Journal of Scientific Exploration, Vol. 13, No. 4, pp. 557–560, 1999 0892-3310/99

Guest Editorial: Data Analysis in Mind-Matter Research

HARALD ATMANSPACHER

Institut für Grenzgebiete der Psychologie
D-79098 Freiburg, Germany

and

Max-Planck-Institut für extraterrestrische Physik
D-85740 Garching, Germany

The question of relationships between the material world and its apparently non-material counterpart or complement is one of the oldest, most puzzling and most controversial issues in the philosophy and history of science. There exists a vast literature addressing its many different aspects from many different viewpoints (see, *e.g.*, Chalmers, 1996). The mind-matter distinction, in its most general form, comprises not only that of mind and body but also, even more specifically, that of mind and brain. Such dichotomies have been posed in both epistemological and ontological interpretations, and elaborated in quite a number of variants (see, *e.g.*, Atmanspacher and Kronz, 1999). They range from a fundamental distinction of mind and matter at a primordial level of description to the emergence of mind (consciousness) from the brain as an extremely sophisticated and highly developed material system.

Most counterintuitive, some might even say absurd, are the class of mind-matter questions dealing with relationships between the consciousness of living beings and material systems external to them. Corresponding mind-matter research has been carried out in the off-mainstream fields of "psychical research," "parapsychology," and other anomalies research. With regard to the broader framework sketched above, there can be no reasonable doubt that the cognitive sciences and related areas of research in recent decades now have to be included in this debate. Better understanding of the various perspectives of mind-matter (also called psychophysical) relationships in general requires interdisciplinary aspects of physical and biological fields, the neurosciences, and parts of psychology and philosophy to be taken into account explicitly.

The history of empirical research on mind-matter relationships, in the sense of anomalies research since the late 19th century, is intimately connected to the history of statistics and probability theory. After the early work of Richet (1884), the sequence of renowned scientists with statistical background interfacing with mind-matter research includes the names of Fisher (1930), Feller (1940), Spencer-Brown (1953), Bridgman (1956), Tornier (1959), Diaconis (1978), Krengel and Liese (1978), Utts (1991), and many others. Why is empirical anomalies research so closely related to fundamental statistical and

probabilistic questions and problems? The answer seems straightforward: one typically has to deal with notoriously rare events, with extremely faint deviations from chance expectations, and it is profoundly difficult to check whether the preconditions and assumptions on which statistical methods always rely are satisfied in particular situations.

But this is not the only point. As in other fields, one can find work on mind-matter research in which statistical methods are applied without the necessary caution and background knowledge. It is well known how easy it is to "lie with statistics," intentionally or not. Many published studies on empirical mind-matter questions suffer from unsystematic, *ad hoc* applications and implicit restrictions of standard approaches, taken over from sciences in which their use can be justified satisfactorily. As will be seen in the contributions to this issue, typical examples are the uncritical adoption of limit theorems or of stationarity and ergodicity, the lacking awareness that transition probabilities in addition to state probabilities are important for an exhaustive characterization of stochastic processes, and the neglect of information that could be obtained from higher order moments of non-Gaussian distributions. Perusing the existing literature, one can hardly avoid the occasional impression of dilettantism in quite a number of instances. Of course, there is also competent professional work (*e.g.*, Burdick and Kelly, 1977).

A question frequently discussed within mind-matter communities (*e.g.*, Palmer, 1986) is what can legitimately be inferred from statistical analyses. Even overwhelming significance levels do not prove the "reality" of an anomaly, but merely indicate evidence for it. Apart from the problematic nature of the term "reality" itself, acceptance of off-mainstream approaches cannot be achieved by statistical evidence for anomalous phenomena alone. For something to be added to the corpus of serious scientific knowledge, it is a necessary condition that the observation of data has to be accompanied by their proper understanding. Beyond a reasonable extent, it does not make much sense to continue to dump data on readers or audiences without offering intelligible ideas for explanation. That "proof"-oriented strategies have been favored in the history of empirical mind-matter research may be due to a situation in which such research has often been rejected with the argument that the phenomena under study have not even been verified so far. There certainly is a dilemma, but nevertheless focusing on "proof of evidence" alone is a non-constructive strategy in the long run.

Another important problem is to tailor the statistical tools to be used precisely to the question to be explored. If the question is whether or not anomalous phenomena occur essentially independently of specific contexts and conditions, then it can be plausible to study large populations without further selection criteria. After many years of such research, however, there are strong indications that other, additional questions are relevant. Many studies indicate that contexts of various kinds (psychological observables, experimenter effects, *etc.*) play significant roles in mind-matter type experiments. In order to

answer context-specific questions, one has to select samples from context-specific populations, maybe even to work with single subjects who are most conspicuous under certain conditions, and try to understand what happens there. Needless to say, any relapse into proof-oriented significance considerations with respect to a hypothetical overall population is pointless within such a research strategy.

