



BULLETIN

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Happy Easter! Again we reach the zenith of the religious year. There can be no greater Christian feast than the Resurrection. Christ has done with suffering now and forever. We, too, in sharing in the resurrection, will be rid of suffering forever. Let's remember Pastor Steve Kuhl's remark in *Christianity and The Human Body*, which will be sent to members in about a month: the purpose of the incarnation, death and resurrection of Christ is our re-embodiment in heaven.

Recently there were hearings in Congress on the ethics of human cloning. Many ethicists testified against human cloning because the result will almost certainly be weak, even non-viable. Thus most of the ethicists were against human cloning now. True! Experience with animals confirms that the product of animal cloning is far from being even acceptable as of now. So far so good! But it is clear that the ethicists were only tentatively against human cloning. That is the thrust of their testimony.

What happens when the science is such that human cloning can be expected to produce viable, healthy humans? What happens then? Will they be in favor of cloning then? I imagine a lot of them will be in favor of this new method of human reproduction. In some churches the use of the word "reproduction" has not replaced the word "procreation." Does anyone have the "right" to a child? This seems to me to be proper. What is the difference between having a "right to a child" and having the right "not to be artificially prevented" from having a child? There may be the crux of the situation. A negatively stated right is different from a positive right.

This is another aspect of the holiness, sacredness, of the human being. Who we are and what we will be is an ongoing anthropological discussion. This will provide another opportunity to refine our thoughts on an issue of neuralgic concern. Is a child a result of love, a two-in-one-flesh gift or is he or she something to be planned and labored over in the lab or the clinic? I know which of the two I would choose. This is a question that we will have to answer in our country and in our culture. I hope we do it carefully and conscientiously. In the meantime, Blessed Eastertide — the time of our redemption and re-embodiment in heaven.

Robert Brungs, S.J.

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The ITEST Bulletin: Publisher, Robert Brungs, S.J.; Editor, S. Marianne Postiglione, RSM

ITEST Offices: Director, Robert Brungs, S.J.
Director of Communications, S. Marianne Postiglione, RSM
221 North Grand Boulevard
St. Louis, Missouri 63103 USA

ANNOUNCEMENTS

1. Invitations to the October 5-7, 2001 workshop: *Nutrition and Genetics*, will be sent within the next month. We have a faculty for theology, science and technology. Presenting the promising aspects of genetically modified food are: Brett Bussler, PhD., Manager of Tech. Development, Monsanto; Mark Smith, Research Scientist, Searle (a Monsanto Company) and Anthony Torkelson, PhD, Catalyst Consultants, St. Louis. We have contacted the Rodale Institute to present an opposing view. Charles Sing, PhD, Univ. of Michigan, Department of Human Genetics, while recognizing the inevitability of biotechnology, will present a more complex model for these technologies.

Our venue this year will be at The Shrine of Our Lady of the Snows, Belleville, Illinois — a place of natural beauty with a comfortable hotel at a reasonable price. Further information will be forthcoming. Because of space constraints, we can accept no more than fifty participants.

2. Sister Marcianne Kappes, CST, reports that the ITEST student chapter at St. Gregory's University, Shawnee, Oklahoma, is going strong. The new officers: Laramie Navarth, Pres., Matt Faulk, V.Pres., Emilo Terao, Sec., Satako Tsurumoto, Treas., Kate Janzen, Chaplain and advisor, Sister Marcianne, have weekly discussions, film and field trips on aspects of science/theology. The chapter has raised money to explore the science and theology of pain control, music and meditation. For more about this model chapter, contact Sister Marcianne at srmarcianne@sgc.edu.

3. The proceedings of the October, 2000 workshop on *A Theology of the Body* are at the printer. We hope to have the books to all dues-paid members (for 2000) by the middle of May. If you haven't paid your dues for 2001, we would be glad to receive them. We will send a final renewal notice to those who have not yet renewed.

VIRTUAL REALITY A LESSON IN MODERATE REALISM

[Dr. John Cross is Professor of Psychology at St. Louis University. This is a precis of the talk which he gave at the one-day meeting of ITEST on Virtual Reality, March 11, 2000. We chose March 11, 2000 for two reasons. One, we thought the topic very appropriate for the year 2000 and the Y2K scare. Two, we figured that by March 11th the weather would be more moderate. The first reason remained valid — the topic was most appropriate. The validity of the second reason was greatly lessened by an eight inch snow on the morning of the meeting.]

This paper is based on the second of three presentations at the March 2000 ITEST workshop on *Virtual Reality*. In the first paper presented at the workshop and published in the Summer 2000 *ITEST Bulletin* (vol. 31, no. 3) John Ashby examined the burgeoning information technology which makes the production of expanding virtual realities possible. In the third paper of the workshop published in the Fall 2000 *ITEST Bulletin* (vol. 31, no. 4) Sr. Timothy Prokes, FSE examined the theological implications of expanding virtual realities. In the second workshop presentation summarized here, I examined the evolution of virtual reality as exemplified in aerospace simulation technology and then commented on the neurobiology and psychology which are source disciplines for further development of virtual realities.

Virtual Reality, according to Webster's New World Dictionary 3rd Edition, 1997, Macmillan, page 1491, is the computer-generated simulation of three dimensional images of an environment or sequence of events, that someone using special electronic equipment may view, as on a video screen, and interact with in a seemingly physical way. A narrow reading of this definition would seem to be limited to images based on geometrical equations stored in computer memory, and presented visually

and separately to each eye to provide stereoscopic visual impressions of three dimensional spatial events. A broad interpretation, as used in this paper, includes visual and non-visual sensory images such as auditory and tactile, and multi-modal presentations. It also includes 2-D presentations on a flat surface such as a video screen, if they incorporate monocular cues to a 3-D space, either computer generated or picked up from 3-D models by a computer guided camera system, or produced by other means.

Existing examples fitting the broad definition would appear to include video games, home style or arcade; virtual tours of real estate offerings with pre-recorded video; and architectural planning with computer-generated images. Applications in research have included presentation of molecular structure models which change as atomic components are changed, or in education, teaching the calculus via modifiable computer graphics.

3-D images, produced by scale models scanned by remotely controlled cameras are sometimes used in aircraft simulators. The computer functions here to translate pilot control inputs into aerodynamically appropriate camera motions which thereby provide visual feedback on a large video screen in place of the cockpit windshield. Alterna-

tively the “models” may be algebraic equations of the geometric properties of 3-D spaces and objects which are “scanned” by the human operator control inputs. Beside video screen or computer monitor presentation, more vivid visual binocular three dimensionality can be provided by two small helmet mounted video screens presenting slightly different views to each eye in response to head movements, as these are transmitted by sensors attached to the helmet. This is a 3-D movie produced in real time. These helmet mounted systems can also be used in real aircraft to aim weapons at either real visual targets or computer-generated images derived from infra-red or radar detected targets. Again real time, 3-D, virtual reality. These devices are deemed most successful when they give a sense of “presence.” It's like really being there. This sense of presence admits of degrees, ultimately being indistinguishable from the real thing.

Please note that there's a lot of latitude of interpretation for the dictionary definition. The computers may generate images via graphics software based on Euclidian or hyperbolic geometry, or the computer may simply guide other imaging devices. In fact the images may be visual, auditory or tactual-kinesthetic or all three. They may even involve vestibular stimulation. As a general rule, the more sense modalities accurately stimulated, the more sense of presence achieved. The interaction alluded to in the definition may vary from simply turning the simulation on or off to appropriately altering the simulation in response to every action of the operator.

