

THE MEASUREMENT OF VALUE

by

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DECISION MAKING AND INTANGIBLES

The subject of this short presentation will be "The Measurement of Intangibles." What are intangibles and how can they be measured? The important choices we have to make in life and, I believe, in business, are based on intangibles. Think, for example, of the choice of your wife. How in the world do you choose her? What do you have to go by? You know very well that if you would have a list of specifications of wives and you would carry that along when you were looking for girls and you would find one with all the specifications, then you wouldn't marry her because you wouldn't like her. There have been cases like this.

What is it then, that you base your choice upon? It is an intangible. In business, suppose you have to choose an elevator boy. There isn't much difficulty in doing that because you can put down in writing the specifications of that job and if he can push a button and open a door and smile, or not smile for that matter, he will be a good elevator boy. But how do you choose the president of a company? What specifications can you write down for the president of a company like General Electric who has to make decisions of hundreds of millions of dollars in terms of hundreds of thousands of men? How about the choice of the President of the United States? Why did you vote for Eisenhower instead of Stevenson or for Stevenson instead of Eisenhower? What did you go by? Why did they vote for Truman as against Dewey? I bet many did because Dewey had a mustache.

INTANGIBLES AND TANGIBLES IN NATURAL SCIENCE

So, what are these tremendously important choices based upon? Can the intangibles be measured? You will say, "of course not, it is impossible, it can't be done." Well, I agree up to a point because the science of measuring those intangibles is in its infancy. But I want to remind you that also in the natural sciences, where you have the precision measurements on which General Electric is based, there was a time when all these tangibles, as you might call them, of measurement today, were absolutely intangible. That was before Galileo had invented the marvelous application of mathematics to nature. For us today, it seems absolutely natural, a tangible thing, that if you go a hundred miles in two hours you have a speed of fifty miles. But for Galileo to produce the equation $v = s/t$ was a tremendous achievement, and of such importance that it actually destroyed the medieval world. And, as you know, it almost killed him.

Why? Because he did something tremendous. He made the intangible tangible and he did it in such a way that those who liked the intangibles more than the tangibles didn't like it. What was the intangible that he made tangible? Before Galileo, motion or movement was defined

by Aristotle, in his Physics, as the transition of potentiality into actuality. This was the Aristotelian definition of movement of things, of animals, of the soul, of God, of the limbs of the human body, and so on. This was called Natural Philosophy and on this you could not have built General Electric.

So Galileo did something absolutely unique and at that time unheard of. First of all, he said, "I am only interested in the motion of objects," mechanical motion as we call it today. Therewith he toppled the whole Aristotelian world picture; he "secularized" movement. Secondly he said, "I will measure such motion with measuring instruments," and therewith he toppled the metaphysical view of the world. Since falling was too fast he put balls on inclined planes, designed a water clock and measured, and the result was the little formula, that " v " equals the mathematical division between space and time, $v = s/t$.

Then he said the following. "If this formula is correct according to my measurements, then I don't have to look at observations of mechanical motion any more at all. All I have to do is look at what this equation means. And what does it mean? For example, it means that $vt = s$. If this is true, then it is also true that s is a rectangle with the sides v and t . If this is true, I will try to see what are the properties of this rectangle and that, then, will give me the space of motion."

And when you opened Galileo's great book, Two New Sciences. 1638, all you find is drawings of rectangles, triangles, and so on and, as you know, he said, "The book of nature is written in rectangles and triangles, in geometrical symbols," and this is the beginning of modern science.

Now, this was the development from natural philosophy to natural science, and on this little formula is based the whole of modern science. It formulates uniform motion, then came the formula for accelerated motion,

$a = 1/2 gt^2$, then the system of Newton, combining Galileo's and Kepler's formulae, the system of Einstein, and the atomic bomb. All this was based on the break by Galileo with Aristotelian physics. The book called Physics by Aristotle contained intangibles which Galileo made tangible.

THE NOTION OF A VALUE SCIENCE

Aristotle also wrote a book called Ethics—the Nicomachean Ethics (his son was Nicomachos). Today when we teach ethics we teach the ethics of Aristotle and similar moral philosophies. Thus today we combine Einsteinian physics with Aristotelian ethics. *We have a disequilibrium of tremendous proportions: technological development in natural science and absolute stand-still in moral philosophy. We are morally at the stage of Aristotle.*

Some of us philosophers, when we were students, thought that this situation was rather lopsided and that we must do to Aristotle's Ethics what Galileo had done to Aristotle's Physics.

We had to take the philosophical definition of goodness of Aristotle (and, by the way,

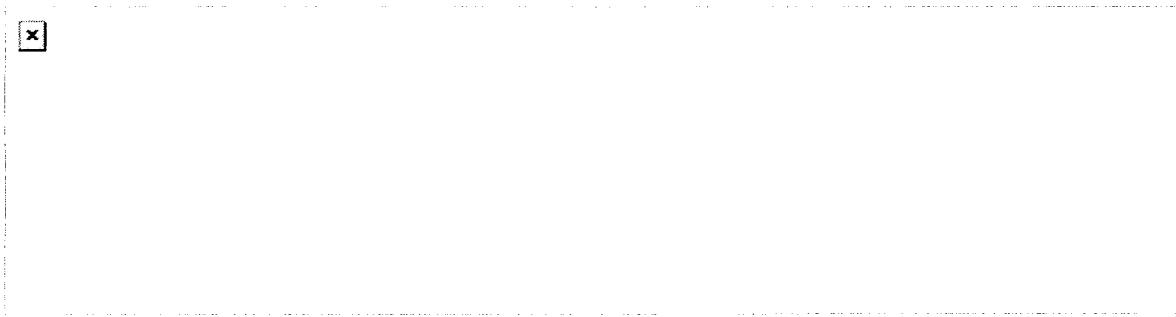
"transition from potentiality to actuality" may also be regarded as an Aristotelian definition of value—it means just as little or as much for value as it does for motion) and we had to change it into something that meant as much for value as the Galilean definition for motion.

