

COMPLEMENTARY AND ALTERNATIVE MEDICINE ON TRIAL

I have chosen to speak on Complementary and Alternative Medicine, reduced in the literature to CAM, and it is this acronym I shall use in my talk. Why CAM? Should a pathologist not speak of death and disease? Well, Mark, last year stole my topic of death, and, in some ways I see CAM as a form of disease, or at least the thinking behind much of CAM as a form of disease. Here, I am unrepentantly admitting bias and possible prejudice. This is not a good beginning for a trial, but I have called my talk ‘CAM on Trial’, partially with tongue in cheek so as to more fully engage the attention of lawyers in the audience, but also because CAM is “on trial” in our society, and is on the brink of gaining general acceptance, recognition and funding from governments, insurance companies and medical regulatory bodies. I find this very disquieting. I must also admit that there is an enormous amount of literature about CAM, and reading all this in preparation for this address has been something of a trial for me.

**“Scoff at all knowledge and despise
Reason and science, those flowers of mankind.
Let the father of all lies
With dazzling necromancy make you blind,
Then I’ll have you unconditionally...”**
Mephistopheles in Faust, Goethe

Let me begin by telling you a little about myself and, in so doing, possibly explaining my bias. I grew up in a medical family. My father was a cardiologist and my

mother has a home science degree. Science prevailed in our house. We were, I imagine, alone in New Zealand in using margarine instead of butter, purely on the basis of early scientific data linking atherosclerosis with saturated fat intake. This was in the 1960's a time when margarine was still only available as a prescription "drug" imported from Australia. I grew up in a world of chemistry sets, electronic kits, model aeroplanes, internal combustion engines, white mice and stethoscopes.

I vividly remember my father's indignation over the Milan Brych affair in the 1970's. Brych, as many of you will remember, was at the time treating cancer patients with apricot kernels and making false and extravagant claims about his success. I remember my father, together with a group of other consultants, in a rare display of medical unity and political activity, threatening to resign from Auckland Hospital if Brych and his apricot kernels were not banished. Such was my upbringing.

These were still the days when there was a general belief in the validity of scientific method, and a respect for all the sciences, medicine included. And it was in this atmosphere that I studied medicine at Auckland Medical School and went on to work as a general practitioner for 8 years.

I have been asked many times what made me give up a successful practice as a GP in Remuera and embark, with young children and a large mortgage, on a long period of training in pathology. And the answer, in a nutshell, is, I suppose "science". I grew tired of having to talk mothers into having their children vaccinated. These generally

well educated and socially privileged women could accept that diphtheria, polio and tetanus were still real and potentially deadly threats, but still somehow managed to convince themselves that their little Samantha or Benjamin would be healthier without the jab.

Remuera and Meadowbank also had, at that time, what seemed an inexhaustible supply of patients with ME (myalgic encephalomyelitis). Now, I'm still not sure what ME is – probably a combination of post viral syndrome and depression, but what I am certain of is that I couldn't treat it! I could listen. I could be sympathetic and supportive, and I could treat some of the more specific symptoms - but that was all. I spent large parts of my days listening to unhappy housewives with symptoms of chronic fatigue, systemic candidiasis, lack of concentration, muscle pains, low grade depression, sleep disturbances, lost libido, indigestion and failing marriages, all in pitiless detail.

About this time I started receiving courteous, often hand written notes on textured paper headed in ornate curlicue script with the name of this or that homeopath, iridologist, acupuncturist or herbalist, often followed by a long string of small acronymic capital letters. These practitioners all appeared to live and work in Titirangi or Mt Eden, and they all seemed a great deal more successful than me in treating my ME patients. I remember being both slightly peeved and enormously relieved!

There were many issues at play here, but basically I saw a situation in which people with a probably real, but rather nebulous and undefined illness, were seeking and receiving treatment from various CAM practitioners using equally nebulous and poorly defined methods, some with purported success.

I consoled myself with notions of care and compassion. Conventional medicine, I thought, did not hold **all** the answers - yet. I began to suspect that some of the drugs I prescribed for many conditions were, at best, unnecessary. However I continued to prescribe them because of the need to “do something”. I was becoming lost in a sea of subjectivity.

Sir William Osler, the great Canadian physician, wrote reassuringly:

“A doctor may have practice and no theory, art and no science.” This was all very well for him, but it was not for me. Soon after this I sold my practice.