Auditory imagery can be far more realistic or “virtual” than can visual imagery with current technology. Multiple-speaker quadraphonic sound can copy the increasing loudness of an approaching race car and the sudden Doppler shift of frequency downward as the “car” is heard to pass close by and recede into the distance. This technology can often pass the “Turing test” of being indistinguishable from the real thing. On the other hand, the technology of simulating kinesthetic tactile and vestibular reality is in general very primitive and unconvincing. In 1955, as a young naval aviator, I was trained for instrument flight by sitting in a big black box shaped like a stubby airplane. This so called Link trainer was powered by air cylinders which could tilt it up and down, and bank it left and right, a bit, but it never moved from its spot on the floor. The accelerative and decelerative forces of actual flying were missing. The stick and rudder pedals were spring loaded but provided unrealistic back pressures. The flight instruments did provide a moderately realistic visual simulation of instrument flying through a compass, altimeter, and artificial horizon. The radio beacon of what was, even then, an antiquated system of quadrants which beamed out a dot-dash or a dash-dot auditory code, could be used by the pilot to hone in on the beacon. I got lost several times and even crashed the simulator once. You can see the value of such virtual reality devices for saving lives and training costs, and for entertainment. My instructors at

least found my embarrassment over “crashing” to be quite entertaining. My continuing personal experience with simulation technology parallels in several ways the evolution of flight simulator virtual reality for training and research. In 1957 my squadron acquired a fix based simulator of the Lockheed Constellation cockpit, where we junior pilots practiced handling the innumerable emergencies that can occur in a four engine aircraft loaded with electronic equipment.

On leaving the Navy, I went back to the Jesuits at Fordham to earn a masters in Experimental Psychology and then to Saint Louis University on a NASA Fellowship for my Ph.D. I proceeded then to McDonnell Aircraft Company as an Engineering Psychologist, to work on advanced “Cold War” design projects like the vertical/short takeoff (V/STOL) fighter-bomber for the U.S. and West German Air Force. One device we designed to include was a heads-up display combining reality with virtual reality. The pilot of this low flying, terrain-following, super-sonic plane was to see the real world streak beneath him through the windshield or, in fog or at night, see an image of the terrain projected from below the slanted sheet of the windshield. Thus when real vision was inadequate a radar-based moving virtual image took its place.

Another advanced design project was the Air Force Manned Orbiting Laboratory (MOL) to study the capabilities of astronauts for military tasks in orbit. We conceptualized an earth based one “g” lab module identical to the proposed orbiting module to provide comparison data on the performance of a variety of tasks in the zero “g” environment. It was at this point that I began to see more clearly both the promise and pit falls of “virtual reality” from a technical and scientific standpoint. We could telemeter or bring back recordings of reconnaissance and other data obtained in orbit for our land based simulator. But could we know that these data contained all the levels of detail that could affect and be sensed by a man in orbit? Differences in performance could be due to differences in the environments or to differences from the recording or transmission processes. This must continue to be a major scientific question area because of our limited knowledge of human sensory processes, which is the topic of the second part of this paper. The promise of “virtual reality” when it accurately reflects “reality”, especially when coupled with it's sister technology of robotics, become most apparent as we contemplated the moon landing mission and exploration of planets, moons and asteroids. The enormous cost of life support systems and risk to life, in increasingly hostile environments, dictates extensive exploration by unmanned space vehicles before manned missions are justifiable, if ever they be so. If we can remain on our beautiful home planet, while experiencing safe aspects of the “virtual reality” of robotically explored and telemetered alien environments, we will have furthered knowledge of God's marvelous creation at reasonable cost. We have, for example, made great progress with this technolo-

gy in exploring the ocean depths. Before too long we can hope for a successful Mars lander-explorer.

A further note here about Virtual Reality's sister technology of robotics. Directly controlled robots have done and do much of the work of the world, from water and windmills and catapults to steam engines to cars, trucks, road builders, excavators, derricks, watercraft, aircraft and spacecraft, to remote handlers for dangerous materials or minute tasks like microsurgery and computer assembly. It is these tools, invented to extend the human capacity for work beyond its natural biological limits, that most characterize technology. In the coming age of computer-aided design and computer-aided manufacturing (CAD-CAM), the control of robots becomes less direct and itself more automated and computer controlled.

Do you recall that old Sci-Fi movie *Forbidden Planet*? An alien civilization had advanced so far that the life forms creating it had disappeared while the machines continued to function. There was a hitch. The earthling explorers who discovered the planet were increasingly attacked by the machines! Turns out that in developing this robotic world the original life forms had perfected thought-control. It wasn't necessary for them to push buttons or pull levers, or even to speak commands as in our car phones with voice dialing capacity. They could just *think* what they wanted and their robots obeyed. These beings, too smart for their own good, had neglected to note that their robots read not only their conscious thoughts but also their unconscious thoughts. You guessed it! Like other humans they had aggressive and hostile unconscious minds. Their robots read their "Id" impulses and destroyed them all. Fortunately our own technology is not so advanced, which is not to say, however, that it cannot and is not used destructively, or that it may not become functionally autonomous grinding on in meaningless activity. In some regards, our technology may be heading that way now. To the extent that "post-modernism" presents a world devoid of ultimate meaning and purpose, it will, as a non-philosophy, generate a meaningless technology. Sister Timothy has had much more to say about this aspect of "virtual technology" in the next to the last issue of the ITEST newsletter (Vol. 31, no. 4).

I would like to turn now to present a view of the evolution of consciousness which identifies consciousness itself as "virtual reality", which can be extended and manipulated by the technology we are discussing here today. Consider an evolutionary process such as envisioned by Jesuit theologian-anthropologist Teilhard de Chardin. In his view non-living matter evolves in the sense of a purposeful "increase of organized complexity" to the point at which, on planet earth, a sufficiently structured physical environment for the support of life forms came into being. In Aristotelian terms, the earth is formed with evolutionary

process being the efficient and material cause and divine nature and intentionality being the formal and final cause, thus reconciling creationist and evolutionary perspectives. Original vegetative life is sensate. It is responsive to physical energy change within and around it. It is "pre-conscious." Animal life represents both its own structure and activity and that of aspects of its surroundings by a neural code generated from sensate pre-conscious activity. This reconstructive representational process is what we call consciousness or perception. It recreates, for animal life, a world of objects and events from the simultaneous presence of inputs from a variety of sensing mechanisms. It reconstructs a "virtual reality," in animal consciousness.

At our human stage in the evolution of consciousness we become aware of the virtual nature of consciousness. We are conscious of consciousness, or reflectively conscious, and critically aware of the limitations of consciousness. We discover sensory limitations, perceptual illusions and conceptual delusions. On this basis we collectively construct language, to explore and compare consciousnesses. We construct science, to extend sensory capacity into the microcosm of quarks and gamma rays and the macrocosm of quasars and gravity waves. We construct technology, to apply science to accomplish our wishes; and we construct art, to discover our wishes. For believers, religion is our highest art, theology is the queen of our sciences, and the church is our technology. Within the context of this religious and evolutionary view of consciousness, allow me to explore three examples of consciousness as "virtual reality."

Consider first haptic space, that is the joint, muscle and tendon senses of kinesthesia, the vestibular senses of equilibrium and force fields and the cutaneous senses of tangibility, resiliency, texture and temperature, all which combine to give us the sense of being-in-space and moving-in-space. This system often inadequately described as "touch", gives us the sense of self, proprioception, which is the background or field in which the other senses can make sense. Without monitoring and learning by the nervous system, of how our eyes are aiming and our heads turning, visual input would be uninterpretable, as would auditory input. Without the haptic system, we would be a randomly writhing mass on the floor, our brains not knowing the state of our body parts and being unable to direct them. It would take a large volume to describe what is known about the specific stimuli, receptor organs, receptor cells, neural pathways, central nervous connections, cortical projection; the absolute, difference and terminal thresholds; the subjective scaling, adaptation, and interactions of the component subsystems of haptic awareness. It will take innumerable volumes to describe what we do not yet know. Predicting the extent to which it may eventually be possible to artificially simulate all of the stimulus inputs responded to by this system — that is to fabricate an ex-

ternal "virtual reality" which will produce any possible state of conscious haptic perception desired — is not currently feasible. It is interesting to note that we use the term tangible as a synonym for real and the word 'appearance', referring to the visual sense, as a synonym for a suspect reality.

We are more able to manipulate the visual input creating illusory "virtual reality" than in the case of the haptic systems. The visual world provides a second example of the virtual reality which our nervous system provides for us. This is the world of exteroception, the distance senses. Although we have a sense of immediate direct awareness of visual objects, it is through reflective consciousness and scientific exploration that we know that what we see is highly mediated and indirect. An exquisitely controlled pair of continuously operating "cameras" explore in search of radiant input, creating a flow of ever changing patterns on the retinas of these cameras, our eyes. The patterns in the two eyes are slightly different because of the eyes separation in space. These patterns are related to each other by a complex hyperbolic geometry which the visual system can incorporate to extract distance information and create a conscious world of three dimensions from the two dimensional patterns flowing on the retinas. Current technology can reproduce only imperfectly these image disparities in simulating the visual input, but the inputs are sufficient to stimulate postural adjustments which have become conditioned to visual changes which accompany the movement of our bodies through space. Reflex bracing for accelerations, decelerations, turns, etc., helps to produce the kinesthetic feedback which augments the feeling of real presence created by the simulated visual three dimensionality. This is a kind of second order virtual reality or virtual reality.

