SUGGESTED READING

A Brief Annotated List

I have divided the following lists of books and references into several categories: Introductory Level Physics Texts, Books on Mathematics and Math for Physicists, Advanced and Specialized Works, Popularizations of Modern Physics and Cosmology, and Examples of Materials that Explore the Study of Consciousness as an Emerging Science. These lists are not intended to be exhaustive or authoritative. They merely represent a reasonable sample. I will add to the list as important works come to my attention. Generally I focus on books rather than papers and articles, because they are more easily available. Most of these works contain excellent bibliographies that the reader can and should mine for additional materials on subjects of interest.

Introductory Level Physics Texts

There are many good physics texts. I will list the main ones that I used because they were handy and helpful.

Benson, Harris. **University Physics**. Rev. Ed. New York: Wiley & Sons, 1995. This book is beautifully illustrated with colored photos, charts, and drawings. There are lots of examples, worked problems, and exercises. It is a very useful book, well organized and clearly written. It also contains good historical coverage with pictures of great scientists and fascinating special topic discussions.

Birk, James P. **Chemistry**. Boston: Houghton-Mifflin Co., 1994. This is a standard chemistry text, not a physics text. I include it here because such a reference work is useful as a resource for information on the aspects of physics that impinge on chemistry.

Feynman, Richard P. With Robert Leighton and Matthew Sands. **The Feynman Lectures on Physics**. 3 Vols. Reading, MA: Addison-Wesley, 1963. Copyright by Cal Tech. This set of lectures by Feynman is an inspirational work. Anyone interested in physics should have it and explore it. It is a wonderful gift from one of the great geniuses of physics that also happened to be a great teacher and took the time to share his views on physics with students in considerable detail and got them down on paper. I heartily support his view that quantum mechanics should be simplified, clarified and taught as part of the foundation for the study of physics. Don't miss his marvelous essay on "Algebra", Lecture 22 of Vol. I. Volume I deals mostly with introductory classical physics including special relativity; Volume II considers electricity; and Volume III is devoted to quantum mechanics.

Radin, Shelden H. and Robert T. Folk. **Physics for Scientists and Engineers**. Englewood Cliffs, NJ: Prentice-Hall, 1982. No color, but good drawings, charts, and tables. I picked it up in good shape at a second-hand book store, and now it's pretty dog-eared. I enjoyed it and found the authors made insightful comments about key issues from time to time.

Books on Mathematics and Math for Physics

Mathematics is a huge field with more books and papers than you would care to read in several lifetimes. I will mention a few works that I drew on in this project. This list is a mixed bag.

Bamberg, Paul and Shlomo Sternberg. **A Course in Mathematics for Students of Physics**. 2 Vols. Cambridge: Cambridge University Press, 1988, 1990. Volume one covers mechanics, special relativity, and optics. Volume two deals with electromagnetics and thermodynamics. One of these days I' ll finish them. They are nicely done. Bamberg was my classmate in junior high and at Harvard, though we hardly ever spoke to each other. I have always admired his quiet, understated intelligence.

Edwards and Penney. **Calculus and Analytic Geometry**. Alternate Second Edition. Englewood-Cliffs, NJ: Prentice-Hall, 1988. This is just one of many good standard texts on the subject that can be used as a reference work.

Eves, Howard, and Carroll V. Newsom. **An Introduction to the Foundations and Fundamental Concepts of Mathematics**. Rev. Ed. New York: Holt, Rinehart, Winston, 1958, 1965. I highly recommend this book. It is the best survey I have ever seen of the foundations and fundamental concepts of mathematics. It also is a good source book on the history of mathematics. It covers, Pre-Euclidean math, Euclid, non-Euclidean geometry, Hilbert' sGrundlagen, Algebra and its liberation, axiomatics, number theory and the postulational approach, sets, logic, and the philosophy of mathematics, including discussions of various crises in mathematics and a nice discussion of Goedel' s work in an appendix.

Hockett, Charles O. "The Origin of Speech." **Scientific American**, 203/3 (1960), 89-96. This landmark article by a noted linguist and expert in morphology outlines a set of basic design features found in human communication systems. Various combinations, and sometimes perhaps all of these features occur also in communication systems used by other living organisms. There may be other features that he has not identified, and there may be new features that will evolve into communication systems in the future. This is not a mathematical work, but Hockett' s description of design features applies equally to mathematics, since that discipline is a specialized form of language.

Mandelbrot, Benoit. **The Fractal Geometry of Nature**. San Francisco: W. H. Freeman, 1982. This is the classic work by Mandelbrot on fractal geometry. It' s a beautiful book. Don' t miss it.

Menzel, Donald. **Mathematical Physics**. New York: Dover, 1961. This book is generally a bit dense at first, but gets more and more useful as you delve into it and gain familiarity. For new students of physics I recommend the more approachable texts in the section on introductory physics texts. However Menzel' s book can be used as a

reference work. I mention this book because I found the first chapter on "Physical Dimensions and Fundamental Units" to be very useful. Particularly helpful are his discussions of dimensional analysis, derivation of equations, dimensionless combinations, choice of constants and parameters, and numerical coefficients. There are powerful tools in there for theoretical analysis. Menzel's brief introduction to the Lagrangian was helpful for grasping the main point quickly.

