapter 7):

Well, if Feng-shui were no more than what our common sense and natural instincts teach us, Chinese Feng-shui would be no such puzzle to us. But the fact is, the Chinese have made Feng-shui a black art, and those that are proficient in this art and derive their livelihood from it, find it to their advantage to make the same mystery of it, with which European alchemists and astrologers used to surround their vagaries. (Eitel 1873/1987, p.1)

The intervening variable option is a case of getting out of the frying pan and into the fire. It becomes just the mouthing of words and the waving of hands. Neither of which advance anything except the bank accounts of shysters.

Chi as Metaphor

The final option for chi theorists who wish to retain the concept, whilst acknowledging that there is no non-inferential, immediate evidence for it, is to say that chi talk is metaphorical not literal. When it is said that chi is a special form of energy, what is being said is that chi is not literally a special form of energy, but rather it is like energy. The chi construct is a metaphor. This is not exceptional; mainstream science is replete with metaphorical constructs as was shown fifty years ago by Max Black (1962) and Mary Hesse (1966).²² The very ideas of natural selection, current flow, electron layers, light waves, light particles, covalent bonds, the ‘invisible hand’, and so on, are deeply metaphoric. It is routine in teaching science that students are told that a remote or new scientific idea A is like experiential or known idea B (Duit 1991, Holton 1986).

The metaphor option is standard and routine in theology. The gospel of Matthew (chap.2, 1-12) recounts how the three wise men from the east followed a wandering star that settled over Bethlehem and there in a manger they found, and gave homage to, the new born child. A scientific, literal reading of the gospel would lead, and has led, believing astronomers to search for such a star. Other believers have said that such a search is pointless as the gospel is not a scientific text, but a literary, religious text, and star-talk is metaphoric. The wandering star coming to rest simply needs to be understood in a non-literal manner. Science is irrelevant to the truth or falsity of the gospel’s account.

Likewise, the metaphoric chi theorist will say that chi exists and does all the things traditionally attributed to it, but it is ineffable, and as best we can do is say ‘it is like energy’. Again, this gives some immediate relief from investigative discomfort, but the relief is temporary. Concepts in science can begin as metaphors; but if they last, if they do work and get incorporated into an established theory, or become the basis for a new one, then they have to be cashed out. The strength of a bond has to be specified, what it can and cannot bond needs to be specified, mechanisms for the bonding needs be specified, quantification, prediction and experimentation all need to be undertaken. Without this, the chemical ‘bond’ concept is not scientific, it is just poetic talk. Ditto for natural selection, electron layers, and

²² For some of the significant philosophical literature on metaphor in science, see at least contributions to Hintikka (1994) and Machamer (2000). For metaphorical thinking in a larger context, see Ortony (1979).

so on. To keep insisting that core concepts are metaphorical is just lazy science; their use cloaks ignorance and so prematurely halts investigation: ‘Oh, so that is what it is like’.

For the purpose of this book, these fundamental philosophical arguments need just be noted, not solved. Students and teachers can themselves, with time and curricula allowing, follow up the arguments and literature.

Conclusion

Chi (*qi*) is not supernatural; yet it is peculiar and unknown to science. It is not supernatural because it is supposed to be a part of nature and putatively has an enormous range of impacts and influences. Once this is acknowledged, chi claims are in the realm of legitimate scientific inquiry. As outlined above, the amount of scientific testing of chi theory is inversely related to the vastness of the extraordinary empirical claims made for it. But the testing that has been done, confirms what is obvious: no chi-effect mechanism has been found or isolated; the bulk of scientific confirmations are simply repeating the fallacy of affirming the consequent, there are other explanations apart from chi for whatever effects are found; there is no tradition of sustained engagement with orthodox science, its community or its research journals.

The educational issue is to see how, when, where, and why these scientific and philosophical investigations might be included in school or university science programmes. It is obvious from all of the above that feng shui is a field ripe for deception, fraud and exploitation of the gullible, and any decent education should not turn the other way and give such fields a ‘free pass’ into society and culture. As mentioned earlier in the book, Matteo Ricci made just this observation about feng shui practice of his time: ‘Fraud is so common and new methods of deceiving are of such daily occurrence that a simple and credulous people are easily led into error’ (Ricci 1615/1953, p.84). The international reach of the web, and ease of electronic cash transfer, provides boundless opportunities to lead even non-credulous people into error or worse (Huston 1995).

The world is awash with magicians, con-artists and fraudsters. In the USA Jimmy Swaggart, Jim and Tammy Bakker, took multi-millions of dollars from their gullible audiences by selling their prayers, healing power, lotions and potions. The US alone has thousands of such corrupt practitioners who are on 24/7 TV and cable cycles.²³ Other nations, cultures, and faiths have their own ‘home grown’ fraudsters and ‘godmen’ that sell healing powers and potions to the desperately poor whose precious money could better be spent on food and medicine, but also to the fabulously rich and well-educated who could do something better with their spare money.

Notoriously, India is awash with Godmen who fleece villagers and sophisticates alike with empty promises and false hopes (Kovor 1978). In 2017 the Buddhist world was rocked by revelations that Grand Master, and mega best-selling, multi-translated author, Sogyal Rinpoche, was basically a sexual lecher who regarded devotees as groupies and treated them accordingly. In Brazil, the 76-year-old Joao Teixeira de Faria (John of God) has for 50 years been channeling spirits and energies in the isolated town of Abadiania in order to effect cures

²³ A recent disturbing study of five centuries of ‘crackpot delusion and make-believe’ in the USA is Kurt Andersen’s *Fantasyland* (Andersen 2017). Another study of magic and ‘dark arts’ belief in the USA is Wicker (2005). See also Schimmel’s *The Tenacity of Unreasonable Beliefs* (Schimmel 2008).

of every kind of illness and ailment (Pellegrino-Estich, R.: 2001). International groups, including an annual group from Australia led by an 'energy therapist', go on packaged 'cure trips' to his 'healing sanctuary' and stay in his accommodations. As well as channeling spirits and energies, John of God channels money: Brazilian police arrested him in December 2018 after he transferred \$9 million out of the country. When his residential estate was raided, false walls were found in which bags of jewels, gold and silver were found. After his arrest, 300 women have come forward alleging they were sexually abused by him. His biographer, and business manager, also published *The Power to Heal: A Clear, Concise and Comprehensive Guide to Energy Healing*. Everyone has an interest in such fraud; in separating con-artist chaff from evidence-based medical wheat.

The overarching claim of this book is that it is legitimate and beneficial to investigate these questions in science classes. Such investigation can be immediately beneficial for the students' understanding of the nature of science, but also beneficial for the cultural health of their society. It is irresponsible for teachers and curriculum writers to give this family of nonsensical beliefs a 'free pass'. Appraisal does not mean condemnation; the former can be conducted without the latter, and there are good educational grounds for this option. Nevertheless, if anyone has had a half-decent science education, hearing the words 'energy therapy' should set off alarm bells.