So our task, we figured, was to find an exact definition of value, of goodness in terms of either a mathematical or logical relation which would be as applicable and as developable as the Galilean definition of motion. This definition was finally found and I will in the time I have give you the principles of it. We are today in the rudimentary beginnings of a science of value, you might say the first ten years of Galileo. If you remember how long it took from Galileo to General Electric, then you will understand the tremendous development that is ahead in the science of value.

THE NATURE OF SCIENCE

Now, what is a science? A science is nothing but the application of a formal frame of reference to a chaos of phenomena. In other words, you have the chaos of moving things. Aristotle tried to order this by words like "potentiality," "actuality," and the like, but these words themselves are disorder. For what is potentiality? If you want to define it you have to define it by words, these words have to be defined, and the definitions defined, and the definitions of the definitions defined, and so on ad infinitum. Such a nest of definitions within definitions itself represents no order, or only a very rudimentary one.

However, if you take a system like mathematics—and the great achievement of Galileo was the line between the s and the t in the formula for velocity, $v = s/t$ which represents the arithmetical division—then you are within a framework that is systematized and you can then apply this system to the chaos. You take points in the system and apply them to points in the chaos, and the order between points in the system is the order between the points in the chaos.



On this relationship between a formal system and phenomenal chaos is based all scientific definition. The minute a ray of light was defined as a straight line, the science of optics was born: the system of geometry could be used to account for rays of light, for "**straight line**" is a notion in the system in geometry.

Thus, a science is a combination of a formal system, whether it be mathematics in physics or theory of harmony in music or axiology in value, to a chaotic set of phenomena, be they natural phenomena or musical sounds or value situations. So today we have the following

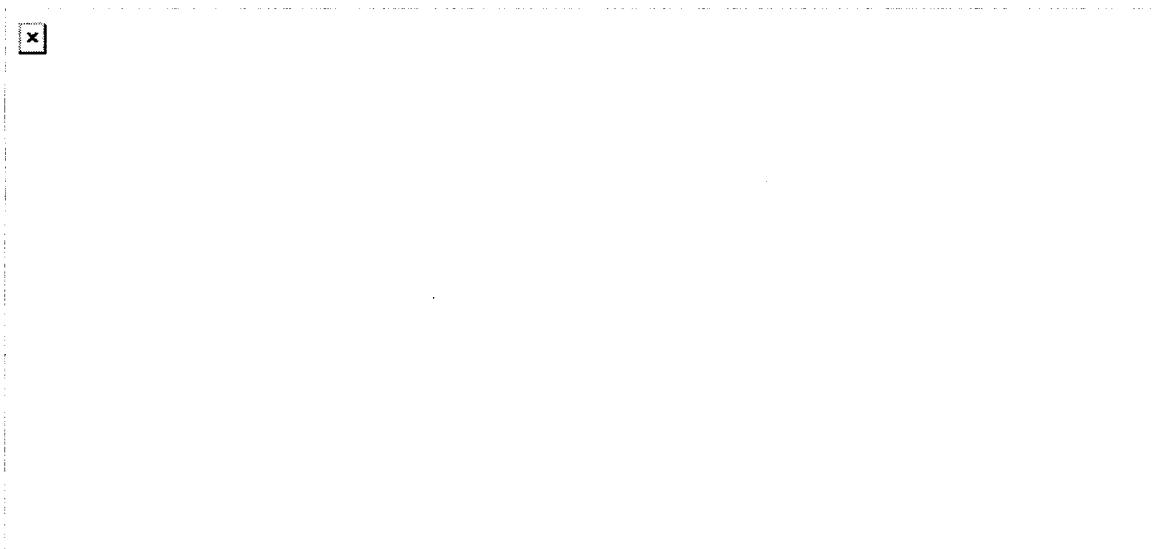
view of science. You have the various natural sciences which are ordered by mathematics, namely physics, chemistry, astronomy, and so on, each applied to a set of natural situations. For example, a situation such as a bicyclist bicycling, is ordered by the science of physics which is ordered by mathematics and mathematics is itself ordered by logic; so that in the last instance the mechanical situation is ordered by logic. All natural science is, in the last instance, applied logic.

THE NATURE OF A VALUE SCIENCE: FORMAL AXIOLOGY

Now, we figured about twenty years ago, there are also value situations—such as I said before—choosing my wife, choosing the president of a company, or to give you another example, the flight of the airplane *Enola Gay* to Hiroshima. The pilot wrote in the log book the wind velocity, the weather and everything, at this exact minute we released the atomic bomb, angle so-and-so, weight so-and-so, weather so-and-so, etc., all the details mechanically, aerodynamically, meteorologically, of the flight.

But at the end of these entries in the log book are these words, "My God, what have we done ?" As you know, the pilot is now under psychiatric care, he has such a tremendous guilt complex that he cannot hold a job, commits petty crimes, and so on.

Now everything in this log book entry up to these last words is natural science, mathematics, physics, astronomy, chemistry—but these last words, "My God, what have we done ?" —that is a moral question, something in the field of value. If we had value sciences, say, ethics, religion, aesthetics, and so on, all these value situations would be ordered by the corresponding sciences. But if they are to be sciences then there must be a formal frame of reference which must order these sciences as mathematics orders the natural sciences; and this formal frame of reference is what we call formal axiology, from the Greek word "*axios*" meaning "valuable."



This notion "*formal axiology*," was already coined in the year 1903 by the German philosopher Husserl. Formal axiology must be a kind of logic just as mathematics is a kind of

logic but it must be a different kind of logic; and what kind of logic, that was, was precisely the question. So, what I want to develop for you very shortly, and only in principle, are the foundations of the science of formal axiology, as that science which does for value situations and value sciences what mathematics does for natural situations and natural sciences.

MORAL VALUE AND AXIOLOGICAL VALUE

I shall now give you the definition of good or value, not in words which don't mean anything and which the books are full of, like potentiality, actuality, or self-realization, purpose, pleasure, satisfaction, and the like. With these words you can't do anything for they are themselves undefined. Rather, I will do it in terms of exact logical relations. Before I do that, we must be absolutely clear that what will be defined is good in the general sense and not in the moral sense. In other words, when I say, "He is a good murderer," I do not mean that morally. I mean he murders well. A murderer is good if he murders well but that does not mean that he is morally good; on the contrary he is morally bad.

