

conceptual mapping, and a nice balance between classical and contemporary views. His chapter on Vedanta focuses on the predominant school of Advaita with particular reference to the nature and possibility of pure consciousness. Other schools of Vedanta are not discussed, in particular the minor school of Bhedabheda, whose cosmological outlook of “unity in difference” in this reviewer’s opinion not only poses a viable alternative to the nondual Advaita but also suggests practical applications in various cross-cultural interfaces.

Rao’s integrative analysis of the psychological, philosophical, and cultural aspects of various theories of meditation is as fine as I have seen in a single paper or chapter. His review of the Transcendental Meditation literature unfortunately does not extend to the recent attempts of the TM organization to experiment with and document the “Maharishi Field Effect,” variations of which are now being applied to crime, war, and other social ills. Indeed, this is but one of many claimed interesting effects that a properly focused consciousness may be instrumental in bringing about, for example, in the use of visualization for self-healing or the focusing of unconditional love to assist the healing of self or others. Academics are generally inclined to write off such ventures as too “New Age” to merit serious research. I prefer to call this part of the evolving “New Paradigm Dialogue” that is slowly making its way into mainstream cultural awareness. In another ten years, books like Rao’s will carry major sections devoted to just such explorations.

Any comprehensive undertaking in the field(s) of consciousness studies is bound to omit topics of importance in someone’s eyes. Such omissions as I have drawn attention to do not substantially detract from Rao’s impressive cross-cultural project or from my recommendation of it for students and colleagues interested in this version of the “final frontier.”

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The Emerging Science of Homeopathy: Complexity, Biodynamics, and Nanopharmacology (rev. ed.) by Paolo Bellavite and Andrea Signorini. Engl. trans. by Anthony Steele. Berkeley, CA: North Atlantic Books, 2002. xii + 409 pp. \$27.95 (paperback). ISBN 1-55643-384-0.

Aimed at physicians, this book is a serious work in academic style with exhaustive referencing to peer-reviewed journals. The reasons for the near downfall of homeopathy in the USA and its many limitations are frankly acknowledged; but hundreds of positive examples of it are given, refuting the epithet of “The Ultimate Fake” applied by certain skeptics (Kauffman, 2002a). For treatment of diseased individuals with particular symptoms, a drug (or mixtures) that cause(s) similar symptoms in healthy, sensitive individuals (“provings”) is given to those with the symptoms in high dilutions, sometimes

bringing relief. This is “the law of similars” (pp. 5, 351). Dilutions corresponding with molarities of 10^{-6} to 10^{-20} are most common and contain many molecules of the active substance(s); but there are reports of positive effects of much more extreme dilutions (pp. 71–72), and it is these “no-dose” remedies in particular that generate endless contempt for the practice (p. 192). Another wrenching oddity of homeopathy is that each dilution must be shaken violently (succussed, dynamized, vortex mixed) or the effect is lost! Another related mystery is that homeopathic preparations kept for more than a few months lose their effectiveness (pp. 10, 11, 19, 28, 169, 245, 259, 263, 288, 291). The preparations can be derived from almost anything; thus some homeopathic treatments closely resembled immunizations (pp. 24–26). As originally developed and practiced, homeopathy was an empirical response to desperate needs and an almost total absence of biochemical knowledge.

Homeopathic treatments are used by 30,000,000 people in Europe today (p. 1), and are popular in Brazil and South Asia (p. 33). Practitioners often try a placebo first, then active remedies to see whether there is any difference. Children and animals respond well (p. 39). The most responsive afflictions are those in which very complex interactions take place and in which the amount of irritant is also very small, such as infections, allergies, pain, and mental disorders (p. 43). For example, in the London cholera epidemic of 1854, the mortality rate for patients in conventional hospitals was 53.2%, vs. 16.4% in homeopathic hospitals. In an American yellow fever epidemic in 1878, patients receiving homeopathic treatment had mortality rate one third of those on conventional treatment (p. 21).

