# Science of the Subjective[1]

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**Abstract** — Over the greater portion of its long scholarly history, the particular form of human observation, reasoning, and technical deployment we properly term "science" has relied at least as much on subjective experience and inspiration as it has on objective experiments and theories. Only over the past few centuries has subjectivity been progressively excluded from the practice of science, leaving an essentially secular analytical paradigm. Quite recently, however, a compounding constellation of newly inexplicable physical evidence, coupled with a growing scholarly interest in the nature and capability of human consciousness, are beginning to suggest that this sterilization of science may have been excessive and could ultimately limit its epistemological reach and cultural relevance. In particular, an array of demonstrable consciousness-related anomalous physical phenomena, a persistent pattern of biological and medical anomalies, systematic studies of mind/brain relationships and the mechanics of human creativity, and a burgeoning catalogue of human factors effects within contemporary information processing technologies, all display empirical correlations with subjective aspects that greatly complicate, and in many cases preclude, their comprehension on strictly objective grounds. However, any disciplined re-admission of subjective elements into rigorous scientific methodology will hinge on the precision with which they can be defined, measured, and represented, and on the resilience of established scientific techniques to their inclusion. For example, any neo-subjective science, while retaining the logical rigor, empirical/theoretical dialogue, and cultural purpose of its rigidly objective predecessor, would have the following requirements: acknowledgment of a proactive role for human consciousness; more explicit and profound use of interdisciplinary metaphors; more generous interpretations of measurability, replicability, and resonance; a reduction of ontological aspirations; and an overarching teleological causality. Most importantly, the subjective and objective aspects of this holistic science would have to stand in mutually respectful and constructive complementarity to one another if the composite discipline were to fulfill itself and its role in society.

## Scientific Definition

The word "science" derives from a Latin verb, *scire*, meaning to know or to understand; it could thus properly apply to any process of comprehension of any topic or form of experience. But in contemporary usage the term has taken on an array of more specific implications, depending on the context, the user, or the audience. In some instances it connotes bodies of established technical knowledge, such as biology, chemistry, geology, or physics, or the technological applications thereof. In other situations it conveys more dynamic images of visionary, portentous research into new and exciting natural or cultural phenomena. In yet another variant, it refers to the communities of scholars and practitioners of such topics, or to the social authority they exert. Or finally, the term science can imply a methodology, or standard, or ethic of intellectual exploration that distinguishes its process from other less rigorous forms of human reasoning and creativity, regardless of the particular

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subjects addressed, or of the credentials of the persons addressing them. In most situations, the distinctions matter little; largely the same impressions can be conveyed and the same conclusions reached by any of these definitions. But in certain rarer cases, such definitions can conflict in serious ways, with much less agreement on the proper circumscription of the topics, on the requisite qualifications of the scholars studying them, or on the proper methods for their study. It is just such examples that test the fundamentality and integrity of any definition, doctrine, or demonstration that claims the authority of science, and it is our conviction that when such contradictions arise, criteria based on methodology, epistemological purposes, and ethical values should take precedence over any topical, academic, or cultural circumscriptions. It is in this spirit that we shall address our subject, referring for background to the historical evolution of scientific methodologies, attitudes, and conceptual currencies.

## Scientific Methodology

The early scientific heritage that evolved through the cultures of the Egyptians, Greeks, Romans, Orientals, Byzantines, and Medieval alchemists involved intimate admixtures of metaphysical rituals with rigorous analytical techniques, yet generated extensive pragmatic knowledge and products, some of which, like the ancient pyramids or stone circles, still defy modern replication or comprehension. The initiation of more secular scientific practice is usually attributed to the renowned renaissance scholar and statesman, Sir Francis Bacon, who pleaded for constructive dialogue between experiment and theory in his characteristically florid terms:

> ...Those who have treated the sciences were either empirics or rationalists. The empirics, like ants, only lay up stores, and use them; the rationalists, like spiders, spin webs out of themselves; but the bee takes a middle course, gathering her matter from the flowers of the field and garden, and digesting and preparing it by her native powers. In like manner, that is the true offices and work of philosophy, which, not trusting too much to the faculties of the mind, does not lay up the matter, afforded by natural history and mechanical experience, entire or unfashioned, in the memory, but treasures it, after being first elaborated and digested in the understanding; and, therefore, we have a good ground of hope, from the close and strict union of the experimental and rational faculty, which have not hitherto been united [1].

Notwithstanding this plea, it should be noted that Bacon, along with many of his peers and successors in this period of “scientific enlightenment,” including Robert Boyle, Robert Hooke, and Isaac Newton, were practicing Hermeticists who retained lifelong interests in the metaphysical dimensions of physical phenomena [2–5]. It has been argued that it was only their need to insulate scientific inquiry from the prevailing theological dogma that engendered progressively more objective interpretation of this “scientific method,” [6] which in the hands of their successors has led to the exclusion of virtually all subjective material. While the immense accomplishments of this modern objective science are abundantly evident, the consequences of continued future exclusion of all subjective elements from scientific purview, which Bacon and his colleagues certainly would not have endorsed, merit some careful consideration.

## Scientific Attitude

Beyond its disciplined reliance upon constructive iteration of sound experimental data with incisive theoretical models, good science is characterized by thorough and respectful cognizance of relevant past and present work by others, humility in the face of empirical evidence, and openness of mind to new topics, new approaches, new ideas, and new scholars. In particular, it maintains a profound respect for demonstrable experimental and theoretical anomalies and their crucial role within the scientific dialogue of experiment and theory [7]. There is no more critical test of the integrity of any scientific process than its reaction to anomalous features uncovered in either its experimental or theoretical endeavors, *i.e.,* empirical observations demonstrably inconsistent with established theoretical expectations, or theoretical predictions that conflict with established experimental data. Such anomalies demand immediate attention to discriminate between artifacts of flawed experimentation or theoretical logic, and the entry of genuine new phenomena onto the scientific stage. Error in this discrimination can divert or extend science along false scholarly trails, while proper identification and assimilation of real anomalies can open more penetrating paths than those previously followed.