Robinson, Abraham and Wilhelmus A. J. Luxemburg. **Non-Standard Analysis.** Princeton Landmarks in Mathematics. Princeton University Press. Robinson develops a systematic notation for a set *R called "hyper reals" or Robinson Reals. This is part of a relatively new mathematical discipline known as Non Standard Analysis (NSA). Nottale makes use of NSA to develop methods of doing calculus on non-differentiable fractal continua. (See my discussion of Nottale's fractal microphysics above.)

Rucker, Rudy. **Infinity and the Mind**. Rucker has presented some of the far reaches of recent explorations into the realm of "infinity", going beyond Cantor into the possibility of mathematical expressions in that tenuous region of the Mind. Rucker has written a number of other books that would be classed as popularizations.

Shannon, C. E. and W. Weaver. **The Mathematical Theory of Information**. Urbana: University of Illinois Press, 1949. This is a classic text on the theory of information. IT has bearing on any theory of consciousness, because it is consciousness that defines and experiences all information. IT also relates to the study of quantum thermodynamics, since information and entropy are the same thing. The multiplicity of microstates of a system tells you how many distinct possible pieces of information you can have in that system.

Whicher, Olive. **Projective Geometry: Creative Polarities in Space and Time**. London: Rudolf Steiner Press, 1971. Sec. Impression, 1985. This book is very artistically done with beautifully executed drawings and illustrations (b & w only), and looks at first glance like a popularization. Actually, in this work Whicher covers the subject of projective geometry very nicely in an approachable and sensitive manner without becoming dry and technical. She encourages the reader to explore the discipline as a tool for heightening awareness and gaining new creative insights and viewpoints.

Spiegel, Murray R. and John Liu. **Mathematical Handbook of Formulas and Tables**. Second Ed. Schaum's Outlines Series. New York: McGraw Hill, 1999. This is just a useful reference, a book full of numbers and formulas.

Advanced and Specialized Works

Baierlein, Ralph. **Thermal Physics**. Cambridge: Cambridge University Press, 1999. This book is clearly written and reader friendly and covers the subject. I enjoy reading it.

Eisberg, Robert and Robert Resnick. **Quantum Physics of Atoms, Molecules, Solids, Nuclei, and Particles**. Second Edition. New York: John Wiley and Sons, 1985. A good source book with a lot of clear diagrams, plus a large array of appendices full of interesting material.

Fisher, Robert A. **Optical Phase Conjugation**. Academic Press, 1983. This is an excellent work on a very important field of physics. For the classic work on this subject by its discoverer(s), see Zel' dovich et al., below.

Frauenfelder, Hans and Ernest M. Henley. **Subatomic Physics**. Second Ed. Englewood Cliffs, NJ: Prentice-Hall, 1991. I used mostly Section III, which deals with Symmetries and Conservation Laws. It also covers the tools of particle physics, particles and nuclei, interactions, and models. In the back are some nice tables.

Harsany, Stephen C. **Principles of Microwave Technology**. Upper Saddle River, NJ: Prentice-Hall, 1997. This is an excellent reference on microwave technology, including EM fundamentals, transmission line fundamentals, Smith charts, components, solid state devices, antennas, measurements, and communications applications.

Hecht, Eugene. **Optics**. 3rd Ed. Reading, MA: Addison-Wesley, 1998. This is an excellent text on optics. It has a section at the end on modern optics including lasers and holography.

Kittel, Charles and Herbert Kroemer. **Thermal Physics**. Second Edition. San Francisco: W. H. Freeman and Co., 1980. This is an excellent book on the subject.

Kroemer, Herbert. **Quantum Mechanics: For Engineering, Materials Science, and Applied Physics**. Englewood Cliffs, NJ: Prentice-Hall International, 1994. A good book. He covers lots of ground. The sections I used most: the wave-particle duality, Schroedinger equation, bound states, hydrogen atom, wave packets and uncertainty, scattering, ..., angular momentum, time evolution and transition probabilities, field quantization and correlated photons, electron spin, fermion and boson states. But there are lots more interesting contents.

Martin, B. R., and G. Shaw. **Particle Physics**. Second Edition. New York: John Wiley & Sons, 1992, 1997. This book in the Manchester Physics Series gives excellent coverage of the field. Topics include basic concepts (particles and antiparticles, wave equations, Feynman diagrams, particle exchange, units and dimensions), leptons, quarks, hadrons, experimental methods, symmetries, GCD, jets and gluons, weak interactions and the intermediate vector bosons, electro-weak unification, GUT theories, and other theories beyond the Standard Model. There are excellent appendices, including an article on the gauge principle and tables of particles and their properties. There are lots of Feynman diagrams, charts, plots, and other illustrations.

Milgrom, Mordehai. "MOND -- Theoretical Aspects." arXiv: astro-ph/0207231 v2 15 Aug 2002. This is an up-to-date article by Milgrom on MOND. In it he goes over the

formulation of the "law" and various approaches that are being explored to develop a theoretical underpinning for it.

Misner, Charles, Kip Thorne, and John Archibald Wheeler. **Gravitation**. San Francisco: W. H. Freeman and Co., 1973. This is the blockbuster book on gravity. It is mostly useful as a reference source. It has just about everything you' d like to know on the subject except how gravity integrates with the other forces. Lots of diagrams to help visualize.