Conventional physicians and pharmacists opposed homeopathy from the start as an economic menace to these established professions, partly because homeopaths were honestly contemptuous of the toxic medicines [mercury(II) chloride, potassium nitrate, opium, *nux vomica*] conventionally used in massive doses to treat symptoms directly. On the formation of the American Medical Association (AMA) in 1846, one of its first objectives was to stamp out homeopathy (p. 22), in which it almost succeeded in the USA by 1960. What helped the AMA was that 1940–1960 was the golden age of antibiotics (before resistance), as well as the era of new anesthetics, decongestants, steroids, anti-histamines, and other classes of effective drugs (pp. 21–23).

The book is arranged in a mostly logical fashion, with the basic principles, history, philosophy and status of homeopathy first (pp. 1–36); evidence for effectiveness in humans next (pp. 37–55); then studies on animals and isolated organs and cells (pp. 56–85). Then a discussion of the complexity of biological processes, concentrating on inflammation and cancer, with chaos and fractals thrown in (pp. 86–192); then an explanation of the law of similars in terms of perturbation of homeostasis by disease, and restoration by appropriate diluted homeopathic preparations (pp. 193–243). This is followed by “The Biophysical Paradigm” in which the properties of water, electromagnetic fields, electroacupuncture, chaos, fractals, oscillations and resonance are addressed to explain

the effects of very high dilutions (pp. 245–301); then future expectations for the field (pp. 302–306). Two appendices follow, which seem to be very recently written reviews with their own references, and which cover the same ground as the main work, but with slightly different views (pp. 336–402).

Amid a plethora of evidence for the effectiveness of homeopathy, both in placebo-controlled trials (Kleijnen et al., 1991) and on animals and isolated cells or organs (pp. 37–83), the infamous Benveniste result, published in *Nature* in 1988 because a refutation was at the ready, was tackled head-on. A 5-center study directed by Jacques Benveniste reported the % degranulation of human basophil cells (a type of white blood cell that contains easily stainable granules) by means of diluted preparations of anti-immunoglobulin-E (IgE) at dilutions from 10^{-1} to 10^{-60} M. Vortex mixing for 10 sec at each dilution was essential to achieve the effect. Peak degranulation at 10^{-2} M of 85% was followed by an irregular cyclic pattern on successive dilutions in which there were troughs of degranulation of only 2–18% interspersed by peaks of 35–50%, including 45% at 10^{-58} M! (Such a cyclic relationship, not unique to this study, is the fourth great mystery of homeopathy.) A group of non-experts failed to reproduce this effect, so the editorial board of *Nature* pilloried Benveniste. The Benveniste group repeated its own work, honestly noting that the result was not as striking as in the 1988 report, but still present at very high dilutions; these results appeared in 3 places in 1991, including *Nature*, but are rarely mentioned by skeptics.

In explaining homeopathic effects at lesser dilutions, the authors use the 20th-century concept of homeostasis. Many concentrations of substances, many gradients, voltages and pressures are maintained in the body by feedback mechanisms. When there is a disturbance by even tiny amounts of irritants, or infections, an extreme amplification with feedback will occur to counteract the problem, whether it be to defeat inflammation, or to multiply antibody production to defeat infection. When distress signals to the regulatory systems are not sufficient, symptoms worsen. Based on these symptoms, a homeopathic remedy chosen according to the law of similars can reactivate the regulatory systems (pp. 192–200). The authors note that radiation hormesis operates similarly (pp. 340–342; Kauffman, in press).