Unfortunately, such intellectual respect for the role of anomalies has tended to be more honored in the abstract than in actual practice. As physician Larry Dossey has observed:

> In any field of science there are always phenomena that do not fit in what can be called 'low' and 'high' anomalies. Low anomalies are those that offer minor and temporary challenges to prevailing concepts and that can eventually be explained according to extant wisdom. High anomalies, on the other hand, cannot in principle be accommodated by conventional, orthodox models. They require a break with current thinking. They may be emotionally wrenching even for those most familiar with them, and are generally surrounded by a swirl of controversy.
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> It is simply the nature of workers in any field in science to feel more comfortable with what they can explain. That is why high anomalies tend to be ignored, usually with the mystification that they will be cleared up at some future date. That is also why they are frequently dismissed as erroneous observation and sometimes condemned as fraudulent. High anomalies do not go down easily [8].

But good science, of any topic, cannot turn away from anomalies; they are the most precious resource, however unrefined, for its future growth and refinement.

## Scientific Currency

To conduct its business effectively, any science must ordain a set of conceptual currencies in terms of which it can represent and evaluate its phenomenology. In most of the classical physical sciences, these currencies strive to embody precisely measurable, unambiguously quantifiable, and strictly replicable properties, with minimal statistical variance. In the quantum-based physical sciences, however, as well as the biological, medical, psychological, and social sciences, progressively more reliance has come to be placed upon statistical rather than uniquely deterministic measurables. In most cases, a cumulative sequence of three genres of such conceptual currencies can be traced, relating to tangible substance, energy in various forms, and information. For example, most early science tended to focus on the behavior of palpable matter, its gross mechanics, chemical and physical properties, with primary reliance on the quantitative measurable we now call "mass." Midway through the 19th century, the concept of "energy"—mechanical, thermal, electromagnetic, atomic—was added to the arsenal of scientific endeavor as a somewhat less tangible, but still quantifiable currency of phenomenological representation. Over the past few decades, a third scientific currency, loosely termed "information," has taken center stage, and clearly will dominate basic research and its applications over the foreseeable future.

A similar conceptual genealogy has characterized the evolution of the biological and medical sciences. Early preoccupation with the properties of biological substance—bone, tissue, blood, cell—led inevitably to confrontation of the energetic processes of living organisms—their metabolism, kinesiological dynamics, immune and restorative activities. At present, the overriding emphasis is on biological information, as manifested in the mechanisms of neurophysiological reaction and communication, immune response, brain function, genetic coding, and a host of psychophysical correlates.

Originally, these three currencies of matter, energy, and information were presumed to be orthogonal, but subsequently they have been shown to be fundamentally interchangeable, with immense consequences. Einstein's transmutation relation, $E = mc^2$, has impelled much of 20$^{th}$-century physics, and its technological, political, and sociological implications can hardly be overstated.

Somewhat subtler equivalence of energy and information has also been established in various thermodynamic and quantum mechanical contexts and in basic information science itself, and this may well drive much of 21$^{st}$-century science and its applications.

## Objective *vs.* Subjective Information

The escalating reliance of science and technology on information currency brings with it two intriguing problems, neither of which have been adequately acknowledged, let alone addressed. First, there is the self-evident distinction between "objective" and "subjective" information. The former, the hard currency of information-processing devices of all kinds, is used to transmit impersonal knowledge, and is readily quantifiable and ultimately reducible to binary digits. The latter is inextricably bound with issues of meaning, value, and perspective, and thus would seem to defy such universal quantification. For example, the objective information contained in any book could, in principle, be uniquely quantified by suitable digitization of its array of letters, symbols, and illustrations, but the subjective information communicated would depend keenly on the reader's interest in the subject matter, intellectual heritage, emotional perspective, and personal value system. Likewise, while we might quantify the objective information displayed by a brilliant sunset or a magnificent waterfall in terms of the prevailing distributions of optical frequencies and amplitudes, in so doing we would fail to convey the subjective beauty of the scene. For that purpose, we would more likely resort to descriptive adjectives in our linguistic syntax, or even try to express in some pseudo-quantitative terms how *much* that book, or that experience impressed or delighted us. In fact, it could be argued that much of human language has evolved from our need to express subjective feelings in a broadly communicable format.

Such pseudo-quantitative representations of subjective qualities, while falling far short of scientific rigor, appear in many diverse contexts. In some cases, the objective and subjective specifications are intrinsically intertwined. For example, the objective information contained in any musical work is routinely recorded in a quantitative array of notes of given pitch and duration inscribed on a well-defined grid. The amplitude of the desired sound, however, is usually specified in semi-quantitative terms, *e.g. piano* or *fortissimo*, that allow the performer some subjective latitude. The tempi intended by the composer are noted in even more subjective instructions, *e.g. andante expressivo*, or *allegro vivace*, overlaid with particular local nuances, such as *sostenuto* or *rallentando*. The total information transmitted to a listener by a performance of this piece thus ranges from an analytic sense of its harmonic and thematic structure that would be commonly agreed upon, to an impressionistic, even emotional reaction that depends heavily on that listener's cultural heritage, musical sophistication, and personal taste.

Inclusion of subjective information within the framework of science clearly constitutes a huge analytical challenge. Many contend that it should not even be attempted—that subjectivity should be categorically excluded from any of the "exact" sciences. Others feel equally keenly that in a world progressively more driven by individual and collective emotional resonances, orchestrated consumer reactions, media-manipulated politics, and delicate interpersonal expectations, for science to deny its immense intellectual power and cultural influence to this entire hemisphere of common human experience and expression would not only be irresponsible, it could be dangerously self-constraining.