Notalle, Laurent. **Fractal Space-Time and Microphysics: Towards a Theory of Scale Relativity**. River Edge, NJ: World Scientific, 1993. The title tells you what this is about. This is an exciting and creative book. Scale is a major issue in physics that is not well understood. The discussions and calculations in **Observer Physics** definitely indicate that there is a fractal structure to the scales and relationships of the various physical constants. Notalle is on the right track, though his work is still preliminary. The work of Wolfram (q.v.) will probably be relevant as well. At the end of this bibliography I have appended a more detailed outline of some of Nottale' s main points and their relation to observer physics.

Ohanian, Hans and Remo Ruffini. **Gravitation and Spacetime**. Second Ed. New York: W. W. Norton & Co., 1976. This is a briefer tome on gravitation than the Misner/Thorne/Wheeler blockbuster and is dedicated to them. After introducing Newtonian theory, special relativity, linear approximations, and Riemannian geometry, Chapter 7 covers Einstein' s gravitational theory with a section on Mach' s Principle. Then Chapter 8 explores Black Holes and Hawking radiation, Chapter 9 looks at Cosmology, and Chapter 10 looks at the Early Universe.

Peacock, John A. **Cosmological Physics**. Cambridge: Cambridge University Press, 1999. This is a big book full of information about recent developments in the aspects of physics that deal with cosmology. This includes gravitation and relativity, distances and measurements, gravitational lensing, quantum field theory, big bang theory, observational evidence, and theories and evidence pertaining to galaxy formation and clustering. It' s a good source book.

Polchinski, Joseph. **String Theory**. 2 Vols. Cambridge: Cambridge University Press, 1998. Reprinted in 2000. Volume one introduces bosonic string theory. Volume two looks at superstring theory and beyond. For me string theory is an interesting form of abstract mathematics. The question for Observer Physics is how to identify the best model for describing the behavior of fundamental particles -- if indeed there is one. This book cites other major sources on the subject.

Quigg, Chris. **Gauge Theories of the Strong, Weak, and Electromagnetic Interactions**. Frontiers in Physics Lecture Note Series 56. Reading, MA: Addison-Wesley, 1983. This is a good discussion of the gauge theories, their successes, and their problems.

Sachs, Robert G. **The Physics of Time Reversal**. Chicago: University of Chicago Press, 1987. Explores symmetry and conservation laws, classical mechanics, quantum mechanics and Wigner' s T-reversal transformation, collisions and scattering, decay processes, relativistic transformations, CPT invariances and violations, and prospects for the "future".

Sakai, Jun-Ichi. **Phase Conjugate Optics**. Advanced Science and Technology Series. New York: McGraw-Hill, 1992. This is the source I used for discussions of phase conjugation principles. It is translated from the Japanese original -- **Isoo kyooyaku koogaku**. This book on a very important new discovery in physics covers various topics in phase conjugate optical systems: history of the technology, concepts and properties, applications, theoretical foundations and techniques of its production in various media.

Singh, Jasprit. **Quantum Mechanics: Fundamentals & Applications to Technology**. New York: Wiley & Sons, 1997. Useful and well organized with nice summary charts, but I use Kroemer more.

Weinberg, Steven. **The Quantum Theory of Fields**. 3 Vols. Cambridge: Cambridge University Press, 1995. This is a detailed 3-volume work by one of the architects of electro-weak unification theory. Volume one is devoted to fundamentals (fourth impression (1999) after three rounds of corrections). Volume two deals with applications (impression in 2000 with corrections.) Volume three discusses Super-symmetry and appeared in 2000.

Zel' dovich, B. Y., N. F. Pilipetsky, and V. V. Shkunov. **Principles of Phase Conjugation**. Berlin: Springer-Verlag, 1985. This is the classic text by the discoverer of this new technology. The general principles of phase conjugation represent an emerging paradigm with profound implications for all of physics and other fields as well.

Popularizations of Physics and Cosmology

Barrow, John D. and Joseph Silk. **The Left Hand of Creation: The Origin and Evolution of the Expanding Universe**. This is a layman' s overview of the current model of the universe and its evolution with discussion of some of the puzzles and problems that remain.

Bohm, David. **Wholeness and the Implicate Order**. London: Ark Paperbacks, 1980. In this book Bohm promotes his theory of the Implicate Order.

Bohm, David and F. David Peat. **Science, Order, and Creativity**. New York: Bantam, 1987. Bohm is a proponent of the "implicate order" interpretation of quantum mechanics. His ideas are always worth considering.

Briggs, John and E. David Peat. **Turbulent Mirror: An Illustrated Guide to Chaos Theory and the Science of Wholeness**. Perennial Library, 1989. Nicely illustrated

introduction to fractals and chaos theory with very creative drawings inspired by **Alice in Wonderland**.

Gleick, James. **Chaos: Making a New Science**. New York: Viking, 1987. This is another good introduction to chaos theory.

Gribbin, John & Martin Rees. **The Stuff of the Universe: Dark Matter, Mankind, and Anthropic Cosmology**. Penguin, 1995. This is another layman's introduction to cosmology. It contains a section on the anthropic principle, a currently popular expression of human egocentrism. Oddly enough, some of the findings of **Observer Physics** could be used as armament for the anthropic cosmology.

Hawking, Stephen. **The Universe in a Nutshell**. UK: The Book Laboratory, 2001. This book is lavishly decorated with computer-generated color illustrations and gives an introduction to modern cosmology for the general reader. Hawking introduces the twentieth-century contributions of Einstein to relativity and quantum mechanics; the problem of how to integrate these two disciplines; the Hamletian idea of knowing the universe though bounded in a nutshell, which is definitely Hawking's challenge; the problem of information and black holes; Hawking radiation, black hole temperature, and black hole entropy; the future, the past, holography, and the evolution of organic and inorganic forms. This book is quite approachable and stimulating as well as being written by one of the finest minds of our day.