I imagined pathology being, in effect, the scientific foundation of medicine, would provide me with satisfaction and a degree of intellectual and professional integrity that had become so elusive in general practice. And in many ways I was right.

My concerns about the efficacy and regulation of CAM were re-activated on encountering two patients, both from Waiheke Island, who had had their melanomas ‘treated’ by a herbalist. The application of some sort of caustic paste had caused partial necrosis of the tumour,

and hence a supposed cure, with good hard overlying scar to reinforce the success. One of these patients has already presented with lymph metastases in his lymph nodes.

So when it came to finding a topic for this address, you can imagine my relief on encountering this article in a recent edition of the New Zealand Herald.

I imagine many in the audience read the article at the time. It appealed to me immensely. Not only did it offer a complete vindication of all my suspicions about the efficacy of CAM...but the article quoted from the Archives of Internal Medicine, I thought would provide me with all the data I would need in one easy hit. Writing this address could be accomplished with little more effort than a bit of skilful cutting and pasting, and a bit of padding.

Well, the first, and possibly most serious problem I encountered was that the quoted article did not exist. I searched all recent editions of the Archives of Internal Medicine thoroughly, first electronically, and then physically. Then I searched the Annals of Internal Medicine, just in case there had been a printing error. There had not. Johann Hari a writer for the Independent, and the author of the article published in the Herald, had taken enormous liberties. Certainly there were articles on CAM in the Archives of Internal Medicine, even one or two meta-analyses of CAM data, but there was no single article which specifically supported the sweeping claims he made.

Not to be deterred I did my own literature search, and it is the results of this I will present to you and discuss.

But first I want to very briefly define CAM, and outline the main modalities of CAM.

Definitions

The recent Ministerial Advisory Committee on CAM (MACCAH) uses a definition and classification of CAM adapted from the United States National Centre for Complementary Medicine.

“A BROAD DOMAIN OF HEALING RESOURCES THAT ENCOMPASSES ALL HEALTH SYSTEMS, THEORIES AND BELIEFS OTHER THAN THOSE INTRINSIC TO THE POLITICALLY DOMINANT HEALTH SYSTEM OF A PARTICULAR SOCIETY OR CULTURE IN A GIVEN HISTORICAL PERIOD”

The very language of this definition is couched in disquiets me. It assumes a definition for CAM that is going to endure all histories, all politics and all thought systems. The American National centre for complementary and alternative medicine (NCCAM) from which this definition is derived is more modest in its range and aspirations.

“A BROAD RANGE OF HEALING PHILOSOPHIES (SCHOOLS OF THOUGHT) APPROACHES AND THERAPIES THAT MAINSTREAM WESTERN (CONVENTIONAL) MEDICINE DOES NOT COMMONLY USE,

ACCEPT, STUDY, UNDERSTAND OR MAKE AVAILABLE”

CAM is really an umbrella term that represents a large residual category of health care practises,

GENERALLY DEFINED BY THEIR EXCLUSION AND ALIENATION FROM THE DOMINANT MEDICAL PROFESSION.

Historically the boundaries have shifted – for example. nitro-glycerine and digitalis began as alternative drugs, just as cornflakes began as an unconventional health food. Ironically, in the 1960’s my father’s margarine habit may well have labelled him as a CAM user.

Also entire professions change sides. In 1903 when the American medical association needed a larger referral base for its specialists, and new allies in its fight with Osteopaths, Chiropractors and Christian scientists, it boldly reversed its policy and declared homeopaths to be conventional MDs. Like-wise osteopathy ceased being a renegade profession in America after WWI.

CLASSIFICATION OF CAM

The classification system used by MACCAH is again an adaptation of that used by the United States Centre for CAM.

The American classification system is more comprehensive and divides CAM into two types – one that appeals to the general public, and another that

confines itself to specific ethnic and religious groups. These are then subdivided under various subtitles.

I shall run through each of these very quickly and give just a very brief summary of their methods and philosophies.

PROFESSIONAL SYSTEMS

Chiropractic

Osteopathy

Acupuncture

Homeopathy

Naturopathy

Massage

Dual trained doctors

Chiropractic is based on the belief that the body's biomechanical structure, especially the spine, is basic to health, chiropractic emphasises spinal manipulation as treatment.