If I say, "She's a good girl," I don't mean it the way you hear it, because that is the moral use of goodness. I mean it in the way that she's got everything that a girl has got to have, and that {allows for the fact that} she might, morally, be a bad girl. I mean axiological goodness. Or if I say, "The better your conscience the worse it is," then you have both uses in one sentence. The axiologically good conscience is a sensitive conscience. If you have a sensitive conscience then, of course, it will be a bad conscience morally more often than when you have an axiologically bad conscience which is an insensitive conscience. So, an axiologically good conscience will be often a morally bad conscience because it's sensitive, and an axiologically bad conscience will be more often a morally good conscience because it's insensitive. We have two levels of language here which must not be mixed up. Their mixing up has been the curse of ethics for two thousand years, although Plato already made the distinction crystal-clear; but Aristotle messed it all up.

THE DEFINITION OF AXIOLOGICAL VALUE

Now then, let us define goodness axiologically. In that same year 1903 there was an English philosopher by the name of G. E. Moore, from whom stems the whole development that I'm explaining to you. After much reflection Moore wrote a book called *Principia Ethica*, the title patterned after Newton's *Principia Mathematica Philosophiae Naturalis*, *The Mathematical Principles of Natural Philosophy*.

Moore wrote *Principia Ethica* as the preface to any future ethics that pretends to be scientific. However he didn't get very far in founding the science of Ethics. The gist of the book is that there is good and that it is indefinable. The book, therefore, is very short. Yet, what it says is fundamental, namely, (a.) there is good and good is not anything else but good, nothing like satisfaction, pleasure, and so on; and (b.) but nobody can possibly know what it is. Then Moore goes back into the history of ethics and shows how everybody had messed up things, mixing up goodness itself with things that are good, starting from Aristotle up to Moore—and

he's right.

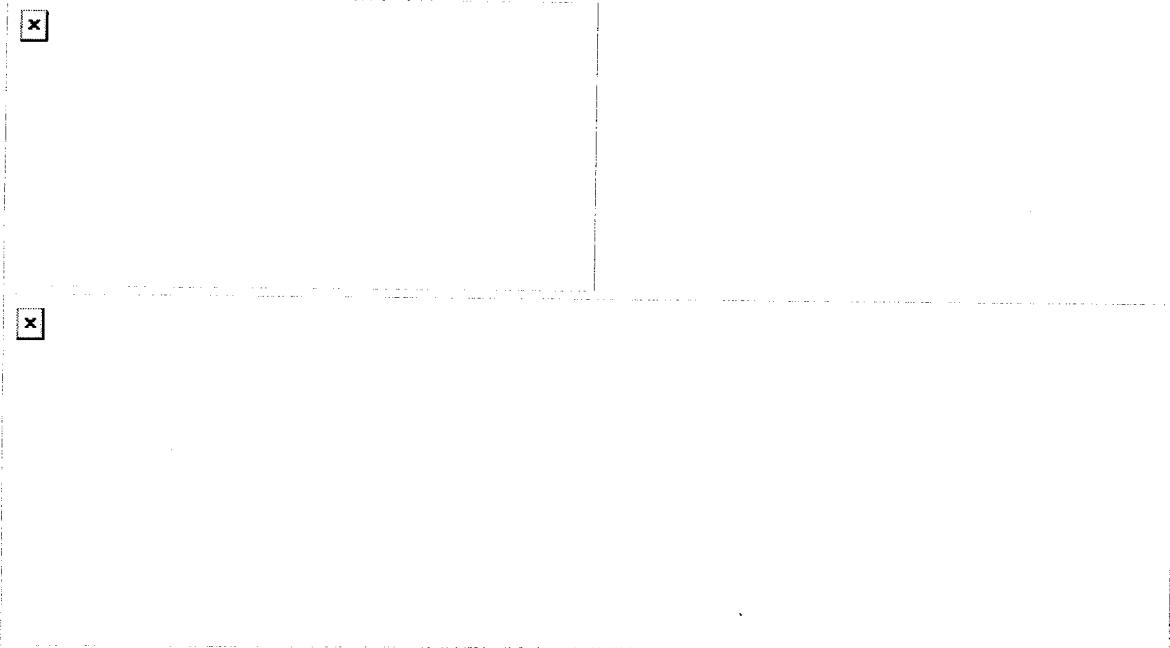
When we were students we thought that that was an awful situation. What is goodness is not definable, and what is definable is not goodness. What we had to find then was Goodness which *is* definable. G. E. Moore himself gave us some help. In 1922 he came up with a kind of definition and in 1943 with a little more of it, the gist of it all being as follows:

"Two things are true of goodness - (1.) it is not a natural property and (2.) although it is not a natural property it depends entirely upon the natural properties of the thing that is said to be good."



Let me explain this, "Good is not a natural property." A natural property is a property of the senses which describes a thing. This desk here is brown, high, with a microphone, and so on. These are the sense properties of this desk and they describe it. Now, says Moore, "Good is not a natural property." Let's take a chair. A chair is a knee-high structure with a seat and a back. These are the natural properties of the chair which describe it and which you learn as a kid. Good, according to Moore, is also a property of the chair, but isn't any of these {natural properties}. It's a value property. "And if only I knew", he said, "how this value property depends upon all those natural properties then I would know what is goodness."

Well, we produced this definition, in a very simple way. But first let me illustrate what Moore said with another example. Let's say that I have my automobile standing out there on the parking lot and I forgot my key there and I say to one of you, "Pray be kind enough and go outside and get me the key out of the car." And you say, "What car is it ?" and I say "Oh, it's a good car." Will you ever find it ? You won't. Good is not a natural property. When I say, "It is a good car," I have not described the car. You don't know whether it's a Ford, Oldsmobile, Chevy, how many doors, what {kind of} tires, you know nothing of the car. You don't know the natural properties. Yet, you do know a great deal about the car, you know it's a good car. What does that mean ? It does have tires; it does have a motor; it does have a door; and when you push the accelerator it will accelerate; when you push the brake it will brake, and not the other way around, all that you know just by my saying, "It's a good car" - and yet you know nothing of the car itself.