In trying to explain homeopathic effects at very high dilutions ($\leq 10^{-20}$ M), the authors produce many examples of metastable systems with explanatory mathematical algorithms, and the authors uncovered many unusual properties of water described in the literature in order to try to explain how water can have a memory. In an unfortunate example in connection with Benveniste's work (pp. 68–69), they wrote that: "... if we take a little water and put it in the freezer [-20°C], after a certain amount of time it will freeze. On removing the water from the freezer, it will be observed that the block of ice, though now exposed to room temperature [$+20^{\circ}\text{C}$], will remain a block of ice for some time. Thus, there exists in water a property which enables it to 'remember' for a certain amount of time that it has been kept in the freezer." Any chemist will realize that any delay

in melting of ice must be due to its temporary existence at a temperature below the melting point of 0°C. Ice is a good conductor of heat, and nearly all of the block must warm up to the melting point before any can melt, beginning at the warmest surface; no memory is involved (Chang, 1998). The authors wrote that the structure of water and alcohol is modified by serial dilution as shown by NMR spectra in which there are changes in the -OH proton resonance (p. 261). Chemists recognize that this is due to diminished hydrogen bonding (Streitwieser & Heathcock, 1985); moreover, it is irrelevant to the structure of bulk water that contains solutes at high dilution. Changes in NMR properties of dilutions of silica/lactose in water were detectable to 10^{-17} M (pp. 261–262), but this is not applicable to an explanation for effects at much higher dilutions. Examples of extreme sensitivities of biological forms to electric and magnetic fields, and even to electroacupuncture influenced by dilutions of substances in nearby ampules, make fascinating reading, but fail to explain the effects of extreme dilutions. The examples of cyclic metastable states calculated by means of the Verhulst algorithm, and the invocation of chaos, fractal dynamics, oscillations, and superradiance also fail to explain the effects of homeopathy remedies at very high dilutions.

The authors make some fatuous statements about the successes of oncology in one place (p. 234) that are unwarranted (Bailar & Gornik, 1997; Fisher et al., 2002; Kauffman, 2002b; Moss, 1999, 2000); but they are totally realistic elsewhere (p. 35) about the impasses displayed by conventional medicine, including the contrast between outstanding imaging and poor curative means. The most serious error of omission was on the practical problem of whether off-the-shelf homeopathic preparations are of any value, or whether individualization of treatment (pp. 9–10) is still essential.

Despite the failings noted, another of which is too much redundancy, the many discussions are carried out mainly at the highest level of academic tradition, fully referenced, and ought to spark research on homeopathy for decades to come. This review has not done justice to the subtleties and complexities addressed by these authors. The four great anomalies of homeopathy and many other anomalous observations are set out. Your reviewer saw no attempt to mislead the reader. The need for the patient to interact with highly competent homeopathic practitioners was emphasized. The limitations of homeopathy were frankly acknowledged, and incompetent (or worse) practitioners were acknowledged and lamented. Justification for the continued practice of homeopathy is plentiful. As an inspiration for others to provide explanations and in providing numerous ideas to explain the anomalies, this book is excellent.

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Science Held Hostage: What’s Wrong with Creation Science AND Evolutionism by Howard J. Van Till, Davis A. Young, and Clarence Menninga. Downers Grove, IL: InterVarsity Press, 1988. 189 pp. (price unknown; out-of-print, paper). ISBN 0-8308-1253-9. (Retrospective review.)

This book is outstanding in at least two ways: It describes concisely and clearly what science is and how science is done, concentrating particularly on features that matter for debates over evolution and creationism. Second, the book gives a sound critique of invalid invocations of science and unwarranted assertions from prominent scientific popularizers who state or imply that science and evolution disprove theism¹. This makes the book (though out-of-print²) worth mentioning in connection with the revived controversy over creationism in its latest guise as “intelligent design theory”.

The aim of the book is described as challenging some misperceptions about the professional scientific enterprise and illustrating the mischief that flows from them. Part I, in two chapters, points out that the natural world is the *object* of scientific inquiry, and describes the proper *domain* of that inquiry and the practices that have come to be accepted in the scientific community. Good science demands competence and integrity. Sound scientific judgments of proposed theories are based on such values as cognitive relevance, predictive accuracy, coherence, explanatory scope, unifying power, and the fertile