Osteopathy – was once a second manual therapy competing for the same patients as chiropractic.

Acupuncture – relies on the insertion of fine needles at specific sites to regulate and balance humoral forces and 'energy' (qi). As a component of East Asian medicine acupuncture is often complemented with herbal treatment.

Homeopathy – is a 200 year old therapeutic system that uses small doses of various substances to “stimulate auto

regulatory and self healing processes” homeopathic medicines are prepared by serial dilution and shaking, which proponents claim imprints information into water.

Naturopathy uses a wide assortment of therapies that its practitioners call ‘natural’. Herbs, nutritional supplements, dietary and life style advice, homeopathy, manipulation and counselling are components of the naturopathic repertoire.

Massage therapists – also called ‘body workers’ or ‘hands-on therapists’, perform unorthodox interventions, but can overlap with recognised biomedical professions such as physical therapy and relaxation therapy.

POPULAR HEALTH REFORMS

Megavitamins

Nutritional supplements

Botanicals

Macrobiotics

Organic food

Vegan diet

Popular health reforms (alternative dietary and lifestyle practises). – These are an important component of CAM, and may in fact dwarf the professional sector in terms of use and expenditure. Its advocates are often untrained laypeople who claim knowledge superior to that of expert scientists. This movement usually espouses diets of various kinds – high protein, vegetarian or vegan, and avoidance of chemically treated or genetically altered food.

NEW AGE HEALING

Esoteric energies

Crystals and magnets

Spirits and mediums

Reiki, quigong

New Age Healing is the source of many extremely disparate beliefs and practises that includes overlapping religious and healing movements. Instead of any fixed religious doctrine, the movement emphasises a fluid spirituality. It is not uncommon to see an iconography that is a grab bag of Hindu, Christian, Buddhist, Rosicrucian and pagan motifs.

The New Age is also a health category because spiritual equanimity and physical health are considered to be linked. In fact, New Age beliefs resist any separation between spirituality and physical health or faith and medicine. It employs esoteric energies that resemble an ‘electromagnetic’ dimension of wellness. The names of these energies change – life force, universal innate intelligence, psychic, Para psychological, psi, astral, spiritual vital force – but they elude scientific detection. Healers, devices and substances can transmit these forces.

MIND-BODY

Deepak Chopra

Bernie Siegel

Courses in miracles

Silva mind control
Cognitive –behavioural therapy
Biofeedback
Hypnosis
Guided imagery
Relaxation response

‘Mind Cure’ or ‘New Thought’ are CAM therapies which can include an assortment of visualisations, affirmations, intentions, meditations and emotional release techniques. All share a single point: Mental forces are the pre-eminent arbiters of health. The notions that “What you think is what is real” and “your emotions determine cancer or other major disease” are dogma repeated over and over like mantras. Such best sellers as Bernie Siegel’s ‘Love, Medicine and Miracles’ and Deepak Chopra’s “Ageless Body, Timeless Mind: The Quantum Alternative to Growing Old” testify to the appeal of these beliefs.

The other sector of CAM ‘mind body’ therapies merges into conventional psychotherapy and cognitive behavioural interventions. This can produce gray areas. Generally speaking, in conventional medicine, psychotherapeutics is conceded only limited agency and is primarily used to treat psychological problems or to help patients cope when conventional treatments are not available or insufficient.. However whenever too much power or efficacy is attributed to regular psychological therapies they ‘transgress’ and can become CAM. For example most doctors would consider psychotherapy appropriate treatment for reactive depression after a

cancer diagnosis, but psychotherapy used to treat a metastatic tumour would be considered unconventional.

NON- NORMATIVE SCIENTIFIC ENTERPRISES

Chelation

Antineoplastons

Pleomorphic bacteria

Cancer vaccines

Iridology

Hair analysis

Non normative scientific enterprises typically appeal to patients with potentially catastrophic illnesses, such as cancer. These therapies can include sophisticated pharmacologic agents, and often revolve around a well know proponent who can have a legitimate or even impressive scientific or medical credentials but advocates theories and practises unacceptable to the general scientific community. Examples include Dr Burzynski's "antineoplastins" and Dr Livingstone-Wheelers "pleomorphic cancer vaccines". Unvalidated diagnostic methods and unconventional technological devices that diagnose or heal can also be considered part of the non-normative science category. Examples of these include hair analysis, iridology, and chelation therapy.