The auditory world provides a third example of stimulus patterns which can be manipulated to create a false sense of being-in-space. As noted earlier this technology is more perfected than in other sensory modalities. This is partly due to the greater ambiguity and illusion proneness of auditory space. The direction of a sound source is most ambiguous for sounds in the median plane of the body. Sounds directly in front, behind, above or below reach the two ears simultaneously and only slight differential shadowing of frequencies by body and head parts can give a hint of the true direction. People typically make many errors in locating these sounds. The auditory axis, an imaginary line running through the two ears, provides maximum time, frequency, and loudness difference between the two ears and yields the best identification of direction. Localization accuracy decreases as sound sources move from the auditory axis to the median plane. As in the two-loci visual system, the two-loci auditory system suggests a hyperbolic geometry. For a given time-of-arrival separation, between the two ears, there exists an imaginary

hyperbolic cone-shaped surface, centered on the auditory axis, for all the possible points from which such stimulation can originate. A moving head can sample from the surfaces and this is typically how we locate sounds. Distance of a sound source as compared with direction, presents much more ambiguity, although a changing distance does produce a systematic frequency shift, or Doppler effect, along with a loudness change. All the stimulus changes noted above, along with some phase angle changes in lower frequencies, can be manipulated artificially to simulate the auditory spatial world.

In the ultimate simulation, the haptic, visual, and auditory world need to be perfectly coordinated with observer action. When and if this becomes possible more organic senses like taste, smell, pain and the visceral, about which we know less, would be needed to complete the simulation.

A final and perhaps insurmountable problem in attempting to create a virtual environment via artificially produced sensory inputs is related to the phenomena of Pavlovian conditioning in the nervous system. In Pavlov's famous dog, conditioned salivation to the sound of a bell would weaken and then cease if the bell was never followed by the food. Reconditioning was rapid if the food again followed the bell, but re-extinction was more rapid with successive removal of the food. When stimuli from different modalities, like hearing, taste and smell are brought together to make a unique compound multimodal stimulus it is consistently responded to, but unless the stimulus complex is preserved the response will weaken. When we first see a Cinerama or Omnimax roller coaster or airplane ride we make reflexive postural adjustments to anticipated banking and deceleration. The sensory feedback of those adjustments simulate within our own bodies feelings which are associated with the real thing, thus adding to the sense of presence, of actually moving rapidly through space. We are however sitting perfectly still in the theater, and if we repeat the experience often enough the postural adjustments, which are actually not needed, will gradually subside, and the simulation will lose some of its original convincingness. Creating an environment with all the stimulus interrelations of the real world, ultimately requires creating the real world. We can fool some of our senses some of the time but we can't fool all of our senses all of the time.

Even if we could achieve the ultimate simulation capability we would not be creating a world like the real God-given world we all enjoy. The man-made virtual world could not include all the as-yet undiscovered truths which the real world keeps on yielding to our curiosity and contemplation, nor could it include the potentialities of the dynamic ever-evolving historical reality which surrounds us.

Like other encounters of science and technology with technology, this examination of the promise of a humanly engineered virtual reality, like that of genetic engineering, reveals that technologically we have much to learn in the

realm of *how* to do things and a more demanding need for philosophical, theological and religious examination of *what* to do and *why* to do it, the ultimate questions which science and technology are inherently unable to answer.

CONCEPTIONS OF THE HUMAN, LAW AND THE ENVIRONMENT

[This article is re-printed from a paper given by Professor John M. Griesbach at the Workshop on The External Environment sponsored by ITEST in October, 1990. Professor Griesbach has taught in the Law School at Saint Louis University since 1977. Among his courses are Torts, Administrative Law, Legal Philosophy and (occasionally) Environmental Law and Natural Resource Regulation. The article is as relevant now as it was in 1990.]

The expression "the" environment is tricky. It suggests a single region that is everyone's environment. The definite article makes environment singular. Yet as a matter of history, there have been many environments, many accounts of nature and man. (John William Miller, *The Midworld of Symbols and Functioning Objects* (Norton, 1982), p. 84.

While I suspect that nearly all of us agree with Miller, his statement is a confusing claim. The trouble becomes apparent upon setting out some of the many senses of the word 'nature.' In one thoroughly modern sense, everything is part of nature, Chernobyl no less than the swallows of Capistrano. Grounded in our knowledge of causal continuity, this sense of the word admits no unnatural forces, no unnatural acts, no unnatural disasters. 'Nature' is a term of undifferentiated inclusion, with humans and what we do part of the causal structure of the universe along with everything else. To talk of "many environments" on this understanding of 'nature' simply makes no sense. There is only what there is, one environment, one nature.

There is a second, more colloquial sense of the word, however, according to which we distinguish the natural from the artificial. On this understanding 'nature' is a term of exclusion, used to denote everything uninfluenced by human hands. The criterion of use here is also causal, but it is a matter of causal discontinuity. It suggests that there are parts of the world that are what they are quite independently of the distinctly human. Insofar as we understand the environment to be natural in this sense of the word, it is of course true that "as a matter of history, there have been many environments"; it is simply to say that humans have influenced now more, now less. Yet this seems to miss Miller's point. His message is not that the environment has varied, but that what the environment is has changed as a consequence of "many accounts of nature and man."

This brings us to a third, far more venerable sense of the word 'nature.' We use it when we speak of the nature of the atom, the nature of life, the nature of man, the nature

of government, and so on. Such talk expresses recognition that, while causality is continuous, it is a continuity of relatively closed systems. These systems exhibit a measure of what we might call causal integrity, a wholeness that evidences structure. Each of these systems, we say, manifests its own nature; each has its own properties and its own inner workings. But the closure is only partial, and relatively so. Every system is in some measure open, featuring as part of larger, more complex systems, both influenced by and influencing what is around it. These larger systems have their own properties and inner workings, their own natures. Yet they too are open. Some far more than others.

The most remarkable of systems are we humans. We are, at once, among the most closed and among the most open. It is our capacity to understand, to develop accounts of ourselves and of what is around us, and then to act on those accounts, regardless of other influences, that marks our closure. This cognitive inner-directedness, this freedom, distinguishes us, gives rise to our integrity, our wholeness; it manifests our human nature. Yet it is this same feature that has us among the most open of systems. We are able to reach out and to cognitively grasp, and so to be cognitively influenced by, all variety of systems — from the intricately chemico-physical to the subtly interpersonal to the grandly cosmological. And as we are cognitively influenced, so also do we influence — guiding and altering and fashioning. We are systems, yes, but system knowers and system builders even more.

It is ourselves in-context, context known and context made, I think, that Miller has in mind when he talks of environment. If so, as a matter of history, there have indeed been many environments, many anthropocentric complexes of systems. Each has been known and fashioned by our science, of course. But also by our literature and our theologues and our law.

My interest here is in environments that we know and fashion through our law. Like other modes of human discourse, law expresses conceptions of ourselves-in-context.

When a legislature enacts a statute or when a judge issues an opinion, a portrait is drawn, perhaps of a response to a problem, or a song is sung, perhaps of a new way to get rich, or a story is told, perhaps of an oft-taken way of providing for descendants. What distinguishes legal discourse, however, is its extraordinary causal efficacy. By painting the portrait or singing the song or telling the story, the lawmaker initiates a scenario that tends to include just what is painted or sung or told. Thus law, more than any other human activity, can be seen as humans, directly and self-consciously, making themselves (and so also their contexts) according to their own lights. It reveals our conceptions of ourselves in context but it also comes to constitute part of the reality that accords with those conceptions. Moreover, it is a part that often endures long after the conceptions that give rise to it fade.