We put in a relation. What we did was this:



and we said, "A thing is good if it has all its descriptive properties." This is the fundamental definition of value of formal axiology.

It is both simple and obvious. Take anything that you call good and you will see that you call it good because it has all its properties. This is a good chalk because it writes and it has all the other properties of chalk. Anything that you know has all its properties you may call good. From this definition, follows the system of axiology, for it is a logical definition of value, and logic is a system. It means that the measurement of value is the concept of the thing in question. This concept you have in your mind.

We are now getting close to the measurement of intangibles.

THE MEASUREMENT OF VALUE

Goodness is an intangible. It's none of the descriptive properties that you can see or hear or smell or taste, yet you can measure it with absolute precision. The measure is no more tangible than is mathematics. It's the concept of the thing that you learn by learning language. In other words,

language itself has within it the measurement of value, it is value measurement. Let us see what this means.

Let's take that chair again. The concept chair is in quotes, the chair is standing there. The concept chair is not a chair. The concept is in the dictionary, you look it up if you don't know it. So the concept chair has one, two, three, four properties - "knee-high," "structure," "a seat," and "a back." The set of these properties is called the intension or meaning of the concept and the set of chairs that are, have been, or will be, is called the extension or class of the concept. The concept chair, then, looks logically as follows:

You learn the intension or meaning of the concept as a kid. How? By asking mother. What's this? A Chair. What's this? A girl. What's this? A mirror. My little boy, when he came to the ocean first, looked in and said, "Daddy, mirror!" I said, "No. This mirror is liquid." I added another property. I said, "Such a liquid mirror is called water." So you learn the words of the language learning their meaning as a set of properties and this set of properties is the measurement of value for the things named. Those of you who have read the autobiography of Helen Keller will remember the tremendous excitement of a child on learning names, when her tutor Miss Robinson spelled into her hand the word W-A-T-E-R. The excitement is not only because the name names, but also because it values.

A good chair, then, has all the properties you learn chairs have. It is a knee-high structure with a seat and a back. Now if a chair is nothing but a back it's a pretty poor chair. It's a good back but a bad chair. There you have another little beautiful thing of our simple definition. Anything which is good if it has the totality of its properties is not good when it has less than the totality of its properties. But it is also true that any set of properties can be looked at in terms of some concept. Take any set of properties and you can always find a concept for them. So that a bad chair with legs and a seat but no back is a good stool because it fulfills the properties of the stool and a bad house is a good ruin, and a bad car is a good jalopy. Here you have the difference between the pessimist and the optimist. The pessimist always finds the concept which is not fulfilled by the properties at hand, and the optimist always finds the concept which is fulfilled by the properties at hand. So the pessimist says, "I have a lousy car" and the optimist says, "I have a lovely jalopy."

In other words, the famous saying that for the optimist the glass of water is half full and for the pessimist it is half empty, means in logical terms, that for the optimist the concept is half full and for the pessimist it is half empty.

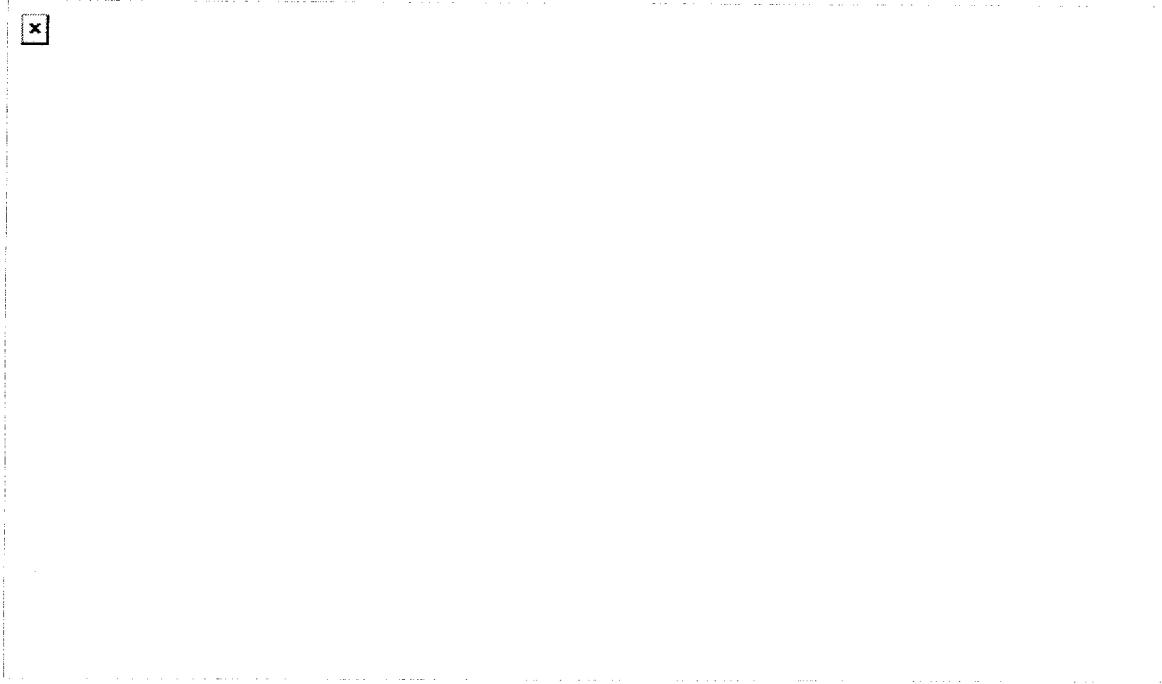
THE CALCULUS OF VALUE

Now, let us look at the definition of value in greater detail. The measure of value of a thing, we said, is the set of properties which defines the thing. So let's take our chair again, one, two, three, four properties, "knee high," "structure," "a seat," and "a back." If it is not knee-high it is not a very good chair. If it is not a structure but wobbles it is not a good chair but it's a good contraption for circus acrobats. If it has no seat it's not a good chair and if it has no back it is not a good chair either. Thus, if a particular thing is what it is named to be, for example something called a "chair," then we call it a good such thing. If this thing here having all the chair properties would be an elephant then it would be a monstrosity.