The second Category:

PAROCHIAL UNCONVENTIONAL MEDICINE

ETHNOMEDICINE

Traditional Maori medicine
Puerto-Rican spiritism
Haitian vodun
Hmong practices

These CAM therapies are generally limited to a specific culture. Occasionally a culture bound medical system ventures outside its historical sphere of influence and becomes another option for a wider population. This is true of acupuncture and seems to be coming true for India's Ayurvedic medicine.

RELIGIOUS HEALING

Pentecostal churches

Catholic charismatic renewal

Christian science

Many people rely on religion for salutary effects on their health. Generally, normative main stream religious institutions have seen their role as supporting the ‘spiritual dimension’ however there is an increasing trend for ‘healing’ services of one kind or another, particularly in Christian churches in which this ministry is seen as replicating the miraculous healing recorded in the bible Christian Science, whose origins may be closer to Mind Cure than to Christianity, also continues to be an important source of healing, particularly in America. Finally, some religious denominations such as Jehovah’s witnesses are known for non-adherence to normative procedures.

FOLK MEDICINE PRACTICES

Copper bracelets for arthritis

Chicken soup for the common cold

Red string for a nosebleed

Folk medicine is often a deeply embedded, un-organised and seemingly spontaneous responses to illness. It is often geographically specific, and can be traced back to remnants of ethnic traditions, magical traditions, or

earlier lay forms of self care and home remedies. Common practises include wearing a copper bracelet for arthritis, covering a wart with a penny, or curing a cold with chicken soup. Some folk practices have more wide spread currency and are derived from pre-modern medicine, such as Hippocratic medicine. Examples of remnant Hippocratic ideas include such folk wisdom as ‘Bundle up to prevent a cold’ or ‘Feed a cold and starve a fever’.

PREVELANCE AND COST OF CAM

Over the last 20 to 30 years there has been a significant trend, particularly in first world countries, towards increased acceptance and use of CAM. I imagine there is at least one, and probably more, dual trained practitioner in the audience, and I would be surprised if most people in the audience had not, at some time, availed themselves of some form of CAM therapy, even if only in the form of arnica or a vitamin supplement. Interestingly 60 – 70% of patients who use CAM do not disclose it to their clinician.

A survey conducted by the Ministry of Health of NZ in 2002/3, in which 12,000 adults were interviewed and asked “In the last 12 months, did you see any complementary or alternative worker or traditional healer?” yielded the following data.

Cost is more difficult to assess, as most CAM is patient funded, with, as yet, only a small proportion of funding

coming from insurance companies and other agencies. As a rough index, 21.2 billion dollars was spent by Americans on CAM in 1997, and this rose to 27 billion dollars when other CAM expenses such as nutritional supplements and CAM books were included. By comparison, out of pocket spending on conventional medicine in the same period was 34 billion dollars. Spending in the UK is currently estimated at over one and a half billion pounds a year. Spending by New Zealanders would be proportional to these sums.

So, just how effective is CAM?

Most in the audience tonight will have correctly assumed that results of the overview of CAM reported in the Herald by Mr Hari from his mysterious non-article are misleading. Well they are, but only slightly. Let me give you the good news first.

Chiropractic spinal manipulation can be beneficial for both acute and chronic lower back pain, but is no better than conventional treatments.

Acupuncture has been shown to be effective for post-operative dental pain, post operative nausea and chemotherapy related nausea and vomiting.

There is some evidence suggesting that Glucosamine is of benefit in arthritis.

Horse chestnut seed extract is of some possible benefit in the treatment of chronic venous insufficiency.

Garlic has been shown to have a very modest effect in lowering total cholesterol levels. This effect may not be of therapeutic significance.

I have drawn these conclusions from an extensive search of the literature, and in particular, I have used data from large well constructed studies, with a **level of scientific evidence** of either one or two.

Many of the studies I have drawn data from are systematic reviews or meta-analyses of large randomised controlled trials. Some are meta-analyses of meta-analyses!

The bad news is that there is no convincing scientific evidence to suggest **any** therapeutic benefit (apart from placebo effect) from any other CAM modality, or for acupuncture or chiropractic except in those specific conditions listed above.

Homeopathy, and all other herbal, new age, non-normative ethno-medical, mind body, religious and folk remedies appear to be a complete waste of time and money. Some are potentially dangerous.