In this paper, I attempt to sketch three conceptions of the human-in-context that I think are both expressed and in some measure realized by existing law in the United States, and which shape much of the context within which we address what we see to be the environmental problems of today. One is an Enlightenment conception. It sees the human-in-context in terms of the self-defining individual entitled by nature to the land and other things with which he fashions his own personality. A second is utilitarian. It pictures the human-in-context in terms of elaborate systems of consumptive activities by which humans maximize their uses of resources under conditions of relative scarcity. The third is what we might call a structural conception. It sees the human-in-context in terms of conditions or structures, largely humanly fashioned, that in subtle and often unknown ways both limit and shape what we can be. As set out here, each of these conceptions is necessarily exaggerated and incomplete. What is more, since each of them, I think, captures part of what we humans are in context, it would be a mistake to suggest that any one of them has been held to the complete exclusion of the others. Nevertheless, because the focus of each vision is quite different, that part of our overall body of law that manifests each of them bears very differently upon our environmental problems of today.

Additionally, it is plain that there are other partial conceptions of the human-in-context manifest in law that bear upon today's environmental problems. Consider, for example, our readiness to conceptually organize ourselves, partly on linguistic and cultural similarity grounds and partly on the basis of geographic contiguity, which conception is legally manifest in our global network of nation-states. And further consider the difficulties that set-up poses for dealing with transnational environmental problems like acid deposition, global warming, ocean fisheries management, and ozone depletion. That and other conceptions manifest in law are relevant to the topic of this paper but beyond its scope.

I. The Human as Self Defining Individual.

It is of course received wisdom that the basic structure of law and the lawmaking process in the United States is an expression of Enlightenment thought. Montesquieu's recognition of human diversity, and his pragmatic call to caution and compromise, given voice in the contentions of Madison during the 1780's, is plainly manifest in the numerous overlapping power-allocating provisions of the federal and state constitutions. We find the cynicism of Hobbes, with its complementary endorsement of strong central power, taken up by Hamilton and given effect in Article II of the U.S. Constitution, in its Commerce and Supremacy Clauses, in *Marbury v. Madison* and other early constitutional decisions. It is the legal realization of the conception most clearly set out by John Locke, of human as self-defining individual, naturally endowed with certain rights, however, that is of interest here. Locke's vision is, of course, enshrined in the Declaration of Independence and set out in some detail in the Bill of Rights. But it is as realized in the common law and in much of the legislation of the first 100 years of U. S. history that the Lockean conception shapes our approaches to today's environmental issues.

In this part of the paper, I briefly sketch the Lockean vision, with special reference to its labor theory of natural property, and then briefly describe its legal realization in the strong, undifferentiated individual property rights of the late 18th and early 19th centuries and in 150 years of governmental disposition of the public domain. I also set out a number of respects by which that Lockean-based law influences current environmental problems and our approaches to them.

A. The Lockean Vision

As is characteristic of Enlightenment thought, the Lockean conception takes the individual (more accurately, the white adult male family head) as the basic social, political and economic unit. This Lockean individual is basically decent, orderly, socially minded, and quite capable of ruling himself. He is an Aristotelian individual with a potential (or end) which he may not in fact realize, but which is in him to realize if his environment permits it. It is the individual's capacity to reason, for Locke, that enables him to fulfill himself. As he puts it in *Of Civil Government*, Ch. VI:

The Freedom then of Man, and Liberty of acting according to his own Will, is grounded on his having Reason, which is able to instruct him in that law he is to govern himself by, and make him know how far he is left to the Freedom of his own Will.

Indeed, as "it is the understanding that sets man above the rest of sensible beings, and gives him all the advantage and dominion which he has over them," (*Essay Concerning Hu-*

man Understanding, Bk. I, Ch. 1, 1.) it is "Reason" that gives rise to the individual's natural attributes or properties.

This analytic focus is perhaps most obvious in Locke's derivation of "the natural right to liberty." In another passage of *Essay* (Chapter XXI, 7.) he writes:

Everyone, I think finds in himself a power to begin or forbear, continue or put an end to several actions in himself. From the consideration of the extent of this power of the mind over the actions of man, which everyone finds in himself, arise the ideas of liberty and necessity.

It is the individual endowed with "Reason" that commands Locke's attention. On introspection, it is the "power of the mind" as manifest in the individual's ability "to begin or forbear" that gives rise to "liberty" as a right natural to man. Notably, it is the positive liberty to do as the power of the mind directs, rather than the negative liberty to be loosed of the control of others, that the passage celebrates.

But it is Locke's theory of the grounding of private property that is of most interest to us. In *Of Civil Government* (Bk. II. ch. V., "Of Property,") he sets out the basic argument:

As much land a man tills, plants, improves, cultivates, and can use the product of, so much is his property. He by his labor does, as it were, enclose it from the common. . . Nor is it so strange . . . that the property of labour should be able to over-balance the community of land, for it is labour indeed that puts the difference of value on everything; and let anyone consider what the difference is between an acre of land planted with tobacco or sugar, sown with wheat or barley, and an acre of the same land lying in common without husbandry upon it, and he will find that the improvement of labour makes the greater part of the value.

The conception is of individuals employing "Reason" through their labor — tilling, planting, improving. Land, "without husbandry," and everything else without the application of labor, is valueless, or nearly so; it becomes valuable in virtue of the application of "Reason." Land and other things, insofar as they are valuable then, are the natural attributes or properties of the individuals who work them. What is more, it is by working land or by working iron or by working grain, that is, by extending his "dominion" over things, that the individual develops himself as a farmer or a smith or a miller. Again, it is noteworthy that it is the positive right, the individual's relationship to land forged through his active improving of it, rather than the negative right to exclude, that grounds the Lockean property right in nature.

Importantly, in the Lockean state of nature, uncultivated land and other unimproved resources are abundant. Thus, the allocation of property can be understood along the same lines as its origins:

The measure of property Nature will set by the extent of men's labour and the conveniency of life. No man's labour could subdue or appropriate all, nor could his enjoyment consume more than a small part; so that it was impossible for any man this way to entrench upon the right of another or acquire to himself a property to the prejudice of his neighbor, who would still have room for as good and as large a possession (after the other had taken out his) as before it was appropriated. (*Of Civil Government*, Bk. II., Ch. V, "Of Property").

Lockean individuals, manifesting "Reason" through their work, can each and everyone lay claim to the property whose value he creates. That property circumscribes a sphere — entirely private and personal — within which he carries out his individual self-development. Conflict of property rights, on this view, is logically impossible, a contradiction; either a man by his labor has made the land or other things he claims as his own, or he has not. Fortunately, there is enough, on the Lockean view, to take the labor of all.

Given this view of the individual and his natural rights, government is seen as a construct, fashioned by consent, and justified insofar as it safeguards those conditions necessary for individuals to realize their natural ends. Consent is in order as Lockean individuals are sufficiently reasonable to see that their well-being lies in mutual and peaceful cooperation. The powers of government, however, are narrowly confined. Primarily, it is charged with discerning and protecting individual spheres of liberty and property. Importantly, rights are natural to the individual, analytically prior to government, and so recognized or discovered rather than governmentally created or assigned. Moreover, extensive public ownership of land is simply not contemplated. Property rights are natural to individuals only. Government ownership is an artifact, a construct of consent, and so restricted to what is necessary to national defense, to the transport of mails, and to other activities appropriate to the common good.

Rather obviously, this Lockean conception of the human, particularly its natural right theory of property, addressed the everyday experience of 18th and early 19th century middle-class farmers, proprietors and tradesmen. In its country of origin, the English landed and entrepreneurs, who had exploited Locke's views shortly after the Glorious Revolution, were caught short by its implications as to the distribution of land and the product of industry. So they abandoned it in favor of Edmund Burke's glorification of

stability, tradition and habit. But on this side of the Atlantic, where it well suited the experience of generations of settlers carving civilization out of wilderness, the Lockean conception took hold.

B. Strong, Undifferentiated Individual Property Rights

The extent to which the Lockean conception of a natural right to property influenced 18th and early 19th century judicial lawmaking in the English speaking world is perhaps put best in Blackstone's opening passage to his second book of *Commentaries on the Laws of England*. Sometime in the 1760's, he writes:

There is nothing which so generally strikes the imagination, and engages the affections of mankind, as the right to property; or that sole and despotic dominion over the external things of the world, in total exclusion of the right of any other individual in the universe.