As an attempt to improve this situation, a workshop on "Data Analysis in Mind-Matter Research" was held in Schliersee (Bavaria) in February 1998. The workshop was sponsored by the Institut für Grenzgebiete der Psychologie at Freiburg. Its goal was to have interested experts discuss some more recent approaches, methods, and results concerning the analysis of data in mind-matter research, mainly understood in terms of anomalies with respect to mainstream science. Among basic developments in statistics and probability theory, particular emphasis was put on topics such as meta-analysis, Bayesian statistics, large deviations, time series analysis, and multifractal scaling. Presentations at the workshop were split into general topics and applications to empirical data. While the publication of the applied papers will be distributed over future issues of this journal, the articles on general topics are collected in this special issue.

The paper by Morris gives an overview of those experimental paradigms that presently dominate the traditional lines of research into anomalous phenomena. This overview introduces the empirical material and methods one invokes in these branches of mind-matter research. The subsequent contribution by Primas outlines some fundamental problems in probability theory and statistics, with emphasis on conceptual topics such as individual *vs.* ensemble descriptions or deterministic *vs.* non-deterministic dynamics. Basic questions of defining what chance "really" is, the meaning of probability estimates for extremely rare events, and other issues that should be considered prior to the application of statistical methods are discussed.

The articles by Utts and Amann/Atmanspacher address two relatively novel developments in statistics, those of meta-analysis and large deviations statistics. Meta-analysis has its main range of application in the social and medical sciences and in psychology. It is typically utilized to combine evidence for an effect from different studies where rigorous replication is problematic. Large deviations statistics represents a mathematical development mainly applied in statistical physics. It is the tool of choice if one is interested in the way in which distributions (or histories of distributions) change when the number of degrees of freedom of the considered system are increased. This is particularly important if events are not independent and identically distributed, or if mean values do not stabilize in the infinite limit. Finally, Khrennikov's article sketches some speculative ideas for data analysis as well as interpretation based on so-called p-adic probabilities, an approach intended to complement the usual formulation of probability theory due to Kolmogorov (1933).

Although the referees of the individual articles had been asked to check for

readability in particular, some of the papers are not easy to digest. The reason for this is not only the technical jargon, without which each paper would have been either much longer or much more superficial, but it is also the topics themselves that foil easy-going reception. I want to thank all authors and anonymous referees for trying to reach the optimum balance between precision and comprehensibility. And I want to thank the editors of the *Journal of Scientific Exploration* for their willingness to venture the risk of an unusual special issue.

References

Atmanspacher, H. and Kronz, F. (1999). Relative onticity. In A. Amann *et al.* (Eds.), *On Quanta, Mind, and Matter*. Dordrecht: Kluwer, pp. 273–294.

Bridgman, P. W. (1956). Probability, logic and ESP. *Science,* 123, 15–17.

Burdick, D. S. and Kelly, E. F. (1977). Statistical methods in parapsychology research. In B. B. Wolman (Ed.), *Handbook of Parapsychology*. New York: Van Nostrand, pp. 81–130.

Diaconis, P. (1978). Statistical problems in ESP research. *Science*, 201, 131–136. See also letters by C. T. Tart and by H. E. Puthoff and R. Targ with a reply by Diaconis in *Science* 202, 1145–1146 (1978). (Another response by E. F. Kelly together with Diaconis' rejoinder can be found in *Zetetic Scholar* 5, 20–31 [1979].)

Chalmers, D. J. (1996). *The Conscious Mind*. Oxford: Oxford University Press.

Feller, W. (1940). Statistical aspects of ESP. *Journal of Parapsychology*, 4, 271–298.

Fisher, R. A. (1930). The statistical method in psychical research. *Proc. Soc. Psych. Res.* 39, 189–192. See also Fisher, R. A. (1924). A method of scoring coincidences in tests with playing cards. *Proc. Soc. Psych. Res.* 34, 181–185.

Kolmogorov, A. N. (1933). *Grundbegriffe der Wahrscheinlichkeitsrechnung*. Berlin: Springer.

Krengel, U. and Liese, M. (1978). Begründung und Kritik der statistischen Auswertung parapsychologischer Experimente. *Zeitschr. Parapsych. Grenzgeb. Psych.*, 20, 185–212.

Palmer, J. (1986). ESP research findings: the process approach. In H. L. Edge *et al.* (Eds.), *Foundations of Parapsychology*. London: Routledge and Kegan Paul, pp. 184–222.

Richet, C. (1884). La suggestion mentale et le calcul des probabilités. *Rev. Philos.*, 18, 609–674.

Spencer-Brown, G. (1953). Statistical significance in psychical research. *Nature*, 172, 154–156. See also his *Probability and Scientific Inference*, London: Longmans, Green & Co., 1957.

Tornier, E. (1959). Die Arbeitshypothese "Antizufallswahrscheinlichkeit." *Zeitschr. Parapsych. Grenzgeb. Psych.,* 3, 90–119.

Utts, J. M. (1991). Replication and meta-analysis in parapsychology. *Statistical Science*, 6, 363–378; comments by Bayarri/Berger, Dawson, Diaconis, Greenhouse, Hyman, Morris, Mosteller and rejoinder by Utts, pp. 379–403.