## The Role of Consciousness

Imposing as this accommodation of subjectivity may be, the deeper penetration of science and technology into the forest of information stands to be considerably more complicated by a second, even more subtle issue, namely the demonstrated capacity of consciousness to *affect* both subjective and objective elements of information. Few will quarrel with the first half of this claim. The self-evident capabilities of human consciousness to create profound subjective experiences for itself and others to enjoy via art, music, literary composition, or even via scientific and mathematical reasoning, can hardly be disputed. The sublime experiences engendered by love and empathy equally well qualify as enhancements of subjective information for their donors as well as for their recipients. But quantifiable alteration of the *objective* information content of a physical or biological system by some attending consciousness, while far more difficult to demonstrate and vastly more controversial to discuss, has also been convincingly established over recent decades, by reputable scholars working in many venues. The bottom line of their research results is inescapable:

consciousness has the capacity not only to absorb and process objective information, but to *create* it, in rigorously measurable quantities. With this capability comes all manner of foreseeable and unforeseeable opportunity, and associated responsibility, which a more profound, open-minded science could endeavor to activate, discipline, and deploy productively.

Nor is this challenge totally confined to the information segment of scientific currency. Once the fungibility of subjective information is conceded, it behooves us to revisit the energy and matter domains as well. The pages of this journal have frequently reported on such topics as “subtle energies,” “healing energies,” and “psychokinetic” phenomena; other sources have presented us with evidence of auras, apparitions, and manifestations. All of vacuum physics traces to zero-point fluctuations, and thence to the uncertainty principle. For that matter, how much subjectivity underlies the material/energetic/informational qualities of the fundamental particles, of the photons and neutrinos, and of the quarks, gluons, and other sub-nuclear events? Is there not some subjectivity implicit in the wave/particle duality? In the indistinguishability principle? In the Copenhagen interpretation? And, while we are at it, is it not possible that a subjective science might aid in the comprehension of UFO phenomena?

## Scientific Purview

The thesis is thus that science must soon make a deliberate and considered choice whether to continue to deny all subjective currency access to its table of scholarly business, thus excluding itself from comprehension of the universe of aesthetic and creative experience, *including that which bears on objective effects,* or to broaden its purview to encompass these softer parameters in some disciplined yet productive fashion. The scientific method and the scientific attitude, as defined above, should tolerate, indeed should encourage, provisional exploration of the disciplined re-inclusion of subjective concepts and properties within the enterprise of the natural research sciences. As William James put it over a century ago:

> The spirit and principles of science are mere affairs of method; there is nothing in them that need hinder science from dealing successfully with a world in which personal forces are the starting point of new effects. The only form of thing that we directly encounter, the only experience that we concretely have is our own personal life. The only completed category of our thinking, our professors of philosophy tell us, is the category of personality, every other category being one of the abstract elements of that. And this systematic denial on science’s part of personality as a condition of events, this rigorous belief that in its own essential and innermost nature our world is a strictly impersonal world, may, conceivably, as the whirligig of time goes round, prove to be the very defect that our descendants will be most surprised at in our boasted science, the omission that to their eyes will most tend to make it look perspectiveless and short [9].

Henri Bergson saw the same vision:

> Science and metaphysics therefore come together in intuition. A truly intuitive philosophy would realize the much-desired union of science and metaphysics.

> While it would make of metaphysics a positive science—that is, a progressive and indefinitely perfectible one—it would at the same time lead the positive sciences, properly so called, to become conscious of their true scope, often far greater than they imagine. It would put more science into metaphysics, and more metaphysics into science [10].

Ultimately, the proposition must stand or fall on whether it is possible to establish a subjective conceptual currency, and a viable mechanics thereof, that can enable profitable dialogue between empirical experience and theoretical predictors, akin to that which has taken modern objective science to its lofty heights. If this fails, natural science must halt outside of the gates of “personality as a condition of events”; if it succeeds, those gates will open to a glorious new domain of scientific exploration.

## The Physics of Consciousness

Any commitment toward scientific representation of subjective properties and effects clearly requires one immediate major concession: the acknowledgment of consciousness as a *proactive* agency in the establishment of reality. This in turn demands a viable definition and model of consciousness itself, one that goes well beyond any neurological wiring diagram of the brain. Rather, we need a model that can encompass all four quadrants of objective and subjective, reactive and proactive, experiences of the physical world. Substantial bodies of established theory addressing some elements of this matrix exist, but unfortunately they are largely disconnected and leave major gaps in the converge. For example, contemporary natural science is replete with objective, reactive models of the physical world, most of which have been well confirmed empirically. Objective models of consciousness also abound in the regimes of cognitive psychology and neuroscience, albeit tending to focus on brain structure and function rather than on the nature of consciousness, *per se*. On the subjective side of the matrix the reservoirs of established models stand more shallow. Present physical science has virtually nothing to say about subjective experience and, with the possible exception of the “observational” interpretations of quantum mechanics, acknowledges no proactive role for human participants. The situation is little better in the psychological and neurophysiological sectors, where subjective and proactive aspects of the psyche have seldom been treated in other than qualitative terms. While contemporary parapsychology or clinical psychiatry may contain some useful empirical experience, conceptualization, and nomenclature, here, too, viable quantitative models are lacking [11–12]. Thus, our theoretical task becomes much more than re-deployment of established models and methods; major extensions in concept, as well as in structure, will be required.

We have faced this problem in the context of our own PEAR program, in attempting to correlate, explicate, and predict the results of a spectrum of human/machine and remote perception experiments. Without attempting detailed review of these studies [7, 13–16], it may be illustrative to summarize the protocols and results of those portions of this research that bear on the development of such a theoretical framework.

## Anomalous Human/Machine Interactions

Over the eighteen-year history of the PEAR program, some 150 volunteer operators have performed a wide range of human/machine experiments designed to assess the influence of human intention on the output behavior of a variety of random physical devices. These devices are electrical, mechanical, fluid dynamical, optical, or acoustical in character; macroscopic or microscopic in scale; digital or analog in their information processing and feedback displays. They generate data over a broad range of rates, in formats that are theoretically, or at least empirically, predictable. All are equipped with numerous fail-safe features to guarantee the integrity of their data and their freedom from artifact, and all can be precisely calibrated to establish their unattended statistical output distributions.