The sentiment was not restricted to England. In the United States, the 19th Century treatises of Chancellor Kent, Joseph Story and M. Cooley struck the same theme. Of course, it is by way of the legal details, most of which were fashioned as common law, that the vision was put to work.

One sees it in the diverging treatment of liability for personal injuries suffered as a result of collisions or medical treatment and liability for entry onto land. As to the collision and malpractice cases, the courts were in the process of developing what has become known as the negligence standard, a case-by-case assessment of the reasonableness of the manner in which the respective parties engaged in their various activities. As regards entry onto land, however, what we now call strict liability was imposed: every invasion, so long as the invader was aware he was on the land he was on (though not necessarily aware the land was the plaintiff's), was treated as a trespass, and redressable in suit for damages. The reasonableness of the defendant's entry was irrelevant, and even in the absence of actual injury to the land, the defendant was held liable for payment of nominal damages. A number of defenses were recognized, of which the most common by far was consent of the owner.

The Lockean theory of property is manifest. Land is taken as an essential part of the person who owns it. Any visible entry — for any reason, regardless of damage — is thus taken as an assault on personality. It is akin to battery — the visible, direct attack on the human body. Each is an invasion of a constituent part (a natural property) of the self-developing individual. Consent, of course, was a defense for it indicated that entry was thought by the plaintiff to be compatible, and perhaps even part of, his own self-development.

Not coincidentally, the developing law of liability of landowners for injuries suffered by entrants took the same line. As to trespassers, landowners were liable only for killing or maiming, but even then only if the force used was in excess of that necessary to drive the trespasser off his land. As to social guests and others in whose presence the landholder acquiesced, liability was found for intentional injuries and upon failure to warn the entrant of hidden, artificial conditions of which the landowner was aware. Only in the case of injuries to business visitors was the landholder held to the standard of taking reasonable precautions to prevent injury. The Lockean notion of property rights circumscribing spheres of individual development with landholder responsibilities varying as entrants' participation in his activities vary, is apparent.

During the period, this Lockean notion of natural property rights was a central organizing concept, used to ground a great deal of lawmaking that in more recent decades has been treated as requiring a balancing of equities, or interests, or costs. Nuisance cases, for example, were treated as if the old Latin maxim *sic utere tuo ut alienum non laedas* (use your property so as not to injure that of another) was altogether descriptive. Litigating parties and their attorneys agreed that each landholder had a natural, prelegal property right to use, say, the airshed to dispose of fumes and odors. The disagreement was over the exact extension of the respective rights. The plaintiff alleged overreaching, that the defendant, by generating an unnatural measure of fumes and odors, had invaded his property (as with trespass). The defendant contended that the generation of fumes or odors was natural, and so part of his property right. The judge viewed his role as a matter of "finding" or "discovering" (as against "determining") the respective property rights, and, in doing so, looked to the "natural uses" of the respective parties. The opinion might take up the "reasonableness" of the parties' behavior, but the term was employed, not in the modern sense of balancing costs and benefits, but as involving an inquiry into the use of reason by the respective landholders in doing what they did.

So also with the law of riparian water rights that was developed under the leadership of Kent and Story during the 1820's and 1830's. All landowners whose land borders a natural watercourse were held to have certain natural rights to the water flowing therein — rights of diversion, use, and consumption. The extent of each landowner's water rights were understood to be determined by the nature of the watercourse and by the nature of his enterprise. Diversion for a mill, for example, was part of landholder's property so long as the mill was situated on land adjacent to the stream and the water was returned to its natural channel before it left his land. The right to consume water varied with the needs of landholder's enterprises. Conflict was seen, again, as involving not a balancing of equities but the "discovery" of what water rights the parties actually had.

Interestingly, in consequence of this analytically prelegal notion of property rights, individuals in Lockean states of nature could jointly enjoy commons without the prospect of degradation from over-use. Each of many neighbors having a cow or two might use a common pasture, or the residents of a town might all fish a small lake for their own consumption. By grazing their cows and fishing the lake, the users create "value" and so acquire "natural" property rights in the pasture or the lake. These property rights, however, are limited by "Reason" to grazing by one or two cows per neighbor or to fishing only for consumption. Overreaching — a neighbor's attempt to graze a herd of cattle on the commons or the initiation of a commercial fishing venture — would thus be seen by all as violating everyone else's property rights. Thus, a sense of community, or moral suasion, or even self-help by the others could be expected to keep violators under control even without official recognition of the rights that were involved. Furthermore, in times of shortage or impending shortage, say, while drought was on or during spawning season, individuals might even be expected to recognize that their "natural" rights were reduced in measure as "Reason" required, and to "enforce" those reduced rights by custom and social pressure.

But this Lockean notion of "property" is manifest also in a great deal of judicial lawmaking not directly involved with land and other natural resources. Before 1850 or so, what we now call contract law was seen, not so much as a framework for the working of markets, but as a diverse grouping of decisions involving judicial oversight of the integrating and adjusting by individuals of their own Lockean properties. The vision comes through in the "meeting of minds" theory of contract formation, the use of Statutes of Frauds, in judicial readiness to distinguish among bargains on the basis of subject matter and to scrutinize the reasonableness of contractual terms, including price. In many ways, contract disputes were treated as analogous to nuisance and water rights and even trespass cases, with judges attempting to discover the natural property rights of the parties in detail and then looking into whether actual, reasoned consent was given to their reallocations.

Importantly, by way of the "due process" and "takings" clauses of the 5th Amendment and comparable provisions of state constitutions, this common law elaboration of Lockean property was given constitutional status, thus insulating individual activity from governmental as well as private interference. Individuals' natural rights to property, as "discovered" by state and federal judges in the course of trespass cases, nuisance cases, water rights cases, contract cases, and so on, were taken as the "property" which government was prohibited from "depriving" individuals of "without due process of law." "And "due process" in the "taking" of "property" required a condemnation proceeding, a finding of "public purpose," and the payment of "just compensation." The set-up essentially foreclosed federal,

state, and even local governmental bodies from regulating or restricting land and other natural resource uses that were not also trespasses, or nuisances, or deprivations of water rights, etc., with respect to individuals. In this way, though not only in this way, was Locke's notion of limited government put into place.

The physical legacy of this Lockean conception of the human-in-context, influenced in no small part by its legal realization, can still be seen across the landscape of the eastern two-thirds of the continent. Thousands of square miles of forest, and wetlands, and wildlife habitat have been "improved"; hundreds of rivers and streams have been locked, and dammed, and straightened; millions of tons of coal and iron ore and copper have been "given value" by the application of "labour." One ought not underestimate the extent to which the Lockean self-developing individual gave rise to our industrial and agricultural capacity, to our standard of living.

It is, of course, obvious now that the conceptions strengths were also in many ways its weaknesses. Land and other natural resources "lying in common without husbandry upon it" were "improved" by the application of the "Reason" of individuals who, as it happens, all too often paid too little regard to habitat and erosion and water and air quality. But the larger problem by far was the conception's failure to recognize, and so to fashion ways for dealing with, adverse effects of individual self-developing activity that were cumulative, indirect, non-obvious and long-term. The common law built on Lockean 'property' could not deal with resource degradation and loss that did not generate actual conflict in the "productive" activities of specific individuals. What is more, the constitutionalization of the Lockean vision disabled nonjudicial governmental institutions from stepping in. These disabilities were manifest not simply in an absence of power but, more importantly, in an absence of legal vision. Neither judges nor other public officials could contemplate that it was any business of government to limit or in any way regulate individual activities that either did not invade the property or other "natural" rights of individuals or that were incompatible with the narrowly understood "common good."

Though the Lockean theory of natural property rights no longer enjoys its central organizing position in legal thought and action, its spiritual legacy, in many ways, is still with us. Its notion of broad, undifferentiated, analytically prelegal individual property rights is part of our national psychology. It surfaces in the readiness of many to regard almost any governmental restriction or intervention regarding any use of any kind of natural resource as raising the prospect of every kind of limit or intervention as to every use of every kind of 'property.' Many of us, for example, would view a government agent's entry onto our private land to investigate hunting or waste disposal or agricultural practices as deeply analogous to his sneaking into our bedroom

in the middle of the night. And consider also the difficulty in enacting legislation or promulgating regulations respecting natural resources that cannot easily be cast in terms of abating individually created nuisances. Whether the matter involved be access to beaches, erosion control, agricultural use of chemicals, rotation of crops, preservation of wetlands or wildlife habitat, public intervention is seen as restricting private property rights. In consequence, much of our law respecting natural resources has either been responsive and disaster driven or has entailed the use of monetary carrots that are always short in supply.

