SOUTHWESTERN THE UNIVERSITY OF TEXAS SOUTHWESTERN MEDICAL CENTER AT DALLAS

Internal Medicine Grand Rounds

October 17, 2002

Thought Tools for Ethics: Fuzzy Sets and the Metaphysics of Quality

W. C. Yarbrough, MD

.....sex is like humor. Courses in humor, if they are given at all, should be given only by people who have laughed at least once in their lives - and enjoyed it.

Eric Berne, M.D.

This is to acknowledge that Claibe Yarbrough, M.D. has no financial interests or other relationships with commercial concerns related directly or indirectly to this program. Dr. Yarbrough will not be discussing off-label uses in his presentation.

Name:	Claibe Yarbrough
Rank:	Associate Professor
Division:	Pulmonary and Critical Care Medicine
Interests:	Clinical Pulmonary and Critical Care Clinical Information Systems Medical Informatics

Introduction

This lecture cannot be viewed as a lecture on medical ethics, because it does not give guidelines or specifics of how to act. Instead it gives tools of how to think about medical ethics, which hopefully will lead to actions based on ethical principles.

The following table is a list of patients present in the Medicine ICU at the VA in August of 2002. It is a snapshot of patients. This was an unusual group of patients with a heavy need for ethical decisions. However, there are always ethical decisions in the ICU. I have highlighted many of the ones that had interventions, however even the "Full Code" patients can represent ethical challenges.

Name	Age	Diagnosis	Outcome
L. C.	63	Tetraplegia, Massive Stroke	Full Code, still on vent., >80 days
J. W.	87	Pneumonia, MOF	Withdrawal of Care - died, day 42
D. B.	54	ESRD, IVDA, Sepsis	Full Code, still on vent., >110 days
W. H.	75	Hip fx, PTE, syncope	Full Code, still on vent., >91 days
K. P.	75	Syncope	Withdrawal of Care - lived, D/C day 45
B. R.	75	Bilat. Empyema	Withdrawal of Care - died day 21
M. G.	68	Sub-dural on Coumadin	Evacuation - D/C day 10
J. C.	63	ARDS, MOF	DNR, died day 16
C. G.	46	AIDS, CHF, ESRD, Hep C	Left AMA, day 36
J. B.	64	COPD, intubated against wishes	Withdrawal of Care, died day 3
R. D.	80	Dementia, A. fib. CHF	DNR, died day 34
R. P.	69	End-stage COPD	Extubated, D/C day 12

There are two main subjects covered in this presentation. The first is the concept of a fuzzy set. This topic was covered previously, but not applied to medical ethics in particular. The second is the Metaphysics of Quality, which is different from our usual subject-object metaphysics. The development of binary logic and classical set theory occurred at the same time as the subject-object metaphysics we all use (without thinking about it). The same individual, Aristotle, developed both of them.

Binary Logic

Aristotle (384-323 B. C.), more than any other thinker, determined the orientation and the content of western intellectual history. He was the author of a philosophical and scientific system that through the centuries became the concepts and ideas of our western culture. Aristotle's intellectual range was immense, covering most of the sciences and many of the arts. He worked in physics, chemistry, biology, zoology, and botany; in psychology, political theory, and ethics; in logic and metaphysics; in history, literary theory, and rhetoric. He invented the study of formal logic, devising for it a finished system, known as Aristotelian syllogistic, that for centuries was regarded as the sum total of logic. Even though Aristotle's zoology is now out of date and his thoughts on the other natural sciences have long been left behind, his writings in metaphysics and in the philosophy of science are read and argued over by modern philosophers.

Aristotle's logic is binary and contains the law of the excluded middle. This logic was also the foundation for present day set theory. Simply stated, something either belongs to a set or does not belong to the set. There can be no middle ground.

Aristotle gave us his three laws of propositional logic (used for syllogistic thinking):

1. a law of identity - (A is A);
2. a law of contradiction - (A must be either A or not A);
3. and a law of an excluded middle - (A cannot be both A and not A).

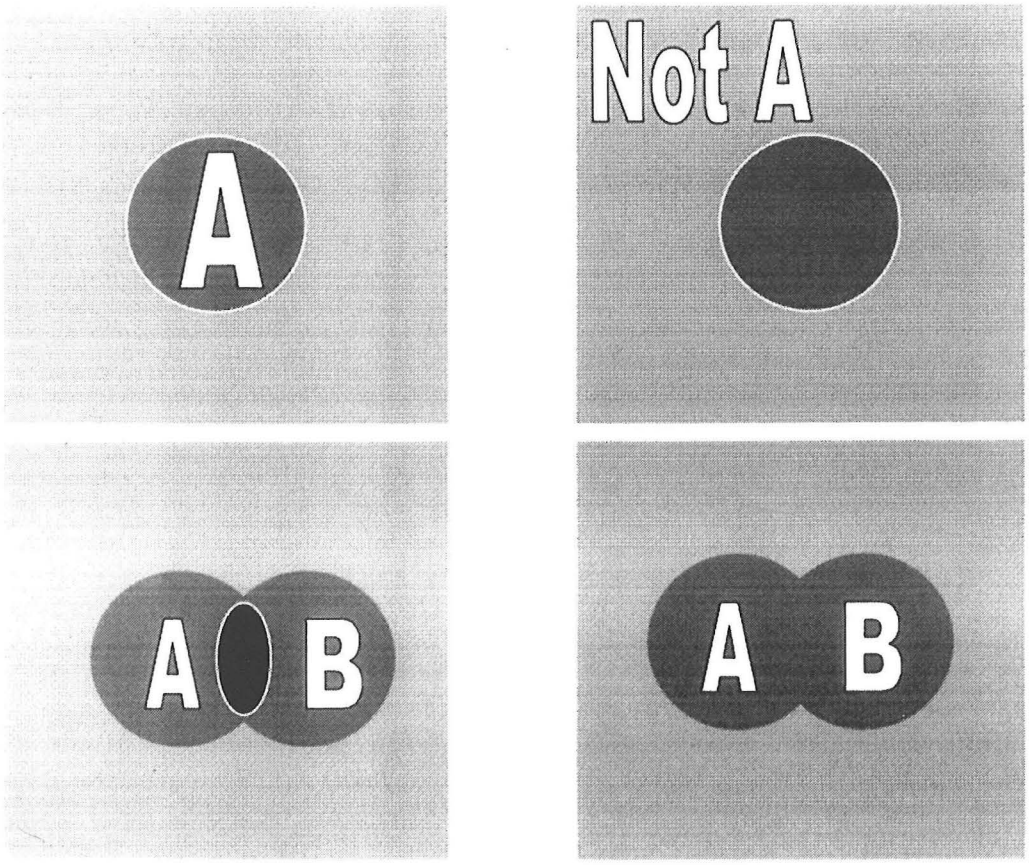
These laws are based upon an assumed classical subject-object division. This division of classical thought assumes objects exist, objects are substantial, and objects do not change or adhere to any other objects or phenomena. It assumes the subjective is insubstantial, and does not exist for purposes of objective syllogistic thinking. Aristotle assumed that 'A' represents something real, that is, a real object. He assumed 'A' exists. His first law says A=A, and classically it is always true, and according to Aristotle, is an absolute truth.