Now one has to ask how this situation has occurred. Just where are the emperor's new clothes, or should I ask, who is wearing them.

There are several arguments and theories put forward to explain the widespread prevalence and acceptance of CAM, despite the lack of any scientific evidence to supporting.

CAM advocates will argue that **under-funding** by governments prevents them from obtaining adequate data. This is not true. There are several very well funded CAM research institutions around the world, with over three million dollars of government money recently allocated in America to just one research foundation for acupuncture and homeopathy. The funding in Northern European Countries, the UK, and America, though not as substantial as that for conventional medicine, is still enormous.

One typical example is that of Elisabeth Targ, M.D who recently had a **“double blind study on the effects of distant healing” published in the Western Journal of Medicine**. Dr Targ is the recipient of over **two million dollars of public funds** that have been used for two studies on distant healing in patients with HIV and Glioblastoma. Experienced “Distant Healers” from several different traditions – Christian, Jewish, Buddhist, Native American and Shamanic were given subject information packs including personal data, colour photos, blood test results etc. The healers were instructed to open their packs and to work on the assigned subject for an hour a day for six consecutive days.” The results, not surprisingly were inconclusive.

More perniciously, CAM advocates argue that conventional studies and techniques are inappropriate or inadequate for assessing CAM. In the recently launched journal “Alternative Therapies’ the editor inveighed as follows –

“While the double blind method of evaluation may be applicable to certain alternative therapies, it is inappropriate for the majority of them. Many alternative interventions are unlike drugs and surgical procedures. Their action is affected by factors that cannot be specified, quantified, and controlled in double blind designs....To subject alternative therapies to impersonal double blind conditions strips them of intrinsic qualities that are part of their power.”

This is, in effect, saying that not only do many CAM modalities work through non-scientific principles, but the measurement of their efficacy must also be somehow intuitive.

Yet the most frequent and worrying argument as to why CAM has become so popular and widely accepted is that it is driven by market demand. CAM is simply here because people need it. Traditional evidence based medicine has some how failed to give society what it needs, it does not treat the patient “holistically”. In April 1993, in the NZ Medical Journal, Professor David Cole wrote:

“There is a perception that science has failed humanity. For many, the errors of science can be symbolised in the destruction of Hiroshima, the birth of deformed babies after thalidomide and the scandals at National Women’s Hospital. Anti-science attains its dizziest height in television advertisements where margarine is revealed as bad simply because of

its chemical nature, and butter is regarded as good because it is natural.”

Things have only got worse over the last twelve years. It is this deterioration in the value of science, and validity of scientific method, both in the general public, and unfortunately, amongst health professionals, that I want to address in the remainder of my talk.

Some of my remarks which follow are gleaned from an excellent essay by Wallace Sampson called “Antiscience Trends in the Rise of the Alternative Medicine Movement” but many others are gathered from a wide range of sources. I believe this is an area of critical importance and some urgency. When I hear Ms Fitzsimmons, co-leader and Health Spokesperson for the Green Party, recently advocating on National radio the funding of many CAM modalities, including traditional Maori healing, purely on the basis that they have been around for two thousand years or more, my heart sinks. When an individual holds to such confused and irrational (dare I say pathological) thinking it is sad, but when that person has potential to affect government policy, it is, I think, downright dangerous.

In one of his aphorisms in ‘Beyond Good and Evil’, Nietzsche remarks:

“Madness is something rare in individuals – but in groups, parties, ages, it is the rule.”

I believe that the unquestioning acceptance of many CAM treatments by the general public, politicians and

public health policy makers is a form of collective madness.

Sampson, in his essay, accuses “**propaganda, cultural relativism, and other post modern doctrines that challenge objectivity – ‘deconstruction’ for example, of being integral to today’s anti-scientific thinking**”

I want to expand a little on these areas and then finish by talking about “magical thinking”.

Propaganda, defined as the intentional and at times cynical manipulation of language to reconstruct perceived reality, thence to alter beliefs, with the intent to alter and control behaviour, is the most effective and pervasive assault on science.