C. Disposal of the Public Domain

While the U.S. judiciary busied itself elaborating the natural right to property during its first century, the executive and legislative branches were putting it into effect with respect to the millions who settled in the eastern two-thirds of the country. Recall that Locke's labor theory of value was meant to serve as a criterion for the distribution of land and other natural resources as well as the basis for the prelegal "natural" character of property rights:

The measure of property Nature will set, by the extent of men's labour and the conveniency of life.

With vast territories acquired from foreign nations and Native American title reduced to the tenuous right of occupancy (itself an interesting bit of Lockean theory at work), the United States was in the unusual position of being able to put the distributional imperative into effect without inviting civil war and chaos. Indeed, the Property Clause, Article IV, § 3, ch. 2 ("The Congress shall have Power to dispose of and make all needful Rules and Regulations respecting the Territory or other Property belonging to the United States) was understood, given Lockean notions of limited government, to authorize territorial governments and federal management of public lands only in anticipation of their disposition to individuals and the formation of new states. But again it is in the details, in the scores of statutory dispositions of the public domain, that we see the Lockean conception at work.

Most obvious was the recurrent statutory recognition that individuals fashioned their own property rights by actually working and improving land. Before 1820, at least two dozen special preemption statutes were enacted, authorizing settler-squatters to buy their claims at modest prices without competitive bidding, with liberal credit extended again and again. In 1830, a retroactive, one year general preemption act was passed. Another series of special preemption statutes were enacted during the following decade. In 1841, prospective preemption was authorized, enabling occupying settlers to purchase up to 160 acres for \$1.25 per acre. In 1862, with the Homestead Act, payment for land was dropped. Settlers were authorized to claim 160

acres without cost upon settlement and actual cultivation for five years. In 1877, the Desert Lands Act recognized claims of up to 640 acres west of the 100th meridian at 25 cents an acre and proof that the land had been irrigated. In 1904, the Kinkaid Homestead Act authorized claims of up to 640 acres in Western Nebraska. In 1909, the Enlarged Homestead Act allowed claims of up to 320 acres (instead of 160) west of the 100th meridian without cost. And as late as 1916, the Stock-Raising Homestead Act authorized entry onto 640 acres of land "designated" as chiefly valuable for grazing.

Interestingly, where property rights were distributed by statute or by administrative action without regard to "the extent of men's labour and the conveniency of life," corruption and graft and ruinous speculation surfaced, and was deplored. Such problems plagued the early land auctions, the use of scrip to pay veterans, the land grants to new states and, notoriously, to the railroad corporations. And of course, each of the "labor"-based dispositional statutes was implemented with its share of fraud, and overreaching. Yet for all the land grabbing, it was not until the 1930's with the passage of the Taylor Grazing Act, that the Lockean distributional ideal was clearly replaced by a policy of government retention and management of the public domain.

Throughout this 150 years of western settlement, it was the strong, undifferentiated, Lockean property right that the settler obtained upon taking his land to patent. Not until passage of the Stock-Raising Homestead Act in 1916 did the federal government reserve subsurface coal and other mineral rights. Indeed, even those who took mining claims to patent under the General Mining Law of 1872, were accorded fee simple title, obtaining surface as well as mineral rights.

The legacy of this legal realization of the Lockean distributional ideal is apparent across the national landscape. It is obvious in the uneven distribution of public land as between the eastern two thirds of the country and the public land states of the West, where "the conveniency of life" (primarily the availability of water) raised substantial barriers to the fashioning of "natural" property rights. One sees it in the pattern of decentralized land ownership in the East and Midwest, with "family farms" increasing in size through the Great Plains and Texas, in the larger, more scattered private holdings of the West, in the worked out mines and ghost towns, and so on. As to the eastern two-thirds of the country, property allocation along the Lockean line exacerbates the problem of cumulative, long-term indirect resource degradation and loss. It accommodated widespread deforestation and loss of wildlife habitat in the 19th century, and the dust bowl of the 1930's. In some measure, it lies behind a wide variety of "tyranny of small decisions" problems of today, ranging from wetlands loss and ground water depletion to agricultural chemical

runoff. In the public land States of the west, the view that the federal government holds the public domain in trust for disposition to Lockean individuals who can create "value" by the application of their "labor" remains alive. It surfaced in the Sagebrush Rebellion and privatization initiatives of the 1980s, in opposition to Wilderness Area designations, in resistance to putting offshore tracts off limits for mineral exploration, and in a host of other contemporary environmental controversies.

II. The Human as Consumer of Scarce Resources

While the Lockean conception of individuals acquiring "natural" property by adding "value" to land and other natural resources builds on an assumption of abundance, the second vision of the human-in-context put into effect by our law is fashioned out of an appreciation of pervasive, though relative, scarcity. This second conception insists that all actual uses of things of the world — time, human energy, land, other natural resources — are always incompatible with other legitimate, but necessarily foregone uses. Every use of a resource, as the economist says, has its opportunity costs. On this view, individuals are seen, not so much to develop themselves in the course of their lives of work, but as consuming, using relatively scarce resources at the expense both of other users and of uses by others. Property rights are seen, not as "natural" attributes of the individual acquired through development of personality and "recognized" by legal actions, but as "positive entitlements" engineered and allocated by law in an effort to maximize total consumption.

In this part of the paper, I sketch in a bit more detail this second conception of the human-in-context and then set out two aspects of its legal effectuation that bear upon present environmental issues. It is of course obvious today that this utilitarian conception with its positivist view of law greatly undermined legal realization of the Lockean vision previously discussed. Blackstone's strong, undifferentiated individual property rights recognized and protected by the judiciary have given way in the 20th century to a more complex set-up whereby diverse "bundles of sticks" are allocated, rearranged, and then reallocated by many different governmental actors. And the Lockean-based policy to dispose of the public domain has been repudiated in favor of federal retention and management for use. But my main focus here is upon two more general ways that law has effected the second conception. One has to do with its disposition to treat pollution and resource degradation as commons problems that can be solved only by either (1) assigning property interests to resource users who will then reallocate them to their "highest uses" by market transactions or (2) by direct governmental regulation of uses. The second general feature has to do with the readiness to employ "cost-benefit analysis" as the mechanism for governmental decision-making respecting land, natural resources, and environmental conditions.

A. Humanity Consuming

Utilitarian conceptions ordinarily distinguish humanity not into individual humans but into the numerous consumptive activities in which individuals engage. Some ground these activities in psychology, in drives to seek pleasure (including pleasures attendant to cognitive activity and altruistic behavior) and avoid pain; others with a more empirical bent speak only of wants and inscrutable preferences as giving rise to action. There is general agreement both that it is of the nature of humans to want, and that no particular wants or preferences are more "natural" than others. Wants are the sort of thing, however, that vary in intensity. Some want what is available from work more than they want leisure; others want current consumption more than they want future consumption. But given their ontological reductionism and this inability to distinguish in kind among an empirically evident diversity of wants, utilitarians generally contend that no cross-individual comparisons of wants — no cross-individual "value judgments" — can legitimately be made. Indeed, most contend that we cannot even compare cross-temporal consumptive activities engaged in by the same person: each action is grounded in the want or preference that was most intense at the time the action was taken.

It is the combination of great diversity in human wants varying in intensity together with relative scarcity that gives rise to utilitarian "value." Value is understood as exchange value: it is what actors give up or forgo in pursuing what they want. Work is viewed, for example, not as individuals developing their persons, but as an expenditure of scarce time and energy in exchange for commodities. Intrapersonally, it is disaggregated into the many commodities that scarce time and energy enable a person to provide for himself sleep, a pretty lawn, hours in front of the TV, a read book whose "values" are understood according to the personal preference curve revealed by his actions. Interpersonally, work is seen as an exchange of time and energy for wages or profits, in turn to be exchanged for other commodities; whose "values" again are understood as revealed by the various actors' actions. Rationality is assumed, but it is thought of, not as an exercise of "Reason" in identifying proper ends of life, but as acting, most of the time at any rate, in ways that maximize the satisfaction of those wants or preferences that a person happens to have at any particular time.

