Pseudoscience and the Paranormal: A Critical Examination of the Evidence by Terence Hines. Buffalo, NY: Prometheus Books, 1988, 372 pp. $22.95 (paper).

The Hundredth Monkey and Other Paradigms of the Paranormal edited by Kendrick Frazier. Buffalo, NY: Prometheus Books, 1991, 400 pp. $19.95 (paper).

Talking Back to Prozac: What Doctors Won't Tell You About Today's Most Controversial Drug by Peter R. Breggin and Ginger Ross Breggin. New York: St. Martin's Press, 1994,273 pp. ISBN 0-132-11486-9.

A very important and general problem in science is how to extract the signal imbedded in the noise. Provided of course, that there is a signal in the first place. As an example of extracting a legitimate signal, one of the triumphs of physics in this century was the theoretical assertion that a particle, baptized as the neutrino, must exist in order to balance the physical entities of energy and momentum in various nuclear interactions. The experimental verification of the neutrino's existence took many years because its properties, its weak signals, were so bizarre as to defy physical measurement.

On the other hand, there is the behavior of the stock market. So-called technical analysts see all sorts of hidden periodicites and other signals in the Dow Jones Industrial Average (DJIA); others claim the DJIA is an example of a random walk and hence, pure noise. Similarly, when it comes to ESP or other forms of parapsychology, a phenomenon based on negating the central limit theorem of statistics which roughly speaking, says, certain outcomes far from the center are highly unlikely, the signal is seen widely by the true believers and not at all by the skeptics.

Nevertheless, there is a difference between the DJIA's supposed cycles and ESP's putative existence. The DJIA is strictly observational and nonrepeatable, whereas properly controlled experiments can be done on ESP. Terence Hines' *Pseudoscience and the Paranormal* and Frazier's *The Hundredth Monkey* argue that wherever a careful, double-blind experiment is performed, the elusive and illusionary phenomenon disappears. According to Hines, "there is a general unwillingness on the part of promoters of pseudoscientific claims to look carefully at the evidence they put forth to support their claims." Even afterward, when no signal is found, there is always what Hines refers to as the "irrefutable hypothesis," that is a nonfalsifiable hypothesis, one in which there can be no evidence that will show the hypothesis to be wrong.

He gives quite a few examples of these nonfalsifiable hypotheses. For instances, Freud's notion that all males have latent homosexual tendencies can never be refuted because males are either overtly homosexual or possess urges so deeply repressed that they never can be revealed. Likewise, when a witch hunt takes place, torture causes either confession or more torture if no confession ensues. Similarly, when it comes to UFOs, creationism or plant perception, the irrefutable hypothesis takes the form of a gigantic conspiracy, God

testing our faith or lack of empathy on the part of the experimenters. To return to the metaphor of signals and noise, the true believers see the signal not just embedded in the noise, but rather the noise actively conspiring to suppress the signal.

Frazier's book is a collection of 43 articles that have appeared in the Skeptical Inquirer, a magazine devoted to debunking paranormal and fringe-science beliefs and claims. According to Frazier, "scientists, busy with their own research, typically ignore such claims [i.e., signals] as irrelevant or unimportant to real science. Yet these claims tend to have a wide appeal among students and the public."

Both Frazier and Hines attempt to give reasons why, despite all the evidence to the contrary, so many people psychologically need to believe in extra-ordinary explanations. Reality, especially scientific reality, can be threatening, confusing and uncomfortable. For many, astrology is preferred to astrophysics, UFOs offer hope in an unsettled world, graphology is more sensible than the chemistry of organic decomposition. Besides, real science is tough and requires years of study, whereas with pseudo-science everyone is on an equal touchy-feely footing.

Somewhere in between strong signals yearning to be measured and non-signals actively suppressed by skeptics is the case of Prozac, an anti-depressant, which according to the Breggins, "has achieved fad like status." I am not qualified to discuss the pharmacology of selective serotonin re-uptake inhibitors (SSRIs) and in fact, I don't even know of anyone who is on Prozac so I can hardly share personal stories of how Prozac greatly benefited or harmed someone. Nevertheless, the procedure by which Prozac was approved is a study in how statistics should not be performed.

According to the Breggins, "All FDA drug studies are constructed, supervised and paid for by the drug companies themselves, using doctors and research of their own choosing — often people with long-established relationships with the company." They go on to detail the flaws in the testing procedure and the consequent unknown inadequacies of Prozac.

For example, Prozac was tested for at most six weeks, yet some patients have been on the drug for several years; "In effect, anyone now taking Prozac for more than a few weeks is part of a giant ongoing experiment on its longer-term effects." Further, "There were no children or elderly adults in the Eli Lilly-sponsored FDA studies of Prozac" although it is prescribed for them as well. The Breggins also claim that, "the grand total [of the double-blind trials] turned out to be 286 patients" and not the 11,000 patients as suggested by Lilly, the manufacturer of Prozac. Moreover, "the Prozac studies as designed by Lilly excluded all patients with serious tendencies toward suicide" as were "hospitalized psychiatric patients"; the implication the authors suggest is that Prozac shouldn't be prescribed willy-nilly to just anyone because it might cause a very seriously depressed patient to go over the edge.

When the Breggins looked at the various clinical trials of Prozac, "eight [of

ten] showed Prozac to have no positive effect" [when compared to other-drugs]; "In six out of seven studies where it was included, imipramine (Tofranil), a very old drug did better than Prozac." When compared to a placebo, only "three [studies of four] were used by the FDA as evidence of some beneficial effect. One showed none at all." Even the three that evidenced benefit of Prozac come in for skewering when the statistical and medical details are laid out by the Breggins: large number of patient dropouts, breaking of the double-blind code, and, of course, bias on the part of the investigators.

But, the Breggins themselves are not exactly immune from seeing signals, in their case, negative signals, where there are none. Peter Breggin is involved as a medical-expert witness for plaintiffs and has appeared on prime-time TV programs, Naturally, his fame and financial success do not necessarily disqualify him from finding the truth, just as Lilly's vested economic interest in Prozac doesn't absolutely prevent it from serving the consumer.

Fortunately, my personal interest in Prozac's physiological benefits and side effects is strictly theoretical even if I find the medical-statistical procedure for FDA drug testing to be terrifying. Or am I guilty of extracting phantom signal? So to speak, if I'm not part of the signal, am I part of the noise?

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Frontiers of Fundamental Physics edited by Michele Barone & Franco Selleri. New York: Plenum Press 1994. xviii + 601 pp. $145 (c) (outside North America, $174 or £116). ISBN 0-3-6-44825-4.

The front matter of this volume identifies it as the proceedings "of an International Conference on Frontiers of Fundamental Physics held September 27-30, 1993, in Olympia, Greece." The conference brought together about 100 people. The proceedings contains nearly 80 articles grouped into five sections: astrophysics: anomalous redshifts; relativity: energy and ether; ***geo***-physics: expanding earth; fields, particles: space-time structures; quantum physics: duality and locality.

This promises a real feast of hard-core, mainstream anomalistics. It must surely have been an exciting conference. Most of the listed affiliations of the authors are universities or research institutes, largely relating to physics, with a sprinkling of what appear to be independent scholars; one presumes the level of soundness and competence to have been high.

Unfortunately, most of this book is accessible only to specialists. Readers are required to be comfortable with such opening paragraphs as,

In this paper we study the cosmological quasar redshift and their internal redshifts and blueshifts via a new geometry, called ***isominkowskian geometry*** [sic], which is con-