Herbert, Nick. **Faster Than Light: Superluminal Loopholes in Physics**. New York: New American Library, 1983. In this little book Herbert summarizes the current understanding about various FTL phenomena, including phase waves, advanced waves, space warps, tachyons, antiparticles, neutral Kaons, the EPR paradox, and Bell's theorem. He speculates about possibilities that future practical applications might emerge from further research into these phenomena. In the back he appends a nice list of sci-fi stories related to FTL phenomena and time travel.

_____. **Quantum Reality: Beyond the New Physics, An Excursion into Metaphysics and the Meaning of Reality**. Garden City, NY: Anchor Books, 1987. Herbert analyzes the various competing interpretations of quantum mechanics. He also devotes a chapter to EPR, Bell's theorem, theClauser-Aspect experiments, and the possibility or impossibility of FTL communications, these being his pet interests.

Hofstadter, Douglas R. **Goedel, Escher, Bach: An Eternal Golden Braid**. New York: Vintage Books, 1980. This is an artistic interdisciplinary exploration of iterative processes. It contains fun, wordplay, and creative illustrations.

McGaugh, S. S. "The MOND Pages." www.astro.umd. McGaugh works in astro-physics and has collected a lot of good material about MOND at this website, including the technical papers.

Milgrom, Mordehai. "Does Dark Matter Really Exist?" **Scientific American**, [162]

Aug. 2002. 287 (2) , 42. This is a recent article by Milgrom explaining the general idea of MOND. For details see his technical articles, conveniently listed at McGaugh' s "MOND Pages" website. A lively debate goes on with the Dark Matterists trying to show how MOND doesn' t work, but lacking enough DarkMatter to provide an alternative that works, and MONDists proposing a formula that fits the data, but unable to say why things should work that way or fully integrate it into the theoretical underpinnings of relativity and quantum mechanics.

Pagels, Heinz. **The Cosmic Code**. Pagels has several works on physics and cosmology aimed for general readers. In this book he describes the discovery of the system of conjugate pairs that occurs throughout creation.

Peat, E. David. **Superstrings and the Search for the Theory of Everything**. Contemporary Books, 1989. This book is actually two books disguised as one. One gives background and a layman' s introduction to the development of string theories. The other is an introduction to the Twistor Theory developed by Roger Penrose and his colleagues. Both of these ventures are extremely interesting developments in the field of mathematics. Whether they can solve the problems inherent in the quantum field theories remains to be seen.

Peitgen, H. O., and P. H. Richter. **The Beauty of Fractals**. Berlin: Springer-Verlag, 1986. This has beautiful illustrations of computer generated fractal graphics.

Trefil, James. **The Dark Side of the Universe**. New York: Anchor-Doubleday, 1989. This book about cosmology focuses mainly on the problem of the missing Dark Matter and different approaches to understanding and resolving it.

Will, Clifford M. **Was Einstein Right? Putting General Relativity to the Test**. New York: Basic Books, 1986. This little book relates the history of the testing of Einstein' s theory of General Relativity by someone who has been involved in the story. It is an interesting read. The design and execution of experiments is fascinating, as is the ebb and flow of controversy. The section on the binary pulsar was particularly relevant to some of the developments in the Observer Physics project. See Will' s diagram on p. 188.

Examples of Materials that Explore the Study of Consciousness as an Emerging Science

Eisen, William. **The Universal Language of Cabalah: The Master Key to the God Consciousness.** Marina Del Rey, CA: DeVorss & Co., 1989. Eisen has written a number of books on the Christian "Cabalah" tradition, astrology, and the so-called "English" Cabalah. These books are filled with mystical theories mixed with Pythagorean mathematical ideas. Generally speaking such cultural material is hardly what we would call science. I mention it here only because the above work contains some curious information that apparently came from clairvoyants and happens to support

the Observer Physics theory of the structure of the proton. I accidentally stumbled across this brief mention by Eisen **after** completing the manuscript of OP. "...The instrument that brings the atom into play is called the *animatical force*, and it consists of a radiation that is sent forth from the anim. It therefore becomes the intermediary between the atom and the anim, and it corresponds to the mental aspect of BEING." (p. 225.) "...Therefore, when we place a positron in the interior of a hydrogen atom and set it in motion around the proton, the combination brings the hydrogen *anim* into manifestation -- the inner core which is enclosed by the atom shell." (p. 226.) On page 227 Eisen presents drawings of quarks apparently cognized by Annie Besant and Charles Leadbeater back at the beginning of the 20th century long before quark theory emerged. They show that the three quarks themselves are made of triplets that the clairvoyants called "anim". According to the clairvoyants there are a total of 9 in a single proton nucleus. Thus a molecule of hydrogen according to their vision consists of 6 quarks or **18 anim** interleaved to form an ensemble. (Of course, they did not refer to the components as "quarks", since that term was coined from a phrase in Joyce' s novel, **Finnegan's Wake**, at the time when Gell-Mann and Zweig invented the theory of quarks in 1964.) Amazingly, according to our model of the proton, there turn out to be "inside" it exactly 9 sub-components: 2 up quarks, 1 anti-up quark, 2 positrons, 1 electron, 2 electron neutrinos and 1 electron antineutrino. Additionally, there is another electron and another electron antineutrino that move "outside" the nucleon. The hydrogen molecule in our model contains 18 internal components with 2 electrons in an external orbit and two electron antineutrinos also in a loose orbit. This picture seems to agree with the vision these clairvoyants had almost a hundred years ago! I am not sure when the "Agashans" came to the notion that "positrons" reside in the proton. But this radical idea also agrees with the theoretical findings and dynamic models we arrive at in Observer Physics through an objective study of the known particles, and their relations via the physical and mathematical constants.