This idea of subjects and objects developed into how we see the world. Aristotle gave us this subject-object metaphysics and it has been the basis for scientific thought for 2500 years. Metaphysics is simply a system of categorizing reality, of breaking it up into smaller things so that they can be understood intellectually. Aristotle's metaphysics places truth, or rather the truth about objects as the highest goal. Any idea of quality is subjective. Quality was important to Aristotle, but not as important as truth. Pirsig summarizes it as:

> *"Under Aristotle the "Reader," ... forms and substances dominate all. The Good is a relatively minor branch of knowledge called ethics; reason, logic, knowledge are his primary concerns. ... science, logic and the University as we know it today have been given their founding charter: to find and invent an endless proliferation of forms about the substantive elements of the world and call these forms knowledge, and transmit these forms to future generations. As "the system."*

Set Theory

Mathematicians and logicians depict classes with formal models. These formal models are built on set theory, which the German, Georg Cantor (1845-1918) developed in the later 19th century. Cantor sets are crisp. Each potential number either belongs or it doesn't belong and none straddle the line. Interactions between sets and relationships between sets are done or described through operations. Four such operations are shown in the figure below.



- Identity: A is A, it contains only its members and no others.
- Complement: The complement of a set is its opposite. Whatever is not in the set "A" is in its complement.
- Intersection: If some members of set "A" belong to set "B" and vice versa, then those elements represent the intersection of the two sets A and B. This corresponds to the Boolean logical operator "and".
- Union: Union merges sets together. This would be all the elements of "A" along with all the elements of "B". This corresponds to the Boolean logical operator "or".

Trouble with Set Theory

Mathematicians were very fond of Cantor's set theory, however it has always been associated with paradoxes. One of the famous paradoxes is called "sorites" often attributed to Zeno of Elea (490-430 B.C.), the "paradox of the heap." This paradox asks you to take a grain of sand from a heap and tell if you still have a heap. Take another grain from it and it remains a heap, and so on. Eventually, one grain is left. Is it still a heap? Remove it and you have nothing. Is that a heap? If not, then when did it cease being one? In Cantor's theory, one resolves such dilemmas by dictating a break point. A certain number of grains constitute a heap. That number minus one is not a heap. Of course, in our every day speech we do not use the word so precisely, however we do

precisely define it if we are speaking about logic, mathematics, and science, and in our case, medicine. If a heap has vague boundaries, the assumptions of set theory dissipate. We have, over a lifetime, simply drawn a line somewhere and pretended. We tolerate this tiny sacrifice for the convenience of thinking in crisp sets.

Vagueness

The first philosopher to grapple seriously with vagueness was Charles Sanders Peirce (1839-1914). Peirce held that everything exists on a continuum, and such continuums govern knowledge. For instance, size is a continuum as sorites shows. Peirce asserted that vagueness is a ubiquitous presence and not a mark of faulty thinking. He said, "vagueness is no more to be done away with in the world of logic than friction in mechanics".

Bertrand Russell (1872-1970) also pursued the topic of vagueness. In 1923 he published a short paper discussing vagueness and precision in language and reality. However, Jan Lukasiewicz (1878-1955) made the first move toward a formal model of vagueness. In 1920 he published a brief paper describing early logic based on more values than true and false. This changed traditional propositional logic and led to the apparent absurdity of opposites equaling each other. In the paper, he let "one" stand for true and "zero" for false. However, in addition, "one-half" stood for possible. In logic, the operation called negation defines opposites. In true/false logic, the true (1) becomes false (0) and the false, true. This can be demonstrated in the following table.

Statement	Negation
1	0
0	1

Statement	Negation
1	0
1/2	1/2
0	1

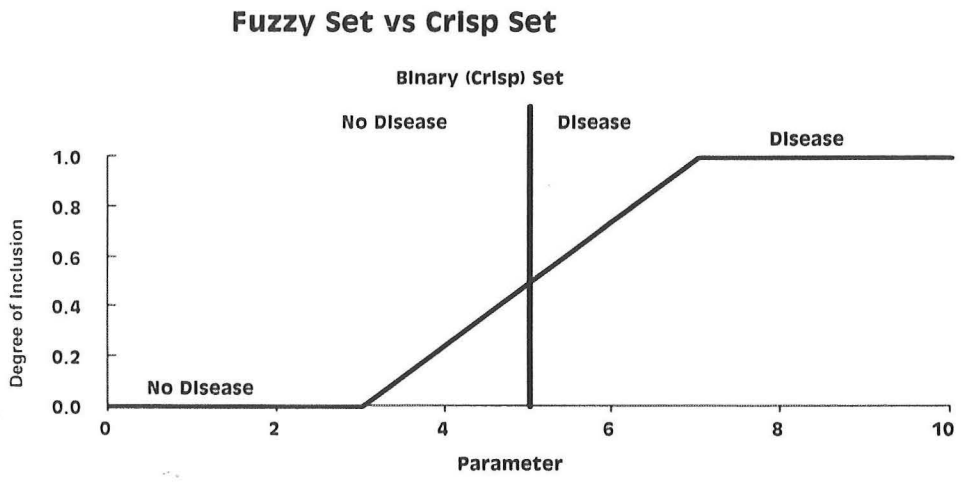
In the three-valued logic of Lukasiewicz the table gains an extra line. The values for binary logic remain intact at the corners. Lukasiewicz saw no reason to insert just one extra value. He could have an infinite number of values strung out between zero and one with true and false at the extremes. The sliding scale yielded greater precision. Instead of merely acknowledging an intermediate value, multi-valued logic conveyed its size. It could, therefore, quantify degrees of truth. Max Black (1909-1989) published a paper in 1937 in which he described a continuum of degrees of usage of terms.