This is the definition of being not good or of disvalue - transposition of frames of reference. Let us now use the concept as measure. If the thing has all the conceptual, or intensional, properties, we call it good. Let us say that the number of properties contained in any conceptual intension is P , whatever that may be. A good chair, or a good anything, has P properties. If it has half the

properties it is a so-so or average thing and has $P/2$ properties. If it has more than half the properties it is a fair thing and has $P/2 + m$ properties, where m is less than $P/2$, $m < P/2$. In other words, in the case of the chair, m would be less than $P/2$, and since $P = 4$, $P/2$ is 2 and less than that is 1. The chair would be fair if it had

$P/2 + m = 2 + 1 = 3$ properties. In other cases, of course, fair would be something else. Bad is less than half, $P/2 - m$, in the case of the chair only one property; it would be pretty bad. In sum, the four values of a thing, goodness, fairness, averageness, and badness, can be measured as follows, using the example where $P = 4$:



All this is extremely simple. But now look what's happening. Let us put a girl on the chair so we get some differences of opinion, for if four people look at a chair it is difficult to get real differences of opinion. There she is sitting with four fellows sitting around her. One says, "Boy, that's a girl!" What does he mean? She's got all the girl properties; she is P . Another says, "Aw, I don't think she's so hot." What does he mean? Well, she's so-so, not so hot, not so bad either. He says she's $P/2$. The other says, "I think she's pretty good." She's $P/2 + m$. The fourth says, "I don't know what you're talking about. I think she's awful." She's still a girl, but she doesn't have much of girl qualities. He doesn't mean to say she's a bad girl, that wouldn't be so bad maybe. No, to him she's $P/2 - m$.

Now, my question is, what is the value of the situation of the fellows saying this about the girl? Or, what is the value of the girl in the situation with these fellows? What does what they say add up to? Very simple. The one said P , the other $P/2$, the third $P/2 + m$, the fourth $P/2 - m$. So let us add up what they say $P + P/2 + m + P/2 - m$. The result is $2 \frac{1}{2} P$.

This is a peculiar result. Remember, P is the totality of all her qualities. Does she then have more qualities than she has? Indeed she does. And this is the core definition of value: valuation is a play with pure properties. You abstract from the thing itself and take the properties of the thing as a set with which you play around. Depending upon how you play, you call the thing good, bad, indifferent, and so on. In other words, fact is only one of the sets of properties that a thing has, and it is that set upon which people most readily agree. This is a desk because it has all the desk

properties. We all agree on that. However, when it comes to valuation, you abstract from that factual set and just take the properties of the thing by themselves, playing around with them, arranging and rearranging them in your imagination.

Evaluation is an imaginative play with properties and not looking at the thing itself. And fact itself is only one set of the thing's properties. This means that valuation is a function of the imagination. You have the capacity of valuation in the degree that you have imagination. If you lack imagination you will see only facts, like the dejected fellow in the Thurber cartoon about whom the ladies gossip, "He doesn't know anything except facts." But facts, being themselves sets of properties, they are not factual at all.

To give you an example, one day I was sitting in my study, my wife came in the door and she kind of coiled back and said, "What's going on, are you here?" I said, "Sure I am, here I am." She said, "But the car isn't in the garage." I said, "What? It must be stolen!" We rushed to the garage and there big as daylight stood the car. She had been looking in the garage but had not seen it because she thought I was out. We see what we conceive to be. Even fact is a part of what we have in our mind.

So, valuation is a play with pure properties; and axiology is the score of that play, just as music is a play with sounds and musical science is the score of that play.

Now, let us continue our play. I can do much more with the sets of girl properties or of chair properties or any other set of properties than merely add. I can subtract, multiply, divide, arrange and rearrange these sets in sub-sets, and the result of all this is value. Let us ask ourselves how many different values a thing can have. Since the set of properties and each of the sub-sets of this set is a different value, and since according to a well-known formula, a set of P items has $2^P - 1$ sub-sets, a thing with P properties can have $2^P - 1$ sub-sets of properties. This number, then, $2^P - 1$ is the totality of different values which a thing can have.

Now, look what that means. Our chair, for example, has four properties, $2^4 - 1 = 15$. A chair with four properties can have 15 different values. Why? Because it can have one value of goodness; there's only one set of all properties. In combinational analysis ${}_4C_4 = 1$. There are 6 ways in which the thing can have two properties, because ${}_4C_2 = 6$; hence there are six different ways in which the chair can be so-so; it can be knee-high and have a seat but wobble and have no back; it can have a seat and a back but not be knee-high and wobble, and so on. There are 4 ways in which the chair can be fair; and there are 4 ways in which it can be bad, for ${}_4C_1 = 4$. Thus, our chair can have one goodness, four fairnesses, six averagenesses, and four badnesses. In toto, a thing can have $2P - 1$ values because every sub-set of properties is, by definition, a value.

Let us apply this now, say, to job evaluation. Suppose you have evaluated a job as so many properties, let's say ten. Then in how many ways can the employee fulfill or not fulfill this job... in $2^{10} - 1 = 1,023$ ways. There are 1,023 ways in which the employee can perform or not perform one particular job which is defined by ten properties. *To be exact, there is one way of good performance, 385 ways of fair performance, 252 ways of average performance, and 385 ways of bad performance. By dividing the possible number of performances through the possible total of all performances, we get the percentage of performance expectation: 0.098% for good, 37.64% for fair, 24.64% for average, and 37.64% for bad.* The difference between this theoretical expectation and the actual performance in your shop is an objective measure of your shop performance.