Obviously, in addition to disaggregating individuals into their want-driven consumptive activities, the conception disaggregates the things that people consume. Work, as just noted, is broken into expenditures of time and different sorts of human energy. Notably, land and other natural resources are also disaggregated into the many uses, often incompatible, that people want to make of them. A tract of forest, for example, is seen as many things — a place for mass recreation and for solitude, as wildlife habitat and as

a source of valuable minerals, a source of water supply and a place of fishing experiences. These many things are individuated according to the criterion of human "want"; and they are of more or less "value" according to differences in "opportunity costs" that are involved in using them.

Ironically, it is this disaggregation of things into their many, differently valued uses that has utilitarian thought, with its beginnings in the inscrutably private, driven to a vision of the active, regulatory state. As uses come into conflict with one another, they must be distinguished and allocated. Lacking a notion of "natural," prelegal rights, utilitarian thought has the state actively creating, extending and restricting all manner of "entitlements" (as against merely "recognizing" rights that are "natural" to individuals). What is more, as "values" of various uses of things differ interpersonally and inter-temporarily, the state is charged with setting up and greasing the wheels of mechanisms that enable things to be put to their "most valuable" ("highest") uses, thereby maximizing the satisfaction of all wants. Thus, we get the two privileged coordinating institutions of the modern Western state: (1) governmentally structured markets and (2) governmental regulation under the direction of the democratic process.

Both markets and regulation according to the democratic process are justified as adding-up devices. With respect to the market, the aggregation is by way of supply and demand curves, thought to be fashioned out of people's varying willingness to pay for specific commodities. As to the democratic process, the aggregation is of votes into competing blocks of political interests, whose power is thought to be expressed in the readiness of elected officials to fashion regulatory programs that reflect constituent preferences. Market exchange, then, is seen, not in the Enlightenment way, as individuals rearranging their conditions of self-development, but as a wealth ("value") maximizing transaction. And legislating is seen, not as elaborating the good society by those inspired with republican civic virtue, but as a transmission belt geared to maximize satisfaction of the electorate's desires. Both mechanisms are seen as entirely impersonal, a valuable feature given utilitarian thought's skepticism regarding our ability to make substantive inter-personal value judgments. This feature, of course, is celebrated with respect to the market by use of the metaphor of the invisible hand; with respect to the legislative process, by various theories of collective choice.

Nearly all thoughtful proponents of the utilitarian conception acknowledge "imperfections" in working markets and in the actual operation of the democratic process. The invisible hand, they admit, is commonly arthritic— with market outcomes greatly influenced by existing patterns of wealth distribution, distorted by characteristics of monopoly and externalities (costs and benefits accruing to non-participants), and frustrated by a whole series of defects which economists lump together as "transaction costs." Re-

gulation pursuant to the democratic process is acknowledged to be just as "flawed"; distorted by defects in the electoral process, replete with "prisoners' dilemmas," and beset with implementation problems. Some extol the values of "liberty" over those of "equality" and, impressed with the flaws of the democratic process, put more stock in markets and in the prospect of adjusting to and correcting their "imperfections." Indeed, the contemporary law-and-economics movement in legal theory, well-represented in the national government for the past decade, is committed to explaining (and shaping) law in just these terms. Others, valuing "equality" over "liberty" and more sensitive to market "imperfections", readily endorse direct regulation through the democratic process.

This utilitarian conception, with its mix of market and democratically coordinated allocations of resource uses is manifest in the bulk of environmental law put into effect in the 20th century. It is apparent in two general ways: First, in lawmakers' readiness to employ direct regulation only under circumstances where it is obvious that market coordination of resource uses is disabled by incorrigible imperfections; and second, in their readiness to employ cost-benefit analysis, a methodology designed to mimic the market, under circumstances where decision-making pursuant to the democratic process is thought to be beset with imperfections.

B. Regulating the Commons

A good bit of 20th century public land law is obviously grounded in appreciation of monopoly and wealth distributional flaws in market allocation. There's only one Grand Canyon. Water in the western United States is in critically short supply. Discovery and exploitation of oil, coal and other "non-precious" minerals, and lumbering, are skewed by existing technological economies of scale toward oligopoly and large accumulations of wealth. These market flaws have not invariably been treated as disabling. The most obvious instance is western prior appropriations water law, a blend of the Lockean and utilitarian conceptions, whereby water rights are allocated on a first-in-time/first-in-right basis upon actual "beneficial use," and where the rights are not subject to the riparian system's restrictions on transport or market exchange. But the overall legal approach, dating back to Teddy Roosevelt's creation of the National Petroleum Reserve and reservation of "pleasuring grounds," has been state retention of what's left of the public domain and regulation of use.

However, by far the most important utilitarian basis for direct regulation has come from its recognition that widespread and serious external costs are created as a result of market allocation of many uses of natural resources. This externality problem has contributed to the policy of retention and regulation of the public domain even more than has worry over monopoly and wealth distribution. Lumber-

ing and mineral exploitation and grazing cattle on the public domain are seen to impose costs upon those who value clear streams and wildlife and solitude. Those costs are not internalized in the supply and demand curves for lumber and oil and beef because no one has been allocated property rights in environmental amenities — rights that if in existence would have to be purchased before the resources could be impaired. Additionally, those who enjoy environmental amenities are too numerous and scattered and beset with free-rider problems, etc., to get together to buy off resource exploitation. Market allocation of resource use, then, is "inefficient." Moreover, since those with wants not internalized in the market are in fact represented in the democratic process, it is not surprising that the mechanism of "collective choice" is employed in its stead.

In like manner, the recognition of externalities resulting from market allocations (and the high transactions costs in reducing them) has undergirded direct environmental regulation of more and more "private" activity. It underlies governmentally imposed fish and game limits, restricting even shotgunning of ducks on one's own land. It gets widespread and constitutionally pathbreaking deployment as a justification for urban zoning. It is used to justify extensive regulation of air and water polluting activities and of hazardous and toxic waste generation, transport and disposal. It underlies fisheries and coastal zone management, regulation respecting agricultural and developer destruction of wetlands and wildlife habitat, even bans on uses of DDT, leaded gas, and high-phosphate fertilizers.

Underlying all of these regulatory regimes is a recognition that some natural resource - wildlife, the ambience of neighborhoods, the airshed, bodies of surface water, ground water — is a commons. This utilitarian commons, however, is far different from the Lockean commons of joint, analytically prelegal ownership, with joint duties correlating to the joint natural rights. A commons to the utilitarian is a resource that is owned by nobody, something under a regime of universal privilege to use, takers-keepers, if you will, like the state of nature of Hobbes. Because no one has property rights in common resources, no one is able to demand payment prior to their use, no one can call upon the state to exclude. And with costs upon other users (externalities) not charged, the common resource is overused, degraded. This is no less the case with individual uses, e.g. driving ATV's in streams, use of plastic disposable diapers, than it is with market-driven uses, e.g. emission of SO₂ by power plants. Furthermore, because both users who impose costs on other uses of common resources and users who incur those external costs (often the same people under different circumstances) are numerous, scattered, uninformed, unwilling to cooperate, etc., the buy-off or bribe is not available to prevent overuse. Thus, the democratic process has been enlisted to determine whether specific externalities of common resources use are certain enough, widespread enough, and serious enough to warrant direct regu-

lation (with all of its weaknesses and with its restrictions on "liberty").

Yet it is becoming increasingly plain that there is a certain pathology to regulation of uses of common resources under the utilitarian conception. It is the view that all have privilege to use the commons though nobody has any right in it (and so nobody has any duties with respect to it) that gives rise to the need for regulation. Legal positivism, the position that rights and duties are created and assigned only by the state, undergirds this view. Regulation, as we have seen, is meant to prevent degrading uses by imposing duties. But there is a great deal of slippage between the wish and the act. Some of it occurs in the legislating process as "interest group politics" has representatives of every class of users scrambling for advantage. Much of it occurs because legislation and regulation promulgated pursuant to it is invariably vague and often ambiguous (a well-trained lawyer can find an ambiguity almost anywhere). Even if the language is clear, degrading resource uses can often be modified to take them out of the prohibitions. What is more, regulation must be enforced and penalties imposed for violation. And in these respects, it is not at all unusual to come upon the sentiments that unenforced law is not really law at all and that penalties are not meant to prohibit but serve merely to increase the cost of doing business. The background to all this, of course, is that same legal positivism that has commons as domains of universal privilege in the first place: with duties arising only upon state action, it is the measure of actual effective state action that determines the extent of the duty.