Bertrand Russell described a paradox, which literally removed the underpinnings of mathematics. The trouble with a paradox in mathematics is that it would then allow you to prove anything (or prove nothing). Russell's paradox had to do with set theory. The set of all apples does not contain itself, since it is a set and not an apple. However, as you might imagine some sets (of sets) do contain themselves as one of the sets. Russell's paradox concerned the set of all sets, which do not contain themselves as a member. Does this set contain itself? If it does not contain itself as a member, then by definition it must, since it is the set of all sets, which do not contain themselves as members. If it does contain itself as a member, then it cannot. There is the paradox. This led to a crisis in

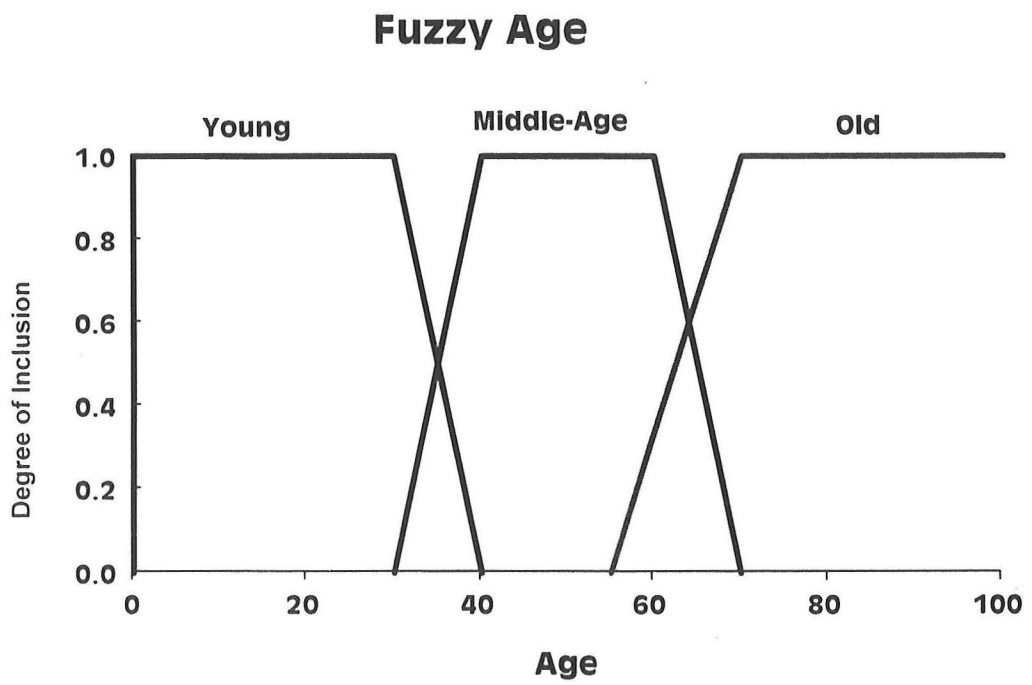
mathematics. Russell himself suggested a solution, which was to do away with the *law of the excluded middle*, although this was too radical and was not generally accepted.

Fuzzy Sets

In 1965 Lotfi Zadeh, who was at the time Chairman of the University of California at Berkeley's electrical engineering department, published a paper called "Fuzzy Sets". In this paper, Zadeh set down formal logical operations on fuzzy sets and explained their importance. The key to Zadeh's paper was the concept of graded memberships. A set could have members who belonged to it partly, in degrees. Fuzzy sets discriminate much better and supply more information than "crisp" sets. They are, despite the name, more precise than crisp sets. The figure below demonstrates an example of a fuzzy set.



In this instance there is a gradual progression from "no disease" to "disease." The parameter could be diastolic blood pressure for the disease Hypertension. Most diseases can be expressed this way. The slope that indicates the degree of inclusion can be adjusted to span whatever distance of the parameter is necessary. If the slope is completely vertical, then you have a crisp set. From this, one can see that a crisp set is a special case of fuzzy sets (one with infinite slope). If there is more than one "linguistic variable" then there will be more than one sloping line and there can be overlap as well:



"Young", "middle age", and "old" are sets where the variable (or parameter) is "age". The degrees of membership in each set ranges from zero, no membership, to 1.0, exclusive membership. A fundamental element of fuzzy logic is the "linguistic" variable that Zadeh introduced. A linguistic variable is a variable whose values are words instead of numbers. For example, "age" is a linguistic variable if the possible values are "young", "middle age", and "old". Each value refers to a membership function. A membership function assigns a degree of membership to any numerical age fitting the perception of "young", "middle age", and "old". Fuzzy sets appear to more closely reflect the way people naturally categorize the world. In this figure the membership functions overlap so that ages of 57 to 65 years are to a certain degree both "middle aged" and "old" at the same time. An age of 65 is comparatively less "middle aged" and more "old". The transition from "middle age" to "old" is gradual as age increases.

Membership functions are not the same as probabilities. An age of 60 is not "middle age" with a certain probability. Instead, it is both "middle aged" and "old" at the same time. The degree to which it is, "middle aged" and the degree to which it is "old" reflect the context and subjectivity underlying the membership functions. Increased precision in the specification of age or the membership functions would not alter the inherent fuzziness in classifying age.

In comparison with the fuzzy set above, binary sets are a special case of the fuzzy sets. The differences lie at the boundaries between the sets. Membership functions of binary sets do not overlap, so that the transition between sets is abrupt. An age of 62 years is "middle aged" whereas an age of 63 is "old". In binary logic, people are either old or they are not old.

Fuzzy sets easily resolve the paradox of the heap. With each grain of sand removed, the heap has less membership in the set of heaps. It drops from 1.0 through 0.8 and 0.2 to, finally, 0. Fuzzy sets glide smoothly across the truth continuum. Estimating the memberships in fuzzy sets is a subjective task. However, the placement of the crisp or binary divisions is likewise a subjective task. Fuzzy sets, with their decimal values, yield better estimates than just 1 and 0. Fuzzy sets include crisp sets. A crisp set is just a fuzzy one with membership values of 1 and 0. Crisp sets imply that the crux of the argument is the ***existence*** of membership, while for fuzzy sets it is the ***extent*** of membership.

Fuzzy sets can be used by complex disciplines. Zadeh recognized the role of fuzziness in managing complexity and described a law of incompatibility(54):

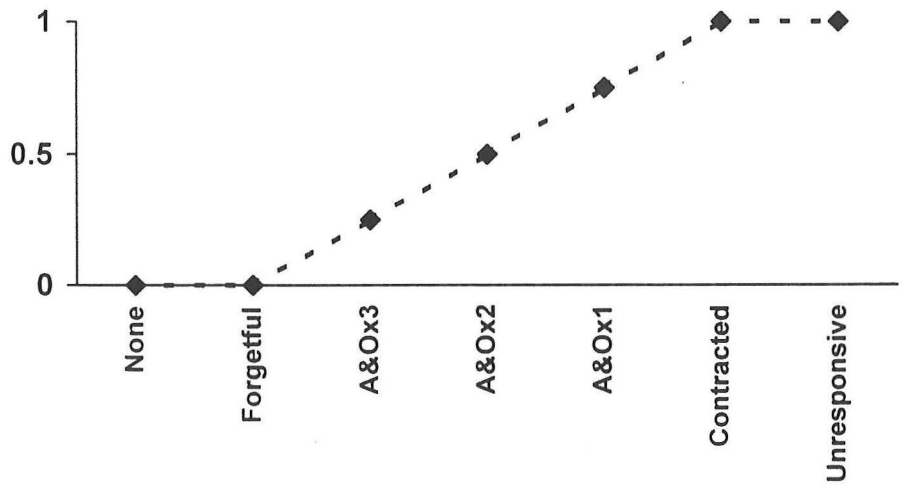
> *As complexity rises, precise statements lose meaning and meaningful statements lose precision.*
> *"...as the complexity of a system increases, our ability to make precise yet significant statements about its behavior diminishes until a threshold is reached beyond which precision and significance (or relevance) become almost mutually exclusive characteristics".*

When people face complex information, they use the strategy of summarization. For example, a patient with bilateral amputations, proteinuria, characteristic retinopathy, and, an extremely elevated hemoglobin A_{1C} on large doses of insulin may be summarized as a "bad diabetic" on rounds, particularly if diabetes was not the primary reason for hospitalization. Words centralize concepts that may have blurred bounds. Language is our ultimate shorthand, demonstrating our ability to summarize.