The calculus can, of course, also be applied to gauge the acceptance of your product. If the product, in the mind of the public, is determined by 10 properties, the theoretical expectation of evaluation of it are $2^{10} = 1,024$, adding one evaluation {equal to} zero; and there are 385 ways in which the product may appear fair or bad and 252 ways in which it may appear so-so. These ways may in turn be broken down; of the 385 ways in which the thing may appear fair, there are 10 ways in which 9 properties may be accepted, 45 ways in which 8 may be accepted, 120 in which 7 and 210 ways in which 6 properties may be accepted. *The corresponding percentages of expectation are, respectively, 0.98, 4.4, 11.73, and 20.53.* Again, the actual acceptance as against the possible acceptance is an objective measure of your product's success.

Here already you have a calculus of value, measuring much that at present is intangible.

THE DIMENSIONS OF VALUE

However, the calculus has much wider scope. The above application is valid only if properties can be enumerated. But how if they cannot, as in the case of the company president or my wife? Here, it seems, matters become really intangible. Yet, even these values can be made tangible, even they can be measured. Let us see how.

So far we have spoken only of one kind of concept, abstract concepts such as "chair" or "girl." There are two other kinds of concepts which give rise to two other kinds of values. The three kinds of values are the dimensions of value.

EXTRINSIC VALUE

Let us look first at the abstract concept again. Abstract concepts are concepts which are abstracted from the space-time empirical things. In other words, in the world we have all the chairs or girls or what-not and we abstract those properties which all these kinds of objects have in common. The result is the properties of the concept "chair," "girl," or "what-not" or "X".

We had before my little boy who saw the ocean and thought it was a mirror. I had to tell him, "No, it's liquid, and such a thing is called water or ocean." I gave him a new concept. Such concepts, abstracted from sense reality, have the following important characteristic: their properties are denumerable, or enumerable, one by one. For they have been abstracted one by one. You have to take common properties and you just have to learn one by one, one after another, all these properties. A set of items which can be identified one by one is mathematically called a denumerable set. The properties of an abstract concept, thus, are a denumerable set.

If I couldn't enumerate and thus identify them I would not know the thing. Denumerability is the essence of discursive knowledge. But, secondly, how many properties can I abstract that things have in common ? If I have a huge number of things they will have very many properties in common; if I have only two things I can abstract an almost infinite number of common properties. The range of the number of properties that can be abstracted, then, is between one and infinity. Or, the properties of an abstract concept are, at most, denumerably infinite. There is a mathematical sign for such an infinity which is " ${}^0\aleph$ " meaning the Hebrew A with a zero. This is mathematically as exact a symbol as any you know.

When an abstract concept is fulfilled or not fulfilled there appear degrees of valuation, goodness, badness, as we have seen. Such values are called extrinsic values because what is valued is not the thing itself but its belonging to a certain class. A good chair is good because it is a good member of

the class of chairs.

SYSTEMIC VALUE

The second kind of concept is constructions of the human mind—constructs. Have you ever wondered why there are no bad geometrical circles? Because the geometrical circle is defined with such precision in the system of geometry—as "plane closed curve equidistant from a center"—that if a curve does not have all these properties and lacks just one of them it is not what it was defined to be. It's not a bad circle; it's not a circle.

Why aren't there bad electrons? For the same reason. When a thing seems like an electron and lacks an electron property we cannot call it an electron; and the main endeavor of modern physics is to find out about these "bad" electrons and give them new names: positron, neutron, meson, and so on. Why are there no bad square roots of minus one? For the same reason. Why is there equity in the law? Because even in the law there are such exact definitions that when a thing lacks a part of the definition it is not what it is defined to be, and in order to relieve the tension between the system and reality, jurists have invented equity and other institutions.

If the systemic rule remain unrelieved you have legal injustices, as in Menotti's powerful opera *The Counsel*. Again, you have moral injustices if, for example, you define a human being by a system, say, the system of spectroscopy. If you define a human as "white," and all "non-white" as "non-human" you use a minimum of properties to define a very complex being. Such a definition is a transposition of frames of reference and hence, as we have seen, not good.

Constructs have the following characteristics:

The number of properties is finite. It is a minimum number of properties, say, n . A construct gives rise to only two values, either perfection or non-existence. There are no degrees such as good, bad, indifferent, and so on. This kind of value is called systemic value.

I can apply systemic value to anything, say, my wife, I look at her systemically when I see her as my housekeeper and get mad when the soup isn't on the table or when she pushes the toothpaste from the top and I at the bottom. But that is not the right way of looking at my wife.

I also can look at my wife extrinsically as a member of the class of wives, compare her with other wives, and so on. But that's not the right way either.

INTRINSIC VALUE

When I really think of my wife the way I should, she's unique. The concept "my wife" is a singular concept. How many properties does she have? She has an infinity of properties and I cannot put my finger on any one of these properties. I see her, as the psychologists say, as a "gestalt" or as the mathematicians would say, as a "continuum." I neither abstract from nor construct her. I live her life, identifying myself with her. She is an intrinsic value. Logically, this means that the properties she has are non-denumerably infinite, and the sign of this is \aleph_1 .

Let me explain this sign and then give you an example. When we come to transfinite numbers most peculiar things happen. If you take all the rational numbers to infinity you have the odd and even numbers, 1, 2, 3, 4... Now take only the odd numbers, 1, 3, 5, 7... How many odd numbers are there? Infinitely many. This means that there are as many odd numbers as there are odd and even

numbers. How many even numbers are there? 2, 4, 6, 8... Again, infinitely many. There are as many even numbers as there are odd and even numbers. So the mathematical definition for a transfinite number is that the part equals the whole.

This is a most peculiar arithmetic, yet, it is as exact an arithmetic as any other arithmetic. Actually, it is much simpler than finite arithmetic. Suppose you deduct an infinity from an infinity, what is the result? Well, an infinity. Now add an infinity to an infinity - again an infinity. Whatever you do you always get an infinity: **Aleph - Aleph = Aleph, Aleph + Aleph = Aleph**, etc. The most significant thing is that no subtraction is possible. The only thing that may significantly happen is rise to higher infinities, by exponentiation: **Aleph₀^{Aleph₀} = Aleph₁**.