Fuller, R. Buckminster in collaboration with E. J. Applewhite. **Synergetics: Explorations in the Geometry of Thinking**. New York: Macmillan, 1982. This is a seminal work on the nature of science, research, and invention. I was going to class this work as mathematical because of the focus on geometry, but finally decided that Fuller really is pursuing research into the nature of consciousness. Bucky tells it like it is, but in his own way. He even invented his own way of talking about his ideas. He was a master of exploring patterns of geometry in the Mental Space and then projecting them into the World Space as marvelous creations. For example, Fuller arrived at his concept of geodesic spheres entirely from his own theoretical explorations. The subsequent discovery of the existence of the "Fullerene" form of carbon in nature, development of techniques to deliberately manufacture it, and the current evolution of this structure into "Bucky Balls" and carbon nanotubules, fundamental inventions in nanotechnology that will have far-reaching practical applications in our future world, all demonstrate the power of Fuller' s visionary creative thinking. Fuller dedicates his book to the great geometer, H. S. M. Coxeter. Fuller' s material is organized around his favorite topics such as the principles of synergy, dymaxion kinetic vector structures, tensegrity, tetrahedral geometry, geodesic forms, and so on. This book is a multi-disciplinary classic.

Hagelin, John S. **Manual for a Perfect Government.** Fairfield, IA: MUM Press, 2002. This is Dr. Hagelin' s latest book. In addition to his insightful contributions to theoretical physics and the development of a Unified Field Theory, Hagelin has become very active in politics as a leading figure in the Natural Law Party, running as their candidate for President of the United States. He has made some excellent charts showing the structure of the field of physics. These are quite compact and useful for envisioning the field at a glance. (See charts on pp. 46, 50, 57, 59, 61, and 125.)

Hagelin, John S. "Restructuring Physics from its Foundation in Light of Maharishi Vedic Science." **Modern Science and Vedic Science,** 3:1 (1989), 3-72. Fairfield, IA: MUM Press. Hagelin presents a number of ideas that he developed in discussions with Maharishi Mahesh Yogi. Their goal is to correlate current theories of physics to ancient Vedic texts, even restructuring the nomenclature of physics according to the cosmology of ancient Vedic Science in order to give it a more timeless, universal quality, and the flavor of a "top-down" system. **Modern Science and Vedic Science** is an academic journal published semiannually by Maharishi University of Management, Fairfield, Iowa. Relating superstring theories to Vedic texts may sound like pretty far-fetched speculation, but perhaps it will stimulate interest among New Agers in some of the exciting notions that are developing in modern physics. Hagelin is very good at summarizing ideas in a clear and simple fashion.

Hubbard, L. Ron. **Self Analysis**. Los Angeles: Bridge Publications, 1987. Hubbard' s controversial life adventure as a science fiction writer who turned fiction into reality with his creation of **Dianetics** and **Scientology** took some of the first steps in the west toward developing a systematic scientific approach to a study of consciousness. Hubbard' s approach is overly analytical and may contain a number of unnecessary hidden assumptions. Also, Hubbard made a curious decision to promote his ideas as a kind of commercialized religion. His reasons for this are of historical interest and may have some bearing on the study of consciousness itself. Like the Maharishi and others who have pioneered developments in the field, the scientific study of consciousness sometimes appears hampered by the intrusion of these commercial and cultish concerns. Of course, although scientists do not like to admit it, this problem also exists for the traditional fields of science as well. Most of the patents for inventions are controlled by large corporate interests, and a great deal of valuable scientific information that could be useful to society is classified by governments or held as proprietary intellectual property by various organizations. There are practical reasons for such measures. Palmer, in his "Star' s Edge Philosophy" (**ReSurfacing**, 143-144, see listing below), has outlined some of the operational dynamics behind these phenomena. In any case, Hubbard deserves credit for playing an important role in the development of the systematic study of mind and awareness.

Maharishi Mahesh Yogi. **The Science of Being and the Art of Living**. New Rev. Ed. Fairfield, IA: MUM Press, 2001. This book has gone through various printings and represents a transcript of discourses that Maharishi originally made in 1963, a few years after he had begun travelling and teaching his Transcendental Meditation technique

around the world. This is one of the earliest and clearest of Maharishi' s explanations of his "Science of Being". It is something of a classic. Later he developed his theories into a course that he calls **The Science of Creative Intelligence** (see listing below). Since then he has spent a great deal of energy exploring the relationship between ancient Indian Vedic Science and modern science. This study has become a vast project pursued by Maharishi and the TM movement. Sometimes the situation gets a bit confused by the tendency of Indian pundits and western scientists to be rather dogmatic about their respective views. Each tends to talk a different language. There are many profound books about consciousness. I include Maharishi' s work because it is not just theoretical. He recommends with it a simple, effective program of direct experience to validate his claims -- the Transcendental Meditation program. The rest is really just words.