Samuel Hahnemann coined the words “**homeopathy**” and “**allopathy**” 200 years ago. Homeopathy, described his philosophically based method of treating disorders with materials which, in larger doses produce the same (homeios) symptoms, in the hope of strengthening the bodies reaction against disease. Hahnemann successfully branded all conventional medicine as **allopathic** (meaning treatments that oppose symptoms), despite the fact that the allopathic method is only part of what physicians use. Scientific medicine seems to be stuck with the term, which now carries negative connotations – “**treating the symptom and not the disease**”.

In the 1960s Laetrile inventor Ernst Kreb used similar word plays with his two invented drugs by first of all calling them “**Laetrile**” and “**Pangamic**”. These were euphonious, appealing names, however the compounds were extracted from apricot and other fruit pips containing cyanogenic glycosides. In other words, they contained significant amounts of cyanide. Kreb initially gave these compounds a generic label of ‘**nitrilosides**’ avoiding any mention of the cyanide containing moiety. Then, when the FDA began seizing Laetrile and bringing fraud charges, Kreb relabelled it Vitamin B 17, and called it a food supplement.

There are many similar stories – Linus Pauling invented “**orthomolecular**” and defined it as ‘**the right molecule in the right place at the right time**’. He advocated that every one take massive doses of vitamins daily to cover all bases, finally concentrating on vitamin C. Orthomolecular claims and theories were demolished by a series of research projects on the common cold, cancer and mental illness in Canada and America, but they are still believed by many.

In the 1970s advocates of the Holistic movement perpetrated another exercise in linguistics. Rational biomedicine was labelled “**reductionistic**” and rational thinking excessively linear. Unscientific thinking was rechristened “non-linear”, and thus more modern, like non-Euclidean geometry. Concepts such as **spirit, mind and consciousness** were inserted in the equation, further diminishing the status of measurement and rationality.

Alternative medicine pseudoscience promoters have now invented for themselves a dictionary of the absurd:

Alternative	Organic	Metabolic therapy
Unorthodox	Life force	Non-toxic
Unconventional	spirit	homeopathic
Non-traditional	healing	essence
Complementary	Power	paradigm change
Holistic	Natural	energy
Orthomolecular	Aura	Eastern medicine

CULTURAL RELATIVISM

In the early 20th century social anthropologists developed the notion of analysing other cultures within a value-free system. This allowed a culture to be seen as a functional whole, without the intrusion of observer prejudices, thereby creating a more tolerant political view of one culture or nation by another. This is all very well and good, however this “**value free analysis**” has promoted the advance of pseudo-science in many areas. The validity of information is forced to take second place to emotion and comforting philosophies. Two generations of students are now taking their places in society having been educated to see scientific as well as social problems in a content- and value- free way. They seem unable to distinguish fiction from fact, or to evaluate the probabilities of validity. Even when they can detect fiction or estimate probabilities, it seems not to matter much to them.

POSTMODERNISM

Postmodernism – embodied in deconstruction, among other doctrines- takes relativistic cultural analysis one step further.

Value-free cross cultural analysis states that science has validity within the community accepting its point of view, without necessarily being any more valid than pseudoscience.

Postmodernism posits that there is not necessarily any validity at all in to the scientific view, which is taken to represent the prejudices of a system dominated by European males. The various forms of postmodernism are appealing to the young who hold firmly and emotionally to anti-establishment views.

I want to finish this address by talking about briefly about **magical thinking**.

“Homeopathy and other popular therapies demonstrates ancient and universal principles of magical thinking, which recent research suggests is fundamental to human cognition, even rooted in neurobiology.” Phillip Stevens, anthropologist.

Many of today’s CAM modalities involve ‘magical beliefs’, manifesting ways of thinking based on principles of cosmology and causality that are timeless and absolutely universal. So similar are some of these principles among human populations that cognitive scientists have suggested that they are **innate to the**

human species, and this position is being strengthened by current scientific research.

We are magical beings in a scientific age. Notwithstanding all the remarkable scientific achievements of our species in terms of understanding and harnessing nature, **we are born to magical thought and not to reason.**

Our nervous system is hard wired to learn through two main processes –

SIMILARITY/RESEMBLANCE AND TEMPORAL CONTIGUITY

What a child learns about one object or event will automatically be attributed to a similar object or event, unless they have enough experience to differentiate between them. Salient events that occur closely together in time automatically become associated in the brain. As the child matures a second form of knowledge acquisition occurs through the process of mental manipulation of ideas and concepts using non experiential information that is taught or absorbed. Thus, as adults, human beings relate to, and learn about the world in two distinctly different ways. One of these is tied very closely to automatic associations that the nervous system constructs on the basis of temporal contiguity and resemblance, while the other is logical, analytical and largely verbal. There is good data to show that people's thinking is transformed by the presence of emotional arousal. The more aroused they become, the more their thinking is non-analytical, concrete and action

oriented, all attributes of the experiential system. Thinking that occurs in a highly emotional state often seems more obviously valid to the thinker, but is not always accurate or cogent.