Zadeh felt fuzzy logic could handle complexity in a similar way. As members in a set grow, they eventually exceed human comprehension. The brain responds by summarizing the set into "chunks," labeled with words. For instance, it might divide the myriad hues of the spectrum into red, orange, yellow, green, blue, purple, violet, and other categories. Because each of these sub-classes is a fuzzy set with degrees of membership, members can describe them. By summing up words mathematically, fuzzy sets could help bring complex systems like the visual apparatus under control.

Graded Truth

Fuzzy sets are important when thinking about medical ethics. Fuzzy sets allow more precision and therefore more information than crisp sets. Dr. Fine's recent Grand Rounds on Medical Ethics started out with a fuzzy set illustration. Below is an example of a fuzzy set for dementia.



It is important to give more information than "dementia." Someone that is a little forgetful is much different than someone that is bed-bound and uncommunicative. Certainly the extent of disease is important. The physiological state of the patient is important. How autonomous the patient appears, what values the patient expresses toward resuscitation and life support are important in making ethical decisions. Fuzzy sets allow multiple truths to exist. Someone can have dementia with wide differences in functional states, yet to say that each has dementia is true.

This graded inclusion and multiple truths introduce relativism into the truth of any statement. There is good and bad in this. It allows us to speak with more detail, but requires more effort to convey the information. But there is another possible effect of placing relativity on truth. In our subject-object metaphysics, truth is absolute. In binary logic with an excluded middle, this is not as much of a problem. This subject-object metaphysics, or way of looking at the world has served mankind quite well, especially in scientific endeavors. If we make truth relative, then binary logic doesn't work with the ease with which we use it now. However, another problem exists. Truth is the highest "thing" in our metaphysics. It is supposed to be an objective truth. Subjective judgments have always been graded and dependent on the person doing the measurements or making the observations. Thus, both truth, or objective facts, and subjective judgments from those facts are relative. This leads to some strange positions.

New-Age

There has been an amazing interest in "alternative therapies." This interest has emerged from a situation where truth and subjective values have both been thought to be relative. If truth is relative, then any claim, such as the many made over the Internet, for any herb or compound might be just as true as those claims made through conventional scientific approaches. This "New-Age" philosophy has allowed a huge business to grow in this country supplying unproven therapies to the public. It is estimated that Americans spent $10 billion on herbs, vitamins, and other dietary supplements in 2000. This is small compared to the more than $100 billion spent on prescription drugs, but not insignificant.

Another effect of this lack of an absolute truth can be seen in the anthropological doctrine of cultural relativism. Again, both truth and value are relative. Cultural relativism states that one culture should not be judged with the values of another culture. This has led to failed experiments in the school system and in the highest positions in government. With relative truth and relative value, then there is only chaos, and not the deterministic type found in complexity theory.

Metaphysics of Quality

In 1974, Robert M. Pirsig published his novel *Zen and the Art of Motorcycle Maintenance: An Inquiry into Values.* Pirsig tried to highlight exactly what quality was and what significance it had for humanity and society. Pirsig began on a personal level with the primary question: What is quality? His inquiry into quality began in the days when he was a rhetoric teacher at a college in Montana. He asked his students to come up with a definition of quality. Not a single student or the teacher himself could come up with a definition. None of them denied the existence of quality, yet no one could define it. Pirsig's conclusion was that Quality (which he turned into a metaphysical concept and capitalized to distinguish from the common word) was something that existed before words. His idea was that the perception of Quality comes first and then words and concepts are created by the mind around the initial perception.

Pirsig's idea is that Quality is not an object, nor is it inherent in the subject; it is an event that makes the subject aware of the object. He suggests that reality is composed of three things: subject (mind), object (matter), and Quality. By making the self aware of the non-self, both the self and the object are created as entities. This is why Pirsig claims that Quality is indefinable, because it exists before even the creation of subject and object and even further before the names given to these things.

This understanding of Quality and the metaphysics built around it is mystical in nature. Mysticism is the discovery of existence through experience rather than through adherence to doctrine. Pirsig speaks about the futility of creating a metaphysics;

> *"By even using the term "Quality" he had already violated the nothingness of mystic reality. The use of the term "Quality" sets up a pile of questions of its own that have nothing to do with mystic reality and walks away leaving them unanswered."*

Therefore, once a metaphysics is developed, then everything from that point on is not truth but only a way of talking about truth with distortion. Pirsig's metaphysics, called the Metaphysics of Quality, is just a map, and a map is not the terrain itself. However, establishing this metaphysics of Quality allows one to explore Quality to its furthest extents and hopefully gain some real insight into the reality that the Metaphysics of Quality merely mimics.

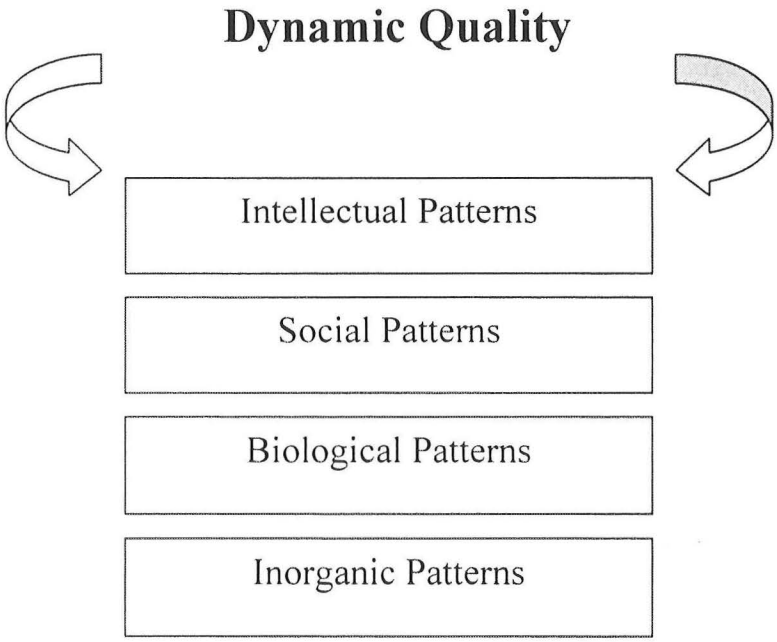
By suggesting an existence prior to subjects and objects, Pirsig rejects the Subject-Object Metaphysics that has dominated western thought for 2,500 years. By this rejection, he dissolves what he calls Platypi, the paradoxes which arise because of our

subject-object metaphysics. These include Mind/matter, body/soul, mental/physical, culture/nature, quality/quantity, etc. However, it is not until his second book that he provides a replacement for our subject-object metaphysics.