_____. **The Science of Creative Intelligence**. (Lecture Course on Tape with a Syllabus). Fairfield, IA: MUM Press, no date. This is an attempt to move the study of consciousness in the direction of a science. Unfortunately it is not available to the public. You must take the course to see the tapes, and only instructors can have manuals. This is too bad, because there is nothing especially proprietary in the printed material. The course is also marred by a tendency to promote itself and a fixation on the TM technique as the be-all and end-all, a viewpoint that hardly lends itself to the spirit of scientific inquiry. The course is also aimed at a layman audience and therefore is sorely lacking in technical rigor. Nevertheless it is a start and deserves credit for taking a big step in a direction that is conspicuously ignored by the public education system. The "SCI" course merits consideration as scientific material because it includes a "laboratory" technology -- the TM program -- that provides experiential confirmation of its basic theoretical claims.

Melchizedek, Drunvalo. **The Ancient Secret of the Flower of Life**, Vols. 1, 2. Self published. (ISBN 1-89182417-1) These two books introduce some of Drunvalo' s findings from his many years spent studying sacred geometry, ancient art and architecture, cultural tradition, mathematics, and physics. To obtain these books or learn more about him and his researches, you can visit his web site at www.drunvalo.net or his e-zine at www.spiritofmaat.com. Also see the next two entries. Drunvalo is definitely a "New Age" character.

_____ **The Merkaba Meditation**. On CD, self-published by Drunvalo Melchizedek. This amazing "meditation" is available through Drunvalo' s web site: www.drunvalo.net Drunvalo developed it from his study of physics and sacred geometry. It consists of "17 + 1" breaths to activate something he calls the MerKaBa, "the MER (the will, the beloved, or guardian) KA ("double", mental body, or food body) and BA (emotional body or soul)". According to ancient Egyptian teachings, the will, the power of love (Mer) directs the Ka and Ba the two engines that drive an individual' s energy field. Drunvalo believes the Ka and Ba form two counter-rotating energy fields around the KHAT (the physical matter body, from womb to mummy.) An immortal Khat is called a Sahu. The other five main components of a person are the AB, or heart body of core being; KU, or light body of photon energy; the KHAIBIT, or shadow

(ghostly or imaginary) body made of phase waves; [SE]KHEM, or life force of body CHEMistry; and the REN, or "name" body, i.e. your name as a sound vibration in language.) You can adjust the rotational velocities of the fields according to certain ratios of the fibonacci series and other principles. If you try the merkaba breathing, be sure you get Drunvalo' s exact instructions for the first 17 breaths. Also, it is probably best to learn it through one of his "Flower of Life" seminars under a trained guide. But if you follow the instructions carefully, your intuition will guide you. The final step (18th breath) of the sequence gives access to the "4th Dimension". Drunvalo does not teach this final step. That is up to you to receive from your "Higher Self". Attentive study of **Observer Physics** may enliven a reader' s awareness to understand the instruction for the 18th step. If you read **Observer Physics** carefully, you will discover what it is and the proper procedure for initiating it. Your intuition will guide you to know exactly what it is. Once you know it, then you can do it. Have fun. [Hint: Refer back to the klystron diagram on page 4 of Chapter 6. The key to the experience of velocity is point of view. The velocity equation says that c^2 = (Vg) (Vp). A photon in the klystron is motionless relative to itself. Relative to any target that it strikes, such as a point in the klystron wall, it moves at (c) = 3x10^8 m/s. Its antiphoton partner moves at (c) = 3x10^8 -m/-s. It travels the reverse path of the photon, but backwards in time, so it seems to be conjoined with its photon partner, and the two move together as one. The photon and its antipartner represent respectively the emission and absorption (perception) aspect of the EM energy exchange. Relative to the klystron' s length, the photon-antiphoton pair seems to move down the tube at (Vg), a velocity that must be less than (c). On the other hand, the wave front of the photon-antiphoton pair is (approximately) orthogonal to the direction the pair, and moves and strobes along the side of the klystron at the Phase Velocity (Vp), which is always superluminal. To experience 0 velocity, take the viewpoint of a photon. To experience (c), take the viewpoint of a point on the klystron wall that is struck by the photon pair. To experience the "Group Velocity" (Vg) take the viewpoint of a detached observer with attention focused on the progress of the photon pair down the tube. To experience the Phase Velocity (Vp), take the viewpoint of a detached observer with attention on the interaction of the wave front with the klystron wall. To receive information at the speed of light, you must detect the photon' s interaction with the wall. If you wait for the photon to reach the end of the klystron, you will receive information at less than light speed. To receive information in a superluminal fashion, you must expand your consciousness to exist as the whole klystron and be able to detect the subtle stroke of the wave front phase as it sweeps along the wall. If you think of the "message" as the distance traveled by the EM disturbance per unit of time, then, depending on viewpoint, you get a message at (c), or you get the same message at (Vg) or at (Vp). However, to receive the (Vp) "message" you must not detect the photon pair. Instead you must detect the wave front that moves **orthogonal** to the flight path of the photon pair as it interacts superluminally with the klystron wall system boundary. This automatically puts you into a kind of hyperspace mode and encourages broadened awareness, subtle perception, and the development of intuition.. This is easy to do, but requires a bit of a viewpoint adjustment for those habituated to viewing the world from the (Vg) and/or the (c) perspective. With a little practice it becomes quite normal. Many people these days are quite effortlessly shifting into the phase wave way of looking at the world.]