The participating operators have varied greatly in personality, background, intellectual sophistication, and style of interaction with the machines, but all have been anonymous, untrained, and uncompensated for their work, and none has claimed extraordinary abilities before or after the experimental efforts. Throughout, we have regarded these operators as research colleagues, rather than as subjects of study, and no psychological or physiological tests have been attempted.

In all "benchmark" experiments, the operators, seated in front of the machines but in no physical contact with them, using whatever personal strategies they wish, endeavor to produce statistically higher mean values of the output distributions, lower mean values, or "baseline" or unaltered mean values, over interspersed periods of pre-stated intentions. Great care is taken in the experimental design and data acquisition to preclude any form of spurious interference with the machine operation, so that any systematic deviation of these three data streams from one another can only indicate the existence and scale of the sought anomalous effect.

A number of variants of the benchmark protocols have been explored, such as whether the intended direction of effort is chosen by the operator or assigned by some random indicator; whether the machine runs continuously or is initiated at intervals imposed by the operator; the pace and size of the data blocks; the presence or absence of feedback, and its character; the number of operators addressing the machine; the distance of the operator from the machine; and the time of machine operation relative to the time of operator effort. All told, some fifty million experimental trials have been performed to this date, containing more than three billion bits of binary information. From this large body of results, the following salient features have been extracted:

1. Anomalous correlations of the machine output distribution means with pre-stated operator intentions are clearly evident. These mean shifts are statistically replicable and quantifiable in the range of a few parts in ten thousand deviation from chance expectation. Over the total database, the composite anomaly is unlikely by chance to less than one part in a trillion.

2. The output mean shifts, or "effect sizes," achieved by the various individual operators on any given experiment range smoothly over distributions that would be expected by chance, except that the composite means are displaced from the chance nulls to the extent specified above. No outlying effect sizes, indicative of "superstar" performance, are found.

3. Several of the individual operator databases are sufficiently distinctive and replicable in their relative effectiveness under high, low, and baseline intentions, and in their responses to particular protocol variations, to constitute characteristic "signatures" of achievement.

4. Both individually and collectively, the interior structures of the distributions of anomalous mean shifts are consistent with a model wherein the elemental binary probability intrinsic in each experiment has been altered from its design value of precisely one-half, to slightly higher or lower values, depending on the operator, the intention, and the protocol.

5. The scale and character of the results are relatively insensitive to the particular random device employed. In some cases, the characteristic operator signatures are quite similar from one device to another.

6. Significant differences in the patterns of male and female performance have been identified.

7. Two operators addressing a given experiment together do not simply combine their individual achievement signatures; rather, their "co-operator" results are characteristic of the pair. Co-operators of the same sex are less effective than male/female pairs, and "bonded" male/female pairs produce the highest scores of any operator subsets.

8. No learning or experience benefits are observed. To the contrary, operators tend to perform best over their first major experimental series, then to decline in performance over the next one or two series, after which they recover better performance that stabilizes to their individual values over subsequent series.

9. No dependence of individual or collective effect sizes on the distance of the operators from the machines appears in the data. Operators addressing the machines from thousands of miles away produce effect sizes and characteristic signatures similar to those they achieve seated next to the machines in the laboratory.

10. Experiments performed "off-time," *i.e.*, with operators exerting their intentions several hours or days before, or after, the machines actually produce their data strings, show similar effect sizes and internal characteristics to those performed "on-time," *i.e.*, with machine operation concurrent with the operators' periods of effort.

11. Subjective reports from the most successful operators speak of a sense of "resonance" or "bond" with the machine; of surrendering their sense of identity to merge with the machine into a unified system; of exchanging roles with the machine; of "falling in love" with it; of "having fun" with it.

From this array of empirical indications, it seems inescapable to conclude that operator consciousness is capable of inserting information, in its most rudimentary *objective* form, namely binary bits, into these random physical systems, by some anomalous means that is independent of space and time.

Human/machine experiments similar to these have been conducted at many other laboratories with anomalous results commensurate with our own [11]. Responses from biological substances or living organisms employed as the random targets of the operators' intentions have also been demonstrated [17–19]. Equally relevant are a small body of experiments in which the role of the operators has been played by other than human species, *e.g.* chicks and rabbits, who seem capable of influencing random electronic processors to respond to some biological or emotional needs [20]. These results, combined with further studies in our own program that demonstrate anomalous bi-directional responses of portable REG units unobtrusively placed in various human group environments, such as religious services, sporting events, professional meetings, medical counseling sessions, or other convocations entailing some collective emotional potential [21], confirm the ubiquitous character of these information anomalies and broaden their potential importance to individual and cultural welfare.

## Remote Perception

In a complementary class of PEAR experiments, the "target" is not a physical device or process in a laboratory environment, but a physical scene at some remote geographical location. The goal of the human participant is not to insert information into the target, but to extract information from it, by anomalous means. In the usual protocol, two participants are involved in any given experiment. One, the "agent," is physically present at a target location selected by some random process, and there, immersed emotionally and cognitively in the scene, records its characteristics on a standard check sheet, and takes photographs of it. The other, the "percipient," situated at some distance from the scene and with no prior knowledge of it, attempts to perceive aspects of its ambience and detail, and then records those impressions on an identical check sheet and in some less structured narrative or sketch. The agent and percipient check sheets are subsequently digitized and their degree of consonance scored numerically by a variety of algorithms. The results, indicative of the amount of objective information acquired by the percipient, can then be arrayed in quantitative statistical formats similar to those used in the human/machine experiments.