The first proposition of the Metaphysics of Quality is that everything is value. The undifferentiated, undefined, pre-existing source of all things is referred to as Dynamic Quality. Pirsig states that in Subject-Object Metaphysics, the first division after Quality is between subject and object. Both Subject and Object are mental constructs used to give an explanation of what has happened with Dynamic Quality. In his Metaphysics of Quality the primary division is between dynamic value and static value. Dynamic Quality creates patterns of Quality that are stored in static patterns to prevent degeneration and loss of what is good. Driven by Dynamic Quality, static patterns develop in an evolutionary manner. The Metaphysics of Quality recognizes four discrete sets of static patterns of value. They are arranged in terms of their evolutionary importance, but this is also equated with their inherent good: Inorganic, Biological, Social, and Intellectual. Each of these levels offers freedom from the constraints of the lower level, but each is also dependent on that lower level for its existence.

Pirsig uses the example of a computer to illustrate levels of value within his Metaphysics of Quality. Silicon fashioned into semiconductor circuits is the start of the computer. The electrons travel through these circuits to activate the computer, but are not of much use at that level, although absolutely necessary for its function. The programmer that writes the program that runs on the computer may not know anything about the circuits. However, the program is as necessary as the circuits themselves for the usefulness of the computer. The word processor program written by the programmer and running on the hardware circuits may have a novel written upon it. Again the author doesn't need to know anything about programming or circuits in order to write the novel. Each level of the computer is essentially built on top of the previous level. There is not much connection between the levels. No matter how hard one looks for the novel in the hardware, it cannot be found there. It is a function of the higher level.

Pirsig used a figure similar to the one below to illustrate these static levels of quality and described the relationship between them:



In this diagram you will notice that Dynamic Quality is not shown in any block. It is in the background. This seems the best way to represent it. It is not only outside the blocks, it pervades them but it goes on where the blocks leave off.

The blocks are organized in the order of evolution, with each higher block more recent and more Dynamic than the lower ones. The block at the top contains such static intellectual patterns as theology, science, philosophy, mathematics. The placement of intellect in this position makes it superior to society, biology and inorganic patterns but still inferior to Dynamic Quality. The Metaphysics of Quality says there can be many competing truths and it is value that decides among them.

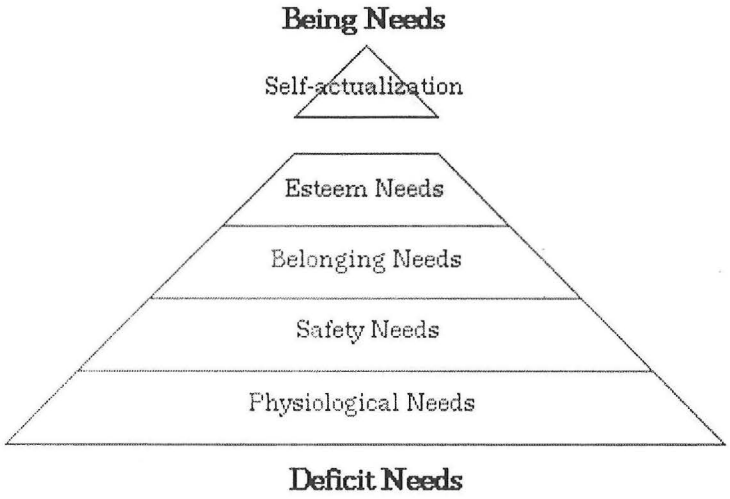
The social patterns in the next box down include such institutions as family, church, and government. They are the patterns of culture that the anthropologist and sociologist study.

In the third box are the biological patterns: senses of touch, sight, hearing, smell and taste. The Metaphysics of Quality follows the empirical tradition here in saying that the senses are the starting point of reality, but—all importantly—it includes a sense of value. Values are phenomena. To ignore them is to misread the world. It says this sense of value, of liking or disliking, is a primary sense that is a kind of gatekeeper for everything else an infant learns. At birth this sense of value is extremely

Dynamic but as the infant grows up this sense of value becomes more and more influenced by accumulated static patterns. In the past this biological sense of value has been called "subjective" because these values cannot be located in an external physical object. But quantum theory has destroyed the idea that only properties located in external physical objects have reality.

This idea of levels of static patterns of value echo in other disciplines as well.

The Psychology of Being



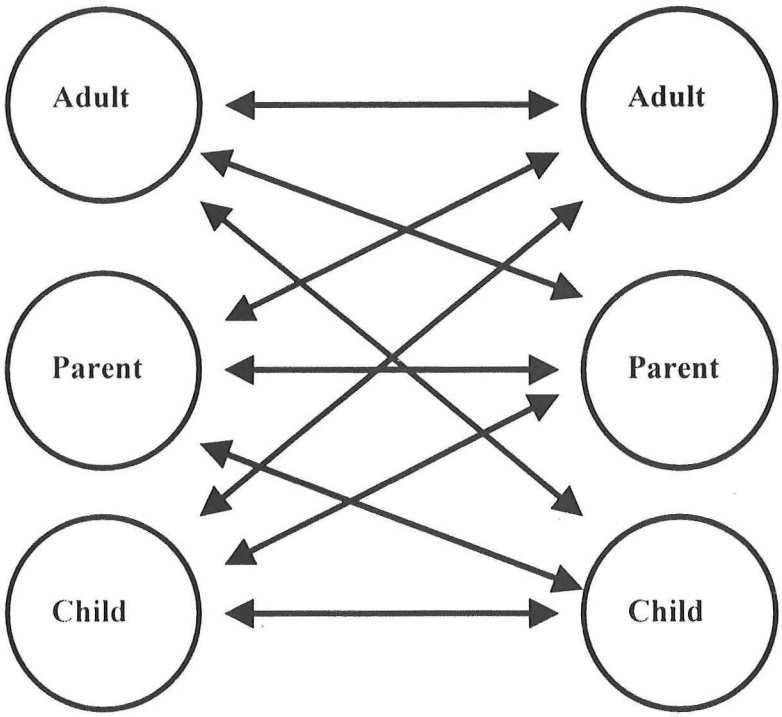
Abraham Maslow was one of the founders of humanistic psychology. Maslow saw the needs of human beings arranged like a ladder. This ladder of needs is suggestive of Pirsig's levels of static patterns of value. The most basic needs, at the bottom, were physical -- air, water, food, sex. These could be likened to Pirsig's Biological level. Then came safety needs -- security, stability -- followed by psychological, or social needs -- belonging, love, and acceptance. These two could be associated with the Social level. At the top were the self-actualizing needs -- the need to fulfill oneself, to become everything one is capable of becoming. This would refer to the Intellectual level. Maslow felt that unfulfilled needs lower on the ladder would prevent the person from climbing to the next step. Someone dying of thirst quickly forgets their thirst when they have no oxygen. Someone caught in the biologic level might be blind to social laws and constraints.