_____. **The Flower of Life Seminar**. Flower of Life Research. www.floweroflife.org. Drunvalo created this seminar to acquaint people with some of the major discoveries from his many years of studying traditional arts and sciences of various ancient cultures. It integrates some scientific ideas, art and architecture, history and a lot of science fiction sounding spiritual history woven together as an engaging set of stories. Probably the key value of the seminar is that it encourages people to be more open, friendly, loving, and tolerant toward appreciating the wonderful diversity of our universe and the life that thrives within it. It also stimulates popular interest in the notion that the universe is constructed on the basis of geometry, a theory that is a central part of the research in modern physics, including **Observer Physics**. Attentive readers will find that quite a few of Drunvalo' s principles of "Sacred Geometry" are supported by the **Observer Physics** research. For more information, visit Drunvalo' s web site.

Palmer, Harry. **Living Deliberately: The Discovery and Development of Avatar**. Altamonte Springs, FL: (c) Star' s Edge International, 1994. This little book, which is available as a free download from avatarEPC.com, is divided into three Parts. The first Part is Palmer' s story of how he discovered and developed the **Avatar Materials**. The second Part is a discussion of the nature of belief systems. Chapter 12 (a mere 4 pages long) is particularly relevant to Observer Physics, because in a few paragraphs Palmer outlines the foundations of a science of awareness that is sufficient to serve also as the foundation for physics. In Chapters 14 and 15 he shows how he has carried the notion of "science" to a new level that he calls "creativism", a method by which anyone can design his or her own reality. This leads him to the third Part of his little discourse, which is an outline of the steps to master the **Avatar Materials** and an open invitation for anyone interested to join with him in creatively designing an "Enlightened Planetary Civilization" for Earth and its inhabitants to enjoy. Don' t miss it. This is a rare gem. **Avatar** (R) and **ReSurfacing** (R) are registered trademarks of Star' s Edge, Inc. All rights reserved.

_____. **ReSurfacing: Techniques for Exploring Consciousness**. Altamonte Springs, FL: (c) Star' s Edge International, 1994, 1997. This little "workbook" contains very little text. It mostly asks questions and poses 30 simple exercises that Harry Palmer personally designed or culled from various sources. Each exercise develops an aspect of an individual' s awareness. Taken as a whole the series of exercises and the exploratory questions open up unlimited vistas for the play and display of creative intelligence. Palmer is a very laconic fellow. The book is not at all flashy or full of exciting material. It' s all up to you. The first exercise is a Personality Profile that lets you define for yourself who you think you are thus far in your life. Then follow 13 exercises devoted to unfolding and strengthening various aspects and qualities of your attention. Many of the exercises in the second half of the book will help you explore or modify the beliefs that you hold. There are also several more attention exercises. This book is the most thorough and systematic exploration of the range, nature and function of attention with the least amount of spiritual ballyhoo and puff factor that I have seen. This workbook, plus Palmer' s other little book **Living Deliberately,** form Section I of the **Avatar Materials**. Section II consists of the "Creation Exercises", and Section III

explores the "Creation Handling Procedure". For intrepid explorers there is Section IV, **The Master Course**. Part A is called "Awakening", and Part B (also known as **The Professional Course**) is referred to as "Beyond Awakening". Finally, Section V, **The Wizard Course**, deals with "Extrasensory Abilities." Taken all together the **Avatar Materials** form an extremely elegant practical method for managing beliefs. Palmer believes that by properly managing our beliefs, we can manage our reality. What do you believe? I, for one, believe Palmer' s discoveries lead to major consequences for the field of physics (and other areas of life as well). This is a classic. Although Palmer makes no claims as a scientist, he definitely promotes a scientific approach. He is trained as an engineer and an educational psychologist and has many decades of experience teaching, consulting, and developing educational technologies. I highly recommend any of Palmer' s writings, especially his experiential odyssey, **The Avatar Materials**. **Avatar** (R) and **ReSurfacing** (R) are registered trademarks of Star' s Edge, Inc. All rights reserved.

Penrose, Roger. **The Emperor's New Mind**. Oxford: Oxford University Press, 1989. This wide-ranging book by a versatile mathematician-physicist who has made significant contributions to geometry and the study of gravitation is a compendium of the fundamental scientific issues critical to the development of a theory of consciousness. Penrose has a knack for recognizing aspects of the same problem popping up in apparently unrelated disciplines. Like Feynman he often has an intuition about where some critical issues lie and creative angles for addressing them. Sometimes he jumps overboard or ardently cranks a pet theory -- don' t we all. But he is a very creative individual, so it' s definitely worthwhile to study his writings.