Several hundred such remote perception experiments have been performed and scored, with results quite similar to those of the human/machine experiments [7, 13, 22, 23]. The overall anomalous effect size is actually somewhat larger, but the interior statistical details are qualitatively much the same, and participant-specific characteristics are again evident. Again, the effect sizes are statistically independent of the distance between the percipient and the target, up to ranges of several thousand miles, and also independent of the time interval between the perception effort and the agent's immersion in the target, up to several days before or after the target visitation. And again, the participants testify to the efficacy of some sort of "resonance" or "bond" between the percipient and agent in facilitating the information acquisition. Remote perception studies such as these have also been performed elsewhere, albeit using somewhat different protocols and scoring methods, with similar anomalous yields [24–26]. A recent issue of this Journal featured an ensemble of articles reviewing the history of government-sponsored research in this field from several empirical, analytical, and critical perspectives [27]. From all these results, we must draw a second basic conclusion, namely that human consciousness is also able to extract information from physical aspects of its environment, by some anomalous means that is independent of space and time. Note that although the information acquired by the percipient is largely subjective in character, it nonetheless survives the transposition to an objective, digital information format imposed by the scoring methods. Indeed, one may speculate that the somewhat larger yield is related to the richer subjective content of the primary information, compared to that of the human/machine interactions.

## Theoretical Models

Any attempt to set forth a theoretical model to complement such experimental data in a traditional scientific dialogue is an awesome epistemological task. Not only are the empirical effects keenly anomalous in the current scientific framework, but in their demonstrably participant-specific characteristics they clearly involve important subjective parameters not readily accommodated by contemporary scientific language, let alone by scientific formalism. Beyond this, the results are inescapably hyper-statistical, *i.e.*, they involve a folding of the individual and collective statistical variations in participant performances with the normal statistical behavior of the physical systems. The series position sensitivity of the results, along with the lack of superposability of individual operator effects in co-operator experiments, imply further strong non-linearities in the underlying mechanisms. On the psychological side, a number of informal observations suggest that unconscious as well as conscious processes are likely to be involved. And finally, the demonstrated lack of dependence of the phenomena on distance and time will severely strain any model rooted in classical physical theory. Clearly, we must face some fundamental reassessment of several entrenched assumptions about the nature of reality before attempting to compose an explicating model of these human/machine and remote perception information anomalies.

Given all of this, it is essential to approach the modeling task at a very rudimentary level. As a start, we might reiterate the four generic ingredients that pervade all of the research outlined above:

1. A *random physical process*, driving an output data stream from a simple device; or an array of physical details embodied in a randomly selected geographical target.

2. *Consciousness*, of the operators, percipients, or agents, acting under some intention, volition, or desire.

3. *Information*, coded in binary form, being added to, or extracted from, the random process.

4. A *resonance*, or bond, or sharing of identity between operator and machine, percipient and agent, percipient and target, or two operators, that facilitates the information transfer between the consciousness and the random process.

It may also be helpful to note that these are just special cases of the more general ingredients that characterize virtually any form of creative human experience:

1. An unrefined or unfocused *environment,* resource, or context that provides raw material for the creation.

2. *Consciousness,* driven by some intention, purpose, or desire.

3. *Information,* in some physical, intellectual, or emotional form, flowing between the consciousness and the pertinent environment.

4. A *resonance* between the consciousness and the environment that nurtures the creative task, be it artistic achievement, athletic performance, intellectual rumination, or emotional stimulation.

In other words, the narrow range of consciousness-related anomalous phenomena we have been studying in the laboratory may be an indicative microcosm of a much broader genre of human capacity—the capacity to create, to order, to heal, or to stimulate. Thus, in attempting to model our empirical data, we may in fact be modeling the essence of human creativity.

Very briefly, our strategy has been to appropriate the one form of existing physical theory that acknowledges a proactive component of human observation, however obliquely, namely the so-called "Copenhagen" interpretation of quantum mechanics, and to extend its concepts and formalisms to include consciousness much more broadly and explicitly. We thereby attempt to extend what has been termed the "physics of observation" into a "physics of experience" that encompasses both objective and subjective components of the information acquisition. The main postulates of this experiential model, which are developed in detail elsewhere [7, 28], may be summarized as follows:

1. Like elementary particles (a form of matter), and physical light (a form of energy), consciousness (a processor and generator of information) enjoys a "wave/particle duality" which allows it to circumvent and penetrate barriers, and to resonate with other consciousnesses and with appropriate aspects of its environment. Thereby it can both acquire and insert information, both objective and subjective, from and to its resonant partners, in a manner that would be anomalous in its "particulate" representation.

2. The celebrated quantum mechanical principles of "uncertainty," "exclusion," "superposition," "indistinguishability," etc., all of which are inexplicable in classical scientific terms, may be regarded as metaphors that are at least as characteristic of the experiencing/observing consciousness as of the physical systems and processes with which it interacts. Manifestations of these metaphorical "consciousness principles" can readily be noted in a broad range of human activities and relationships.

3. The traditional objective properties and coordinates of physical theory, such as distance, time, mass, charge, momentum, energy, etc., can similarly be generalized to encompass corresponding subjective experiences, the more rigidly defined objective descriptions of which are useful tools for analytical purposes.

4. The composite theory is not a model of consciousness, *per se,* nor of the physical world. It is rather a model of the experiential products of the interpenetration of an otherwise ineffable consciousness into an equally ineffable physical surround.

Using such a perspective and vocabulary, it is possible to erect various consciousness “structures” and “interactions,” using much the same metaphoric license that early quantum physics invoked in postulating its “planetary” atom or the “standing wave patterns” of bound electronic structures. In similar spirit, consciousness “atoms” may be assembled wherein the experiences of an individual are represented by patterns of standing waves, akin to the bound electronic configurations of physical atoms. These consciousness atoms thus defined may be combined into consciousness “molecules” that display distinctly different characteristics than their constituents. This bonding process, which is classically inexplicable even in physical situations, is a serviceable format for representation of the anomalous operator/machine and percipient/target interactions observed in the laboratory, and for broader comprehension of many other subjectively experienced phenomena as well. For example, in the physical regime, when the wave patterns of the valence electrons of two atoms come into close interaction, they cannot be distinguished in any observable sense. This loss of information about the electron identities, when properly acknowledged in the quantum mechanical formalism, leads to an “exchange energy” which is anomalous in classical terms, but is nonetheless the basis of the molecular bond. (This process is an excellent example of the fungibility of energy and information mentioned earlier.) Our metaphor would thus predict that an individual consciousness immersed in a given physical situation would sustain a set of characteristic experiences. A second individual, exposed to the same situation, would manifest a different set of experiences. However, if these two consciousnesses were strongly interacting, their experiential wave patterns would become resonantly intertwined, resulting in a new pattern of standing waves in their common environment. As demonstrated in the co-operator experiments mentioned above, these “molecular” experiences may be quite different from the simple sum of their “atomic” behaviors, and if we insist on treating them as such, they will appear anomalous. In their own properly constituted “molecular” context, however, they are quite normal and, in principle, predictable.