People who were successful in managing the higher needs were what Maslow called self-actualizing people. He generalized that self-actualizing people tend to focus on problems outside of themselves, have a clear sense of what is true and what is phony, are spontaneous and creative, and are not bound too strictly by social conventions.

Transactional Analysis

The title page of this paper contains a quotation by Eric Berne, MD. It is doubtful that many people reading this have ever heard of him. He is the father of transactional analysis. This psychology was popular in the 1960's. This method of psychoanalysis

was popularized in the 1970s as the "Games People Play." Transactional Analysis provides analysis of our own interactions. These levels of interaction are also suggestive of Pirsig's static levels of value. The diagram below shows Berne's schematic of interactions within each person and between people:



The child interactions could be thought of as interactions with the biologic level of value. A child-to-child interaction is how Berne describes intimacy. The parent could be viewed as the social level within the individual. This level is concerned with limiting the child's interactions to those that are socially acceptable. The adult interactions could be construed as interactions with the individual's intellectual level. These levels of static patterns of value allow an analysis of how we deal with patients.

What static level of value contains compassion? A look at the biologic level shows emotions of fight or flight. Certainly the concern of a mother for her child or the concern of a person for their spouse would suggest an emotion close to compassion. However, the attraction of a mother for her child may be more instinctive since it seems to be present in lower animals as well, but is not extended to others outside the family unit in lower animals. In Vols it has been shown that a hormone produces fidelity in their relationship. It seems unlikely that compassion resides within this level.

Society also seems an unlikely level for compassion. Society regulates biologic behavior. Society also uses individual biologic forms (people) for its own purposes. This activity is moral and correct to maintain its structure, which is of a higher evolutionary level than biology. Therefore, society sends its individuals to war, puts individuals to death, and allows policemen to carry guns and use those guns to kill anyone threatening social structure. This is not a level of compassion.

This leaves the intellectual level to contain compassion, if we are to assign it to a static pattern at all. Thus, the same level that decides what technological wonder to apply toward regaining health is also the level that contains the compassion needed to switch to allowing a dignified death. In the Metaphysics of Quality both these traits are present in the static level of value of intellect where they can be found and applied within the doctor-patient relationship. If we use the Subject-Object Metaphysics, it can be said that both of these traits reside in the same individual.

Internal Medicine Grand Rounds has repeatedly been a forum for examination of how medicine is practiced. Information has regularly been reported in this forum, over the years, that physical examination techniques are poor at elucidating structural pathology. Studies have been reported about how poor the physical examination of the belly is and how dismal the inter-observer variability is for such physical findings as jugular venous distention or gallop rhythm. The question could well be asked, "Is a physical exam necessary?" On rounds in the intensive care unit, no one had an ophthalmoscope. There was not one among an attending, an ICU fellow, three residents, three interns, and three students. In fact, the nurses did not know where the ophthalmoscopes were kept in the ICU. One of the students went back to his locker and got an ophthalmoscope. Looking in the eyes for a funduscopic exam has been replaced by computed tomography of the head before lumbar puncture. In fact, the standard of care now is to get computed tomography of the head before lumbar puncture rather than simply doing a funduscopic exam. How can any physician compete with an x-ray test that reconstructs the internal anatomy? However, there is another reason for doing a complete physical exam on patients that has nothing to do with its accuracy.

One of the techniques used in transactional analysis was quite interesting:

> *The intimacy experiment in which two people sit close to each other "eyeball to eyeball," and keep eye contact while talking straight to each other reveals many interesting things about intimacy. First, it demonstrates that any two people of either sex, starting as strangers or mere acquaintances, can attain intimacy in 15 minutes or so under proper conditions. Secondly, it shows that any two people who really look at each other, and really see each other, and talk straight to each other, always (as far as these and similar "encounters" go) end up liking each other. This indicates that dislikes result from 1) people not really seeing each other and/or 2) people not talking straight to each other.*

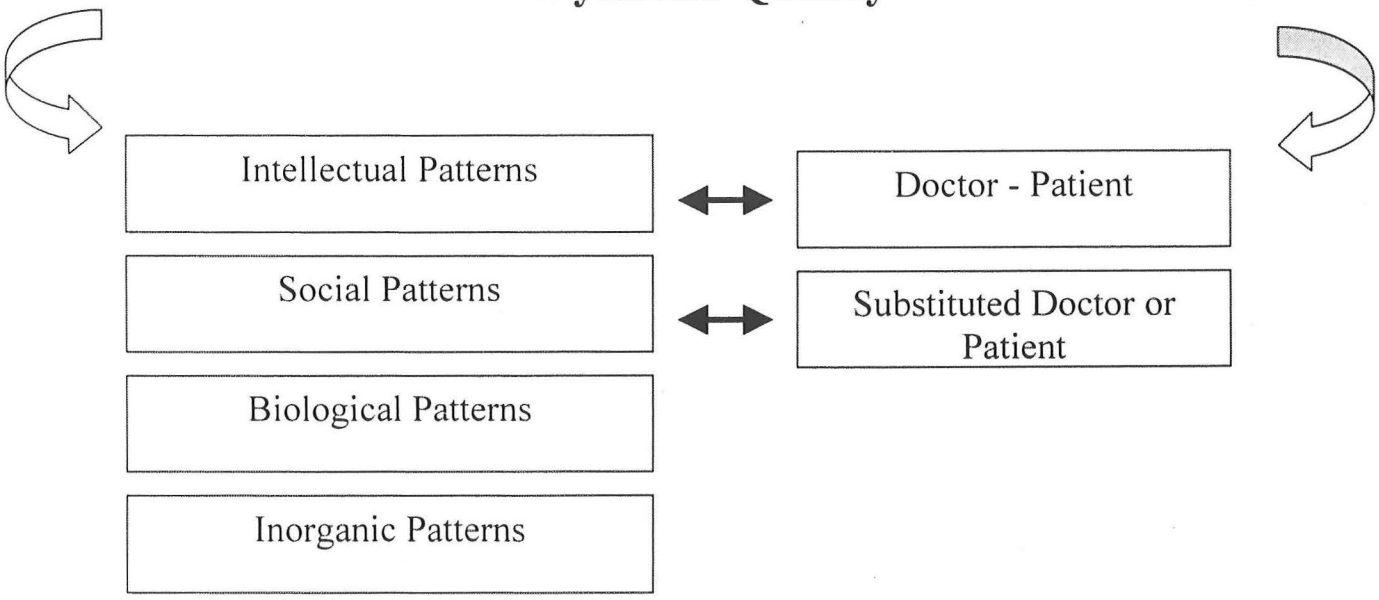
This "intimacy experiment" seems very much like what a physician and patient do when they take/give a history. By performing a physical exam, it is required that the physician invades the other person's personal space. The patient has to allow this. In fact, the patient not only allows the physician to invade his or her personal space, but body cavities as well, and to an extent that he or she would not let a spouse even come close to doing. This requires the patient to trust the physician. This trust that the patient