This automatic experiential learning is the basis of Magical Thinking. It relies on the acceptance of resemblance or co-occurrence as indicators of some sort of link or causal relationship between two objects or actions, without any concern about the actual reality of that link or relationship. This promotes survival as well as understanding of the world around us, but it also leaves us open to egregious errors. It occurs in animals as well as humans – a pigeon in a cage where grains of food fall from a chute on a random basis can be observed to develop superstitious behaviours based on what it was doing at the time of a food delivery. If it happened to have lifted one foot at the time of the last delivery it is likely to continue to hop on one foot from time to time, as if trying to produce the food. Occasionally the food will appear while it is hopping on one foot, reinforcing the behaviour that in reality has nothing to do with the food arriving.

Similarly, crossing our fingers may seem to produce desired outcomes, just as taking large doses of vitamin C may seem to protect against colds, or the supplication of Jehovah or Krishna or Zeus may seem to ward off danger. And of course, **seeming is reinforcing; one might even say, seeming is believing.**

Many research studies have shown that individuals have little ability to judge correlations between a series of

events, and this includes scientists and professional statisticians.

Even if paranormal phenomena do **not** exist, the workings of the brain are such that it is likely that most people will, sooner or later, experience something that seems paranormal – be it in the form of telepathy, psychokinesis, precognition or whatever. The experience of the paranormal most often involves an emotionally striking co-occurrence of two events. One is about to call Uncle Harry to whom one has not spoken for some months: as one reaches for the telephone it rings, and it is Uncle Harry calling. The pigeon gets its food! This is the neurological basis of magico- religious thought.

Science and magico-religious thought both attempt to make sense out of nature. Co-occurrences are important in both. However, unlike magico-religious thought, a basic goal of science is to discriminate between patterns that are meaningful and those that are not. It is only science that attempts to evaluate whether or not coincidence accounts for observed co-occurrence. Science is in part a social enterprise in which the observations and conclusions of a single individual are fully accepted only if they can be verified independently by other researchers. Collective rather than individual validation of findings is paramount.

However, when science is taught, it is almost always taught without any reference to existential or transcendental questions, thus allowing students' transcendental beliefs to continue to escape logical analysis and reinforcing the notion that science need not

concern itself with transcendental beliefs. **This in turn helps nourish the notion that science is limited and that putatively transcendental phenomena lie in a realm or reality beyond science.**

Many scientists are religious; many believe in psychic phenomena based on their own experiences and emotional needs. We are left then in a situation of conflict between experiential learning and logic, between faith and science.

As William James, himself deeply interested in both science and the paranormal wrote:

“At one hour scientists, at another they are Christians or common men, with the will to live burning hot in their breasts; and holding thus the two ends of the chain, they are careless of the intermediate connection.”

Every one of us is vulnerable to magical thinking, whether we recognise it or not; and those who fail to recognise it are most likely to be vulnerable to a conversion experience. **The critical thinking and data gathering methods that make up science have proved to be the most effective system we have for protecting ourselves from error and self-delusion.** They are the product of centuries of intellectual activity, but they do not come easily to the human brain. We need to be as concerned for their survival as we are about the survival of the rain forests and other endangered treasures. To sit back and allow politicians, health administrators and educators to ignore or erode the principles of scientific

method, as is currently happening in New Zealand, is to invite disaster. This does not mean we must reject the spiritual component of ourselves in our personal lives, but it does mean we must clearly separate it from our professional decision making processes. Science must remain secular, objective and inviolable.

I want to end with a quote from Lou Reed, taken from his album Magic and Loss. I think we all need magic to take us away, but I believe this will be found in science, not superstition.

**“Doctor you’re no magician – and I am no believer
I need more than faith ...can give me now
I want to believe in miracles – not just belief in numbers
I need some magic to take me away.”** Magic and Loss, Magician,
Lou Reed