Even our individual operator/machine effects may be addressed in this fashion if we are willing to concede some form of “consciousness” to the machine, in the sense that it, too, is a system capable of exchanging information with its environment. Thus, a bonded operator/ machine system should not be expected to conform to the isolated operator and isolated machine “atomic” behaviors, but to establish its own characteristic “molecular” behavior. Viewed as an influence of one “particulate” system (the operator) upon another (the REG), the empirical results are inexplicable within the canonical behaviors of the isolated systems; viewed as a process of wave-mechanical resonance between two components of a single interactive system, the behavior is appropriate. Otherwise put, the surrender of individual subjective identity within the human/machine bond is manifested in the appearance of objective information on the digital output string of the bonded system; *i.e.,* the entropy of that data string has literally been reduced by the resonance. And when this human/machine resonance is enhanced by a bond between co-operating participants, the entropy reduction appears to be more pronounced.

Such a model can also be applied to the remote perception effects in terms of a bond between the percipient and the agent that enables the “anomalous” acquisition of information about the prevailing physical target environment in which both are subjectively immersed. Alternatively, the resonance may be between the percipient and the target scene itself, with the agent assigned to a more passive facilitating role. In either representation, the merging of subjective identities again enables the transfer of objective information, in this case manifesting as a quantitative coherence between the agent and percipient response forms.

In this fashion, we have succeeded to some extent in establishing a scholarly dialogue between empirical data and a representative theoretical model that encompasses both objective and subjective dimensions of the phenomena. To be sure, this dialogue yet lacks a precise metric and full quantification, but it has nonetheless proven useful in correlating experimental results, suggesting new experimental designs and tests, identifying salient parameters, and prompting subjective conceptualizations of the nature of the phenomena. For the remainder of this paper, let us indulge in some speculations regarding the possible generalization of such a strategy to the establishment of a more comprehensive science of the subjective.

## Requisites and Tactics of a Subjective Science

The construction of a comprehensive science of the subjective will require the harmonious melding of many components, some of which may be transposed intact from established objective science, others of which will require modification or generalization, and yet others of which must be added anew. In the first category, for example, we certainly must retain the commitment to, and reliance upon, sound empirical data and incisive theoretical models that are maintained in a healthy dialogue with one another. Nor can there be any abrogation of the proper scientific attitude: well-informed on previous and contemporary work; open to new ideas, new scholars, and new results; and humble in the face of empirical evidence, especially those anomalous effects that seem to contradict established beliefs. But in the second category, there will be the need to generalize conceptual vocabularies and currencies to accommodate both subjective and objective experience, to search for their measurable quantifiers and standards, and to loosen the constraints on replicability as applied to subjective parameters. And in the third category, certain prevailing epistemological and ontological presumptions will need to be replaced by radically different perspectives. Let us develop a few of these components in a bit more detail.

## Replicability

To begin with, it will be necessary to broaden quite generously the definition of experimental replicability to accommodate the hyper-statistical character of the interactive processes and their participants, the intrinsically elusive nature of many of the phenomena, and the subjective dimensions to which they relate. For example, any event involving a proactive consciousness must be expected to reflect personal characteristics, which in turn may vary widely from individual to individual, from mood to mood, from context to context, and from environment to environment. To require that all participants and their physical targets display the same patterns of behavior in any given subjective-objective interaction with infallible replicability makes no more sense than expecting everyone to be a great artist, a great mathematician, or a great lover, or any creative genius to perform with the same effectiveness on a day-in, day-out basis. To ignore the influence of environment, be it physical, cultural, or emotional, on such processes would be as silly as expecting a great composer to produce the same quality of work in a boiler factory as in his music chamber. But this futility of imposing quantitative micro-replicability standards need not obscure the useful parametric correlations that the subjective science could provide concerning the macro-statistical pattern of experience. In our PEAR experiments, for example, the evidence that female effects distribute differently than male; that bonded couples perform better on average than unbonded or like-sex pairs; or that overall effect sizes are independent of intervening distance or time, are consequential statistical generalizations that can stimulate theoretical models, predicate more incisive empirical studies, and enable more powerful conceptualizations. Similarly broad statistical dialogues will need to be accommodated in any other application of subjective science.

## Subjective Metrics

Closely related to the issue of replicability is the need to identify viable quantifiers and standards of the subjective coordinates and properties that will appear in the data and the models. We know how it *feels* to be "heavy-" or "light-hearted;" to have our mind "miles away" from a given topic; to be "all charged up" about an issue; or to be "spinning" in confusion. Through our language, we have developed means of expressing these feelings in terms that are broadly comprehensible to others. But can we find the meters, in the internal neurophysiology or elsewhere, that will enable us to quantify these parameters to a degree permitting constructive dialogue between subjective experience and objective physical events? Our own first attempts at such codification drew from an assortment of psychological and physiological anecdotes, linguistic precedents, and intuitive speculations and served more to sketch the problem than to solve it [7, 28]. Clearly, quantification of the subjective is a crucial and complex task that will require open-minded colloquy and innovative collaboration among such diverse disciplines as neuroscience, psychology, anthropology, physics, and engineering, to make more substantial progress. Perhaps we may take heart from Arthur Eddington's reminder that the "objective" physical metric itself is not all that tidy:

> Quantities like lengths, duration, mass, force, etc. have no absolute significance; their values will depend on the mesh-system to which they are referred... there is no fundamental mesh-system. In particular problems, and more particularly in restricted regions, it may be possible to choose a mesh-system which follows more or less closely the lines of absolute structure in the world, and so simplify the phenomena which are related to it. But the world structure is not of a kind which can be traced in an exact way by mesh-systems, and in any large region the mesh-system drawn must be considered arbitrary. In any case the systems used in current physics are arbitrary [29].