gives should produce a complementary or reciprocal feeling of responsibility in the physician.

When the Southwestern house-staff were first given time off, they would come into the hospital on their off days. The administration had to order them to stay away from the hospital on their off days to keep them from coming back in to check on their patients. The house-staff felt responsible for their patients and surely the patients trusted the house-staff. They had gone through the "intimacy experiment" together. No one else can substitute for either party in that relationship. Seeing a different patient in the bed upon returning to work would send the physician right back out of the room. Likewise, trust was not given to the substitute physician and reciprocal responsibility was not accepted. This would likely prevent the patient from divulging things with the same ease and would prevent the substitute physician from giving as much attention. After all, the substitute is only covering for a relatively short time. This lack of connection and suspension of connection alters the doctor-patient relationship in ways that probably require active effort to maintain or repair.

Pirsig's Metaphysics of Quality would suggest that no one is a doctor. It is the Quality or the experience that allows us to divide reality into the subject Doctor and the object patient. People have undergone training to be able to act as doctors. However, without a patient one is simply a person who has gone to school for a long time.

End of life decisions, many times, center around a change in bias or values. Our usual bias is to use our technological advances to return the patient to a healthy state. Many times this is not the right thing to do. The right thing to do might be to withhold application of any technological advance, except those that offer comfort to allow the patient a dignified and unavoidable death. The timing of this change in bias should not be made by the doctor alone and should not be made by the patient alone. The best decision can only come out of the interface, the experience, the relationship between the doctor and patient. The best truth out of the many possible truths is the truth that is best for that patient being cared for by that doctor. A substituted decision made on behalf of either the patient or the doctor weakens the process. Placing the type of decision into Pirsig's evolutionary static levels of value can add clarity:



If the decision is made between the doctor and the patient, then it is on an intellectual basis. However, if the decision is made by a doctor substitute or a patient substitute, then the decision drops down into a more social level. This is true regardless of whether the substitute is elective, as in the case of the hospitalist, or involuntary, as on the part of an unconscious patient in the ICU.

The doctor-patient decision is above any law or standard of care. To interfere in this type of dynamic decision through any social law or standard rule is unethical. However, if either party has a substitute for their part in the decision, then it is on a more social level and should be limited by rules and regulations.

The ethical decision can only be made within the relationship between the physician and patient. The Quality or driving force for the ethical decision comes from the balance between the patient and physician. For the physician to make the decision alone is paternalism or parentalism, both of which imply a one-sided state in the relationship and, if the Transactional Analysis discussion above is correct, a more social role. However, today, patients want to participate in more informed decisions, rather than be told what to do. The patient needs our advice on decisions for a couple of reasons. First, they are not really "themselves" when they are sick. The static patterns, which they have had perhaps for all their lives are suddenly gone or seriously threatened. Pirsig uses a passage from an essay by Walker Percy to illustrate this:

> *Why is a man apt to feel bad in a good environment, say suburban Short Hills, New Jersey, on an ordinary Wednesday afternoon? Why is the same man apt to feel good in a very bad environment, say in an old*

hotel in Key Largo, in a hurricane.....Why is it that a man riding a good commuter train from Larchmont to New York, whose needs and drives are satisfied, who has a good home, loving wife and family, good job, and enjoys unprecedented "cultural and recreational facilities" often feels bad without knowing why?

Why is it that if such a man suffers a heart attack and, taken off the train at New Rochelle, regains consciousness and finds himself in a strange place, he comes to himself for the first time in years, perhaps in his life, and begins to gaze at his own hand with a sense of wonder and delight?

Second, they are lost in statistics and need someone that knows what is going on and can explain it to them. Knowledge of medicine is necessary to know what to do to help them return to health. A knowledge of the patient and their values is necessary to know when to change from applying technology to fight illness toward applying technology to relieve suffering. Anything that prevents the physician from interacting with the patient, or prevents the physician from taking responsibility for the patient undermines any ethical decisions. Miller and Fins are correct in their observation that the decision is "value-laden:"

Since this value-laden choice between types of care involves varying attitudes toward grave illness and death, it is not a strictly medical decision. There is no single route to a good death.(16) Some patients will choose to fight to the end, regardless of prognosis — to "rage against the dying of the light," whereas others will want to "go gentle into that good night." The preferences of informed patients and family members are relevant, and good decision making about the treatment and care of critically ill patients depends on empathic communication and negotiation.

However, their assessment that it is not a strictly "medical" decision depends on our definition of "medical."

Dr. Fine has made a job of supplying the second part of the equation above. In his institution, there are a large number of hospitalists. These individuals are concerned with the application of technology to return patients toward health. However, they are there during "shifts" and therefore may not be as concerned with the patient's values and wishes about when to switch to comfort care and end of life.

We may have a separate field of physicians that take the responsibility of making ethical decisions and establishing the doctor-patient relationship enough to inform and help the patient through the scary process of talking about end of life issues. An excerpt from Dr. Fine's protocol suggests this is the case:

...one of the questions that I will ask the patient is something along the lines of, "I know it's difficult to talk about this, but would you like to

talk about the seriousness of your illness and even the possibility of death?" Most patients say yes. Almost inevitably, the response I get from patients is, "Why, Dr. Fine, nobody has ever asked me that before." This indicates to me that none of the doctors and none of the nurses have asked the patient that before. ...This begins to open up the relationship with the patient...

Dr. Fine might be at the forefront of that movement.

Dr. Fine was largely responsible for the passage of a law clarifying how medical futility should be handled. This law, or for that matter, any law or code of ethics outlines how the physician should act "socially." This implies a doctor-patient relationship, which is not on an intellectual level, but rather has dropped down to the social level. This law is valuable and necessary and represents a static latching of something identified as having Quality. Something we wish to keep within our social order. However, it is not as "good" as ethical decisions made dynamically within a doctor-patient relationship.