This is all we need as foundations of axiology. Let me summarize:

1. Value is the degree in which a thing fulfills its concept.
2. There are three kinds of concept: abstract, construct, and singular.
Correspondingly, there are three kinds of value:

- (1) Systemic value is the fulfillment of the construct
- (2) Extrinsic value is the fulfillment of the abstract
- (3) Intrinsic value is the fulfillment of the singular concept.

The difference between these concepts is that a construct is finite, the abstract is denumerably infinite, and the singular is non-denumerably infinite.

To wrap it all up in an example, let us take a student, say, of mathematics at MIT, John. He's going on a vacation trip to Europe all alone and while he steps on board the Queen Mary he says to himself, "I'm going to have a good time." While he thinks this, he has nothing on his mind but a mathematical curve, a kind of sinus curve, belonging to the concept "girl." He does not think of any girl in particular but, so to speak, the principle of femininity. This is systemic valuation, construction in the mind. He sets up an ideal of some kind.

The next day out on board there's a little party, quite formal as it is on these European ships. The boys line up on one side of the room, the girls on the other side. John is standing there and over there are samples of the class of girls, in space and time. Now the concept has enriched itself and, by the way, you may also define valuation as enrichment of properties. The concept **m** = now is not just a mathematical curve but quite a bit more—the curve has been filled in. In looking over there he uses the concept in his mind, "girl," with those new properties, to measure what is standing over there, the samples of the class - he weighs in his mind the members of the class in light of the concept—and the word *axios* is our word "axle," namely the axle of a scale.

The process of weighing is reflected in his face. On one he says, "Uh uh" and on one "Mmmm" and on this one "Ah!" meaning **P** properties. So he walks over, asks her to dance, and the dancing itself, of course, is a continuation of the process of valuation, weighing what he has in his arms against what he has in his mind.

Well, let's say he likes her; let's call her Mary. They keep company and do have a wonderful time. Extrinsic valuation—she's the best girl in the axiological sense.

One day before the ship arrives in Southampton there happens a most peculiar, and you might say irrational and intangible, thing were it not for axiology. He wakes up in the morning and suddenly thinks, "Mary—she's not a girl at all; she's the only girl in the world." He knows very well there are one thousand million girls in the world and yet he knows with equal certainty that she's the only girl in the world. So, being a mathematician and very logical, he reasons, "If she's the only girl in the world and I'm a man, and I have to live with a girl, then I have to live with her." So he writes her a letter which starts as if he had read axiology. "My one and only." Uniqueness! And the language of the letter is as foreign to mathematics as poetry. "My treasure," "my world," "the sun of my life," and the like. And he adds a "PS If you don't marry me, I'll jump overboard."

What has happened? Systemic, extrinsic, and now intrinsic valuation. In intrinsic valuation, since you do not abstract nor construct, how do you know it? By self-identification. He identifies himself with her. They marry and after three months or three years the process goes into reverse. He walks down Main Street and suddenly sees, "Ah, there are girls." And then he compares Mary with them; extrinsic valuation.

Then he goes home and there comes systemic valuation as his housekeeper, as I said before, the soup isn't ready and she pushes the toothpaste at the wrong end and the linens are not washed and he gets mad. He shouts at her, "I'm working all day and the soup isn't ready," and she cries and she says, "Now you're not nice to me," and he looks at her and there she is again, the one and only girl in the world, and he goes over and says, "I'm so sorry, I measured you systemically." And she says, "Yes, you were very bad. I am unique. I am to be measured intrinsically. I am I."

All right. This wraps up the thing. Now we come to a few applications.

APPLICATIONS OF AXIOLOGY

The Axiological Nature of Man: Moral Goodness

The most important thing for all of us to determine: What is a human being? We define a human being as the only thing in the world that has its own definition of itself in itself. That chair over there doesn't know it's a chair, but I know that I am I. And no matter how people might look on Mars—they may look like chairs with four legs, who knows? But if they can say "I" and can reflect upon this, then they are human beings.

From this definition of a human being follows a far-reaching consequence. When I say, "I am I," then I am thinking of myself, that is I think of Me. But I think Me, how about the I that thinks? Since it does the thinking it is not being thought. How can we think of the I that thinks Me? By making it a Me. So, let's think of it. I think of Me thinking of Me. But now what about this new I? Well, let's think of it. I think of Me thinking of Me thinking of Me. Again, there appears another I that cannot be thought of and so on, ad infinitum. By the simple definition of a human being as self-reflective it appears as an infinity. I can never completely reach myself as thinking.

The peculiar thing is that in one of the first mathematical treatises on infinity German mathematician Dedekind, 1887, used this example to prove the existence of infinite systems. The American philosopher Royce, twelve years later, turned around Dedekind's proof in order to prove the infinity of the human being. The human being, axiologically, is an actual infinity. Moreover, he is a non-denumerable infinity: for what is true of I and Me is true of any thought I may have. If I

think of this chair, I can think of my thinking this chair, and my thinking thinking this chair, and so on, ad infinitum. Each of my thoughts, thus, may be an infinity. If I can have a denumerable infinity of thoughts—as potentially I can—then the infinity of this infinity is non-denumerable, for $\text{Aleph}_0^{\text{Alepho}} = \text{Aleph}_1$.

Since a non-denumerable infinity, by our definition, is intrinsic value, the human being is an intrinsic value. This is an objective definition of the worth of a human being. Depending on how I fulfill it in actuality, I am a good or not good human being.

If we now define moral good as the application of intrinsic value to humans, then the goodness in question is moral goodness.

Let us see what this means. Our definition of value was that a thing was good if it fulfills its definition. The definition of a human being is in himself. Hence, a human being is good when he fulfills his own definition of himself. What does this mean? It means that he is morally good if he is as he is.

All the words of ethics mean this very same thing, this identification of myself with myself, being sincere, being honest, being genuine, being true to myself, having self-respect—these words mean that I am as I am, that I am myself. This seems to be a very simple thing and yet it's the most difficult to achieve. For I can define myself in three ways, systemically, extrinsically, and intrinsically.