## Metaphor

The PEAR approach to a model of reality based on the interpenetration of consciousness and its environment outlined earlier has occasionally been criticized as being "only a metaphor." This troubles us little, for upon deeper reflection, all of science is, to a large degree, metaphoric. Any search for new knowledge begins with some form of subjective experience, which consciousness then attempts to describe, catalogue, and comprehend by comparison with other previously catalogued and comprehended descriptions of experience. The metaphoric ladder thus constructed may reach lofty intellectual heights, but its lowest rungs inevitably rest on very subjective, perhaps even archetypal, ground. The most basic physical concepts of distance, time, mass, charge, force, energy, linear and angular momentum, *et al.,* are all metaphorical representations with self-evident analogies in subjective human experience that doubtless impelled their first objective specifications. Indeed, one may argue that all of the formalisms of mathematics and statistics, and the number system on which they are based, are themselves symbolic metaphorical extrapolations of the primordial human propensities to establish order and to count. No, metaphor is not a sloppy form of conceptual representation; it is a critical step in establishing the foundations of any objective science, and it will be even more indispensable in creating a subjective science. In fact, the implicit reliance of objective science on metaphor as a means of sensorial association will need to be elevated to a more explicit functional role, wherein the commonalties of superficially disparate experiences can be assembled into an interdisciplinary skeletonic structure of corporate, rather than cellular, cause and effect. Jonas Salk focuses on this point in his book, *Survival of the Wisest:*

> Man has come to the threshold of a state of consciousness, regarding his nature and his relationship to the Cosmos, in terms that reflect 'reality.' By using the processes of Nature as metaphor, to describe the forces by which it operates upon and within Man, we come as close to describing 'reality' as we can within the limits of our comprehension. Men will be very uneven in their capacity for such understanding, which, naturally, differs for different ages and cultures, and develops and changes in the course of time. For these reasons it will always be necessary to use metaphor and myth to provide 'comprehensible' guides to living. In this way, Man's imagination *and* intellect play vital roles in his survival and evolution [30].

## Epistemology, Ontology and Teleology

It will also be crucial for the subjective science to distinguish far more sharply between its epistemology and its ontology than is commonly acknowledged in prevailing objective science. Indeed it may be most productive to relegate objective ontology to an irrelevant, or at least ineffable, status. The need for an absolute reality, so precious to objective science, now must evaporate in favor of more participatory, probabilistic, and holistic experiential patterns whose characteristics are represented and analyzed by the same minds who experience them and, in this sense, create them. This subtlety was well recognized by Albert Einstein, who articulated it in many of his philosophical writings:

> Concepts which have been proved to be useful in ordering things easily acquire such an authority over us that we forget their human origin and accept them as invariable [31].
>
> The system of concepts is a creation of man together with the rules of syntax, which constitute the structure of the conceptual systems... All concepts, even those which are closest to experience, are from the point of view of logic freely chosen conventions, just as is the case with the concept of causality [32].
>
> . . . even scholars of audacious spirit and fine instinct can be obstructed in the interpretation of facts by philosophical prejudices. The prejudice... consists in the faith that facts by themselves can and should yield scientific knowledge without free conceptual construction [33].

In other words, *any* physical model is no more than an objectification of some form of subjective experience, useful for analytical purposes but not to be confused with any deeper ontological reality. In pursuing this wisdom, one is struck by yet another metaphor; namely, that much as the elementary physical particles reveal their properties only in their interactions with some physical environment, *e.g.* a bubble chamber, Geiger counter, or photographic emulsion, so consciousness also defines itself only in its interactions with its physical surround. Conversely, just as physical detectors respond only to external stimuli, the "objective" properties of the universe are, without exception, only defined by some inquiring, ordering consciousness.

This recognition, in turn, opens the door to admittance of the most powerful, but most difficult to represent, family of subjective parameters, those of the teleological genre that comprise conscious (and very possibly unconscious) intention, desire, will, need, or purpose. These are demonstrably primary correlates of empirical consciousness-related anomalies of all ranks, from laboratory-based microscopic human/machine effects, to macroscopic poltergeist phenomena, to creativity of all forms. They are explicitly postulated in Lamarckian evolutionary models, clearly implicated in many forms of medical anomalies, and central to most religious belief systems. This teleological ability of living systems to influence their environments desperately needs to be postulated in clearly testable form, corresponding experiments performed with precision, and the results interpreted in sound and enlightened scientific methodology, attitude, and conceptual currency. The role of teleology will be a keystone of the proposed science of the subjective, and thereby of the advance of our culture.

## Resonance

One of the most proliferate and dramatic modes of interaction in all objective science is that of resonance, the coupled sympathetic oscillations of participating components of mechanical, electromagnetic, thermodynamic, quantum, or biological systems that can produce extraordinary physical effects and responses. The corresponding subjective concept of resonance as facilitator of deeper personal experiences such as trust, hope, and affection are also well acknowledged. But in the new science of the subjective, resonance assumes the even more critical role of coupling the subjective and objectives hemispheres of experience to one another via its demonstrated capacity for imparting order to random physical processes. Such resonance devolves from the principle of indistinguishability mentioned earlier, whereby the surrender of information distinguishing the two interacting subsystems within a single complex system translates into enhancement of the structural strength of the bonded system. Thus, when the perceived boundary between consciousness and its physical environment is permeated via subjective merging of the "I" with the "Not I," the resultant bonded system may manifest tangible alterations in both the environment and the corresponding experience of the consciousness. If this resonance entails a teleological component, be it conscious or unconscious, the bonded system may acknowledge that intention in some characteristic manner. As suggested by our experimental results, the scales of such effects may be marginally small, making them difficult to identify on an incident-by-incident basis. Nonetheless, they can manifest in significant probabilistic trends accumulated over large bodies of experience. This leaves us with the intriguing possibility that what we denote as "chance" or "random" behavior, in any context, rather than deriving from some ultimately predictable, fully mechanistic behavior of a deterministic physical world, is actually an immense subsumption of a broad distribution of potentialities reflective of all relevant resonances and intentions of consciousness with respect to the system or process in question. Eddington proposed the possibility in only slightly different terms:

> It seems that we must attribute to the mind power not only to decide the behavior of atoms individually but to affect systematically large groups—in fact to tamper with the odds on atomic behavior... Unless it belies its name, probability can be modified in ways in which ordinary physical entities would not admit of. There can be no unique probability attached to any event or behavior; we can only speak of 'probability in the light of certain given information,' and the probability alters according to the extent of the information [34].