Schueler, Gerald J. **Enochian Physics: The Structure of the Magical Universe**. Llewellyn' s High Magick Series. St. Paul, MN: Llewellyn Publications, 1989. Schueler builds his theory of a "magickal universe" from Aleister Crowley' s definition of Magick: "The science and art of causing change to occur in conformity with will" plus 27 other basic theorems. He summarizes the Enochian Physics model of the universe in seven simple theorems (p. 53) that fit very nicely with the material we have derived in **Observer Physics**. 1. "Every person is an **I-not-I** monad." 2. "Every point in space is a consciousness center." 3. "Energy flows . . . through . . . dimensionless points in space. . . ." 4. "Spirit is unmanifested energy. Matter is manifested energy." 5. "Every manifestation within space and time is dualistic." 6. "Space, time, and consciousness come into existence simultaneously." 7. "Every energy field and every force in our universe is directed by the True Will." (Schueler defines "True Will" as "the desire of an **I-Not-I** monad as it expresses itself in a continuum.") Schueler discusses the four forces of physics as the four classical elements (earth, water, air, and fire) adding a fifth -- consciousness. From this fifth force combined with the Enochian theorems he arrives at the conclusion that "Any conscious deliberate control over oneself will simultaneously give one control over one' s world." (p. 77.) Like the material world, consciousness is quantized. However, the apparent probabilistic outcomes of quantum mechanics are an illusion due to observers ignoring the shaping power of the True Will of a system' s monads. Schueler also does an excellent revision of Newton' s laws (p. 85), and he puts Einstein' s famous equation (E = m c^2) into Enochian terms as S = F v^2,

where S is Spirit, F is form, and "v" is the speed of thought (p. 156). Schueler also briefly describes the possibility of superluminal communication and travel in the "astral" (i.e. phase wave) realms. The FTL aspect of physics and the notion of wormholes and whiteholes needs further development and is treated in much more detail in **Observer Physics**. Nevertheless, Enochian Physics is one of the clearest presentations of modern physics that takes into account the key role of the observer. I recommend it highly even though some of the "magickal" terms, such as the 30 aethyrs, are a bit mystifying.

Whyte, Lancelot Law. **The Unitary Principle in Physics and Biology.** London: The Cresset Press, 1949. This little book is a landmark in the history of the study of science in a way that integrates it with a scientific understanding of the mind. Whyte traces the evolution of fundamental theories of science in the 19th and early 20th centuries and arrives at the conclusion that there is a single unitary principle at work in all processes, whether physical, biological, or psychological. He defines his "Unitary Principle" (first formulated by him in 1931) as follows: "Asymmetry tends to disappear, and this tendency is realised in isolable processes." (p. 18.) This is basically a rewording of W. Koehler' s (1924) statement: "In anisolable process asymmetries disappear as a constant state is approached." Any system that remains unstable is under the influence of more extensive processes -- in other words, it represents a subsystem within a larger system. [In his essay Whyte cites pioneering insights by P. Curie (1894), Mach (1896), Russell (1903), A. Sellerio (1929, 1935), and P. Renaud (1935) as he traces the evolution of this fundamental idea.] In a way the Unitary Principle is another way of stating the principle of entropy, but the emphasis is not on increasing disorder, but rather the increase of symmetry in the system. The emphasis on symmetry furthers the progress toward seeing the natural sciences as expressions of geometry, a major aspect of modern string theories and other approaches to Unified Field Theories. Whyte believes that the universe as a whole exists in a state of tension that causes asymmetry. Wherever asymmetry occurs, phenomena appear and the Unitary Principle sets in to restore symmetry. Whyte believes that the universe will never reach a state of zero asymmetry since it has a certain amount of inherent dynamic tension. The question then arises: where does the tension come from? The answer, according to Observer Physics, is that the dynamic tension that causes asymmetrical phenomena to evolve derives from an observer creating and holding certain beliefs (viewpoints), and then resisting the experience of those beliefs. When the observer releases his resistance to a phenomenon, the tension disappears from the system. The system then returns to a state of symmetry (or equilibrium) and is stabilized.

Wolf, Fred Alan. **Star Wave: Mind, Consciousness, and Quantum Physics**. New York: Macmillan-Collier Books, 1984. Wolf has written a number of popularizations of quantum mechanics, some on the level of comic books. He is definitely trying to get the discoveries of QM out there to the people. He understands physics, and has a great interest in consciousness. This book is for general readers too, but it goes deeper. Wolf proposes a hypothesis to explain consciousness in terms of quantum physics. He suggests that the mathematical model used for describing the phenomena of quantum mechanics can also be used for explaining phenomena of consciousness. He also proposes some physiological mechanisms that could be responsible for consciousness.

This fascinating work suggests directions for further research. I consider it a classic, the first example I have seen to provide a mathematical model for the relationship of consciousness to the physical world. (Evan Harris Walker, III, did some work in the 1960's on mathematical models of synaptic thresholds and onset of waking consciousness, but this work was limited in scope and I haven't heard more on it.)

Wolfram, Stephen. **A New Kind of Science**. Champaign, IL: Wolfram Media, Inc., 2002. See my comments on this work appended after the bibliography.

Wolinsky, Stephen. **Quantum Consciousness: The Guide to Experiencing Quantum Psychology**. CT: Bramble Books, 1993. This "workbook" is full of wonderful exercises that you can play with to cultivate awareness as an Observer. Wolinsky's goal is to help you explore various aspects of consciousness. He begins with a discussion of how the observer is coming to the fore in the study of physics. Then he identifies a series of viewpoints on the world that he calls "levels". The rest of the book is devoted to exercises starting with dissociation, exploration of energy, discovering how you create mass, time, space, consciousness, interpenetration, and the void. Don't just read the book. Do the exercises. Then explore Harry Palmer's **Avatar Materials** for an elegant summation that brings it all together. **Quantum Consciousness** is a milestone work in the field of exploring consciousness in a systematic, scientific manner.