When I define myself systemically, I put up a system, I construct something as myself which I'm not at all. And you probably know some people in your acquaintance whose images of themselves are very different from everybody else's images of them. They live a construct. Karen Horney and others call this the "self system." It leads to neurotic breakdowns and similar sicknesses of the self for in the long run you can't live another's life or an imaginary construct. In the worst case, it leads to the asylum.

Also, a person can define himself extrinsically, as a member of some class. In our lives we are continuously in external situations, all kinds of situations, like now I am a speaker, then I'll be a listener, then an eater, and so on. I am a father, I am a commuter, I am a Rotarian, etc. I'm in the millions of situations in my lifetime. But do these situations add up to myself?

Suppose I define myself as the best professor in the world. So what? I haven't touched the core of myself, which would be my intrinsic definition of myself, not as this or that, doing this or that, but as the gestalt of my essential being, as simply who I am. Who am I? I am this human on this planet Earth. I was born a naked baby and I have to die. That's all. That's the gist of being myself and being a professor or anything else for that matter is a different thing from being this human, born on this planet Earth and having to die.

Any extrinsic definition of myself is really not the definition of myself. In order to make the definition of myself I must neither construct myself nor even abstract from myself, but simply BE, namely, identify myself, as we said before, with myself. And this is the most difficult and the most important task of our mortal life. It is very difficult simply to be, to be natural and not to pretend, nor be proud nor ashamed of this or that. Sometimes we reach this stage when we "get away from it all" on vacations, to be alone with ourselves and to get acquainted with ourselves.

To be moral is, so to speak, to bring the vacation spirit into our daily lives. The moral, in this sense,

appears whenever you cannot impress anyone either positively with your achievements or negatively with your failures. It is what makes children and dogs love you—if they do—and what makes your wife look at you when you are asleep.

Just to Be, in daily life, is highest maturity. Also it is very powerful for it brings into play the infinity of your intrinsic self. To scramble around in the treadmill of extrinsic value is not only immature, it is inefficient. It shuts up your infinite powers and lets them lie idle. It prevents you from really Living. It is not, however, immoral; it is amoral - neither moral nor immoral. To be immoral is *not-to-identify* oneself to be insincere, dishonest, not true to oneself, to lack self-respect - nor to identify oneself with any other human being, to be indifferent to human beings. Often, those indifferent to concrete human beings profess great concern for humanity in the abstract.

All this is illustrated by a wonderful story by Tolstoy, *The Death of Ivan Ilych*. Ivan Ilych is a judge in a provincial town in Russia whose whole ambition is to be a judge of the Supreme Court in Moscow. He finally reaches that ambition, his whole family moves to Moscow, they get a great big mansion, furniture and everything, and while he puts up the curtain he falls down the stepladder, breaks a rib, it goes into his liver and from that moment he dies. The story is about the dying of Ivan Ilych. How trivial, how insignificant is the fact, that now {that} he is a judge of the Supreme Court, that death is upon him. All his family falls away from him, it takes too long for him to die, all his friends fall away from him and at the end the only friend he has is his menial servant, Gerasim, the butler's assistant, a peasant lad, who makes him comfortable.

Here we have the transition from extrinsic to intrinsic self-definition.

Examples from Business

Now let's turn to some examples from business. Take, for example, the idea of a worker. Systemically, a worker is a system of mathematical elements, as you have it in time and motion studies.

Extrinsically, a worker is a member of the class of workers or a member of the shop or some other function. This, of course, is a different view from that of time and motion studies. It leads to different kinds of compensation, such as incentives.

Intrinsically, a worker is a human being with infinite value, and this again leads to entirely different consequences in business actuality, e.g. to the partnership of worker and employer in profit sharing.

What is a salesman? Again, systemically, he may be a person who has learned a certain approach by rote, he makes that approach and he sells. Extrinsically, he has been trained in analysis of situations, in psychology: the science of psychology is defined as extrinsic value applied to a human being. He analyzes the situation as such and such a situation, and he sells. But intrinsically, he goes in there and he uses no approach at all, he breaks all the rules and he runs away with the sales. His secret is that he identifies himself with the customer.

In one of the companies where we discussed this matter in detail we came to the conclusion that every single job except the most simple should be specified and evaluated in all three of the value categories.

Every single job can be both systemic, extrinsic, or intrinsic. Let's take the president of a company. If you have a company which is nothing but automation and there are people just pushing buttons, then the president of course can be systemically selected, for things here run by themselves like an elevator. All he has to do is to push the main button and, perhaps, to know why the thing works.

But if the company is defined in a different way, let us say in its function in society or as making the best product at the lowest price or, as some do in Europe, as making the worst product at the highest price, or by whatever other social or economic function, then you need a different kind of president.

He has to have the extrinsic view of situations, he has to be a master politician and manipulator. And if the company is as big as a country and has a tremendous number of people, then every decision is wrought with "intangibles," with values, and the president should be one who, in addition to the other value dimensions, also knows intrinsic value and is a human being.

Take other examples. Think of the Hawthorne experiments. A group of girls was taken out of the factory and experimented upon. They got better working conditions and productivity increased. They got worse working conditions and productivity increased.

They got better lighting, productivity increased, they got worse lighting—productivity increased. They got rest periods, midmorning lunches, a shortened work week—productivity increased. They got no rest period, no midmorning lunches, a lengthened work week—productivity increased. No matter what was done—productivity increased. Roethlisberger and Dickson shook their heads, and wondered what kind of logic was at work. Any particular thing we do, they concluded, is unimportant, the only important thing is the attention we give them and the cooperation they give us. And that was exactly right. What was mobilized was intrinsic valuation: "stores of latent energy and productive cooperation" were uncovered.

In intrinsic valuation, as I said before, the only thing that can happen is addition. Once these girls were given intrinsic human attention everything that happened was addition. The finite arithmetic of subtraction simply did not apply.

Again, take the case of profit-sharing companies. Some give away 50% of their profit (I am thinking of a foundry in Ohio) and you might think that the formula would be **100% - 50% = 50%**. But in that particular case the formula was **100% - 50% = 170%**. Why ? Because, again, the human element was mobilized, productivity increased