## Complementarity

It would be wrong to cast this plea for creation of a science of the subjective solely in terms of a replacement for, or even an extension of, precise objective science. Rather, if they are to be mutually productive, the two perspectives need to complement each other, in very much the same spirit as the Complementarity Principle first proposed and later generalized by several early quantum physicists. Niels Bohr originally conceived this profound idea to ameliorate the wave/particle dilemma in quantum mechanics, in the sense that neither the wave nor the particle was to be regarded as the "correct" representation of atomic-scale physical matter, but that both were needed to triangulate its evidence and comprehension. Bohr himself quickly recognized that this complementarity was not solely a physical property, but a much more fundamental aspect of human consciousness:

> ...we must, indeed, remember that the nature of our consciousness brings about a complementary relationship in all domains of knowledge, between the analysis of a concept and its immediate application... in associating the physical and the psychical aspects of existence, we are concerned with the

> special relationship with complementarity which it is not possible thoroughly to understand by one-sided application either of physical or of psychological laws... only a renunciation in this respect will enable us to comprehend... that harmony that is experienced as free will and analyzed in terms of causality... The real problem is: how can that part of reality that begins with consciousness be combined with those parts that are treated in physics and chemistry? Here we obviously have a genuine case of complementarity [35].

Bohr's colleague, Werner Heisenberg, author of the uncertainty principal, expressed a very similar recognition:

> We realize that the situation of complementarity is not confined to the atomic world alone; we meet it when we reflect about a decision and the motives for our decision, or when we have the choice for enjoying music and analyzing its structure [36].

They were joined in this generalization by Wolfgang Pauli, most celebrated for his "Exclusion Principle," but perhaps more importantly for our purpose, for his collaboration with Carl Jung on the concept of "sychronicity." Pauli wrote:

> On the one hand, the idea of complementarity in modern physics has demonstrated to us, in a new kind of synthesis, that the contradiction in the applications of the old contrasting conceptions (such as particle and wave) is only apparent; on the other hand, the employability of old alchemical ideas in the psychology of Jung points to a deeper unity of physical and psychical occurrences. To us... the only acceptable point of view appears to be to the one that recognizes *both* sides of reality—the quantitative and the qualitative, the physical and the psychical—as compatible with each other, and can embrace them simultaneously... It would be most satisfactory of all if physics and psyche could be seen as complementary aspects of the same reality [37].

While it may be presumptive to embellish this wisdom, it is our opinion that the powerful philosophical extension of the principle of complementary into the domain of human consciousness that Bohr first proposed propagates its roots even more deeply into the subjective foundations of modern science than even he may have imagined. Objective science, in its neoclassical format, and subjective science, as we now propose it, should be regarded as two complementary ethics, fundamentally united by the yearning of the human consciousness for understanding of its relationship to the cosmos and for participation in the creation of reality, although necessarily distinguished by the tactical approaches employed in pursuing these goals. Thus, objective science, launching itself from the sharp distinction between self and non-self implicit in its Aristotelian heritage, must continue to utilize its ability to discriminate, to isolate, and to represent elements of reality via precise observation and dispassionate logic. Subjective science should complement this thrust by acknowledging and utilizing the innate consciousness strategies of association and assimilation to achieve a unity of self and not-self, in its search for a participatory role in the mechanics of creation. Failure to recognize and utilize the essential complementarity between these objective and subjective strategies and purposes of consciousness within an integrated scientific method will ultimately frustrate any research, experimental or theoretical, that attempts to comprehend either the dimensions of human consciousness or the subtleties of the physical world. In fact, it is this very failure that lies at the heart of the generic philosophical impasse that is confounding our contemporary cultural condition. Einstein stated the problem succinctly several decades ago:

> Science without religion is lame; religion without science is blind [38].

In the interplay of objective intellect and subjective spirit, we are dealing with the primordial conjugate perspectives whereby consciousness triangulates its experience. The issue is whether these will be deployed in mutually encumbering contradiction, or in mutually fulfilling complementarity. The desirability of the latter course has long been recognized and propounded in various abstract contexts, but it has never been satisfactorily formulated in practical terms. Clearly, we do not yet have an explicit formula, but we can now rigorously demonstrate on the laboratory bench, and to some extent in the corresponding models, that human intention, will, volition, desire, by any name, deployed in self-surrendering resonance with even a simple physical system or process, can significantly affect the latter's behavior, and that the same deployment of human intention in resonance with another human consciousness can condition their mutual reality to a significant extent. The challenge ahead of us is to extend such databases and models into many other scholarly and pragmatic sectors, from whence to weave a new fabric of complementary science that respects and utilizes subjective qualities as much as objective, aesthetic sensitivities as much as analytical logic, and mystical insights as much as tangible evidence. Although we face monumental obstacles of conceptualization, vocabulary, and measurability on our road to this holistic science, we should be sustained in the effort by the recognition that science of any era has always been no more than a particularly disciplined form of human inquiry; that scientific vocabulary has always been only a subset of human linguistics; and that scientific observation and scientific conceptualization have always drawn metaphorically from broader and less tangible human experience. It is not unfounded, therefore, to hope that the same exquisite consciousness that has so brilliantly conceived and refined its science of the objective, and that has at the same time so fully experienced and celebrated the subjective dimensions of its life, can now finally integrate these complementary perspectives into a super-science of the whole, wherein consciousness will stand as full partner with its cosmos in the establishment of reality.

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