There is another aspect, which should be addressed. The idea of hospital "culture" needs to be addressed. We are brought up to think within our own language and culture. We also train our patients how to think about medicine, although many already use relativistic truth and therefore use us only as one of many resources.

If the "culture" is one of "do everything" to bring a patient back toward health, then there is no room for comfort care or even an end of individual life. The end of an individual's life is then seen as a failure by the physician and by the patient's family. No one wins; everyone loses. This culture also flies in the face of an underlying truth of nature: that all individual biologic forms die. This "culture" is stronger in some parts of the nation than in others. A letter to the editor in reply to the previous article sums up this idea nicely:

To the Editor: Unfortunately, establishing a new unit does not address the core cultural issues that stand in the way of improved care for the dying. The overreliance on technology; a "never say die" attitude by patients, families, and physicians; and the fear of personally confronting the issues of death — these are the core social and cultural issues standing in the way of better care for the dying. Although a noble idea, designating a special unit within the acute care hospital will in no way eliminate these fundamental barriers.

David E. Weissman, M.D.
Medical College of Wisconsin
Milwaukee, WI 53226-3596

Dr. Weissman may be correct. Unless the culture changes, then any measures used as a fix will be of a lower quality. So the underlying question becomes, "How can the culture be changed?" It is easy to find fault, but much harder to find real solutions that work. What are the driving forces that produced the culture in the first place?

One very large driving force is reimbursement for services and cost effectiveness. This force is probably behind the emergence of hospitalists. It is simply not cost-effective for a physician to take time away from clinic to see one or two patients in the hospital. Another advantage may be that sub-specialists are generally better at fixing complex problems than generalists. This importance of experience in the outcome for patients is particularly demonstrable for surgeons. With these advantages, it is hard to argue against hospitalists and it appears that they are here to stay. So a balance between aggressive and technical treatment of disease and consideration for the dying patient is required.

However, changes in culture should ideally be guided by the intellect. So really it is up to us to effect the change. It is hard to change the reimbursement pattern, but it is easier for each individual to make the sacrifice on a personal level. The only question is does it hold enough value for the individual? The question is, "Does it hold value for you?"

As stated earlier, Quality and the Metaphysics developed around it are mystic in nature. However, mysticism is not a belief. Mysticism cannot be grasped by intellect. It is possible to discuss mysticism, to analyze and dissect it in words, but ultimately it is something that must be experienced for understanding to occur. The path to that understanding cannot reside with words; a transformational practice is needed or a transformational experience. The action of taking care of patients, of being a doctor, is that transformational practice for medical ethics. Pirsig states it thus:

> *The thing to do ... is to cultivate the peace of mind which does not separate one's self from one's surroundings. When that is done successfully then everything else follows naturally. Peace of mind produces right values, right values produce right thoughts. Right thoughts produce right actions and right actions produce work which will be a material reflection for others to see of the serenity at the center of it all.*

References on Fuzzy Sets and Fuzzy Logic:

McNeill D, Freiberger P, *Fuzzy Logic, The discovery of a revolutionary computer technology - and how it is changing our world.* Simon & Schuster, New York. 1993.

Kosko B, *Fuzzy Thinking, The new science of fuzzy logic.* Hyperion, New York. 1993.

F Goguen JA: The logic of inexact concepts. Synthese 19: 325-373, 1968.

F Halgamuge SK, Glesner M: Fuzzy neural networks: Between functional equivalence and applicability. International Journal of Neural Systems 6: 185-196, 1995.

F Kosko B, Isaka S: Fuzzy logic. Sci Am , 76-81, 1993.

F Kosko B: Fuzziness versus probability. In Kosko B, ed., *Neural Networks and fuzzy systems.* Englewood Cliffs, NJ, Prentice-Hall, Inc, pp. 263-294, 1992.

F Lin C-J, Lin C-T: Adaptive fuzzy control of unstable nonlinear systems. International Journal of Neural Systems 6: 283-298, 1995.

F Maddox J: Fuzzy sets make fuzzy logic. Nature 306(15): 637, 1983.
F Phelps CE, Hutson A: Estimating diagnostic test accuracy using a "Fuzzy Gold Standard". Med Decis Making 15: 44-57, 1995.
F Sedbrook TA, Wright H, Wright R: A visual fuzzy cluster system for patient analysis. Med Inform 18: 321-329, 1993.
F Zadeh LA: Biological application of the theory of fuzzy sets and systems. Proc Int Symp. *Biocybernetics of the Central Nervous System*, Little, Brown & Co., Boston, pp 199-212, 1969.
F Zadeh LA: Fuzzy logic = computing with words. IEEE Transactions on Fuzzy Systems 4(2): 103-111, 1996.
F Zadeh LA: Fuzzy logic and approximate reasoning. Synthese 30: 407-428, 1975.
F Zadeh LA: Fuzzy sets. Inf Control 8: 338-353, 1965.
F Zadeh LA: Outline of a new approach to the analysis of complex systems and decision processes. IEEE Trans Syst Man Cybern 1: 28-44, 1973.

References on the Metaphysics of Quality

Pirsig, Robert M. *Zen and the Art of Motorcycle Maintenance,* Bantam Books, Inc., New York, 1985.
Pirsig, Robert M. *Lila,* Bantam Books, Inc., New York, 1991.
Pirsig, Robert M. Subjects, Objects, Data and Values. Einstein meets Magritte conference: the meeting of art and science. Brussels, Belgium, June 1, 1995.

Other References:

Angell M., Kassirer J. P. Alternative Medicine — The Risks of Untested and Unregulated Remedies. N Engl J Med 1998; 339:839-841, Sep 17, 1998.
Berne, E., *Sex in Human Loving*, Simon and Schuster, New York, 1970.
Cassileth B. R. The Role of Complementary & Alternative Medicine: Accommodating Pluralism N Engl J Med 2002; 347:860-861, Sep 12, 2002.
Fine, Robert L. and Mayo, Thomas W. Treatment alternatives for the dying patient: medical ethics and the law. Baylor University Medical Center Proceedings 1998;11:187-194.
Ko RJ. Adulterants in Asian patent medicines. N Engl J Med 1998;339:847-847.
Lo B. Improving care near the end of life: why is it so hard? JAMA 1995;274:1634-1636.
Maslow, Abraham. *Toward a Psychology of Being* New York: John Wiley and Sons, Inc. 1964
Miller FG, Fins JJ. A proposal to restructure hospital care for dying patients. N Engl J Med 1996;334:1740-1742
The SUPPORT Principal Investigators. A controlled trial to improve care for seriously ill hospitalized patients. JAMA 1995;274:1591-1598.
Weissman, D. E., N Engl J Med 1996; 335:1765, December 5, 1996.