The moral legacy of the "natural law" thinking of the past is missing. With no notion of analytically prelegal rights, and responsibilities, common resources absent state action are treated as free-fire zones. The initiation of state action, however, only broadens the front of battle, with participants in "the democratic process" guided by no more than their constituents' preferences. Signs of the pathology are everywhere. It is apparent in legislative stalemate and complexity when all the deals are struck, in the incredible regulatory detail, in the litigation at every step, in the expenditures on investigation and enforcement. The most troubling indication is the widespread view that government is both the other, the enemy, in existence not to recognize responsibilities but to impose arbitrary limits, and that it is itself a utilitarian commons, one of those resources that one uses as one can to maximize the satisfaction of one's wants.

C. Cost-Benefit Analysis

Whereas direct regulation has been the characteristic utilitarian response to disabling flaws in the working of markets, cost-benefit analysis has been its response to various "imperfections" in the democratic process. The major political "defect" is thought to be democratic processes' inability to reflect varying intensities in voter preferences.

Every member of the electorate has but a single vote with which "to bid" for government projects and programs. Costs and benefits of those public initiatives, however, are dispersed very unevenly. In consequence, the democratic process is skewed toward endorsing programs that disperse net benefits to majorities of the electorate yet impose costs that in the aggregate exceed aggregate benefits. The "solution" has been to delegate project selection and program design powers to public officials who, independent of voter preferences, identify and add-up costs and benefits with an eye toward maximizing net "value."

In the United States, cost-benefit analysis was introduced during the 1950's and 1960's as the formal device for ranking public works projects such as dams, locks, and hydro-electric facilities according to relative "value." Analyses were used not so much to make decisions as to provide information to, and thus to influence, legislative authorizations and appropriations. Since then, the methodology has been employed with respect to a wide range of government project decisions, e.g., interstate highway, airport, and nuclear power plant siting, mass transit funding. It has been adopted as the primary mechanism for assessing all manner of proposed uses of the public domain, from offshore oil exploration and drilling to timber harvesting to construction of ski resorts. And from the 1970's, it has been employed as a mechanism for evaluating regulatory alternatives with respect to air and water pollution control, workplace safety, hazardous waste transport and dispersal, and so on. What is more, over this period the role of cost-benefit analysis has been transformed. Increasingly, it is used, not as a source of information for political decision-makers, but as the decision-making process itself. This transformation is partly the result of broad statutory delegations of power to administrative agencies, partly a matter of executive direction (a Reagan Executive Order directed all executive agencies to employ cost-benefit analysis as the criterion for decision-making where not statutorily foreclosed), and partly a matter of bureaucratic training and culture.

Cost-benefit analysis is commonly justified as a device designed to reach outcomes the market would yield if only it were able to operate, i.e., if monopoly, externalities, transaction costs, etc., were not so disabling. Thus there is the need to identify the consequences of government projects and programs, to characterize those effects as costs or benefits, to quantify them, and to price them. Whenever possible, market prices are used; and so the methodology tends to incorporate the same biases that the existing wealth distribution, monopoly and inability to internalize all costs and benefits give to market exchange. Also, costs and benefits recognized by market actors, viz., those that are certain, short-term, hard, and easily quantified, are readily taken into account in cost-benefit analysis, whereas those that ordinarily escape market notice, viz., costs and benefits that are uncertain, long-term, variable and cumulative in ef-

fect, are much more difficult to identify and quantify. Thus, outcomes tend to be skewed in favor of programs with "hard" front-end benefits and "soft" rear-end costs, e.g., timber harvesting, oil exploration and drilling, and against stringent regulatory standards with "hard" front-end costs and "soft" rear-end benefits, e.g. tight ambient air quality standards. This skewing of cost-benefit analysis outcome is, of course, greatly exacerbated by the use of high discount rates to reduce future costs and benefits to their "present values" (Reagan Administration agencies were told to use a discount rate of 10%!).

In addition, it is becoming increasingly apparent that use of cost-benefit analysis as a government decision-making methodology is afflicted with what might be called "scoping problems." One kind has to do with the scope of decisions that are made. Consider, for example, that cost-benefit analysis might be employed to select among alternative offshore oil exploration sites, but, because oil is treated by the market as a valuable commodity and so increased production is regarded as an unambiguous benefit, cost-benefit analysis cannot be used to decide whether a petroleum-intensive economy is better than some other. Likewise, while cost-benefit analysis might be used to select among alternative levels of air pollution control, because industrial output and displaced industrial workers are treated by the market as costs, cost-benefit analysis cannot be used to decide whether an industrial production oriented economy is what we "really want." In large measure, this scope-of-decisions problems is grounded in the cost-benefit analysis assumption that government decisions are no different than the decisions of businessmen within working economies. Altogether lost is the vision of government as shaper of "preferences" and "wants" and opportunities and conditions of life.

A second scoping problem has to do with the extensiveness of the cost-benefit analyses that are performed. Because gathering information is itself costly, every cost-benefit analysis at some point runs up against an inability to identify and so to consider indirect, long-term, cumulative, synergistic, cross-medial, interecosystem effects of alternative initiatives. Cost-benefit analysis discounts this informational scoping problem. It has no option, for treating it seriously would have the analyst overwhelmed with uncertainty. In consequence, though, we find air pollution control regulations generating water pollution problems, highway routing decisions with individually high benefit-cost ratios cumulatively generating congestion, and so on.

III. The Human within Structures of our Own Making

Although the conception of human as consumer continues as the dominant view expressed and effected by our law respecting environmental matters, there are indications that a third conception is coming into its own. Instead of disaggregating individuals into their activities, it seems to me that this third view moves in the opposite direction; it

places individuals in contexts or structures within which they think, act and live. There appear to be two main features to this move to structure. First, by putting the individual into context, he is seen to be far less self-defining than he is under the Enlightenment view and far less able to satisfy his preferences than he is under the utilitarian conception. What a person becomes and what consumptive activities he engages in are seen as circumscribed and greatly influenced by external conditions. Yet it seems to me that this third conception also insists that those external conditions that circumscribe what we can become and what we can do are largely products of human thought and action. We humans are seen as exercising the power, and thus also charged with the responsibility, to shape the conditions of our own existence. To put the point plainly: The state of the ozone layer influences whether we fry on the beach but we humans largely determine the state of the ozone layer.

Although this third conception of the human-in-context is in the process of developing, some of our existing law appears to manifest it. In this part of the paper, I offer some illustrations. I then speculate a bit as to the experience which seems to give rise to this third view and discuss some of its implications.

The Endangered Species Act, the Wilderness Act, and the development of the National Wildlife Refuge System are fairly obvious legal expressions of this third conception. In different ways, each of these initiatives has us establishing side-constraints on "normal" market and political outcomes. Also, each can be seen as shaping conditions under which otherwise unavailable preferences might be formed, e.g., to see some high mountain sheep, and under which otherwise unavailable paths of human development, e.g., medicinal use of rare plants, might be advanced. Costa Rica's series of national nature reserves is a similar effort with respect to rain forest ecosystems. There are international analogues.

The development of technology forcing as a mode of pollution control is another manifestation. It has us exploiting market forces to generate the technical means to reduce emissions and effluents. Markets are seen not as impersonal mechanisms that coordinate satisfaction of inscrutable wants, but as structures that are created and directed — human artifacts like roads and bridges — as means to already identified ends. Further, as evidenced by the economic success of pollution control technology firms over the past decade or so, such initiatives belie the claims that environmental regulation is necessarily accompanied by economic decline and loss of national wealth.

The conception is also apparent, I think, in the fashioning of decision-making procedures, like the environmental impact statement process under NEPA and judicial employment of the public trust doctrine, that manifest a measure

of caution and systematic inquiry into the uncertain consequences of "normal" market and political decisions and which are biased toward mitigation and preservation of "trust corpus." Short-term, "snapshot", aggregations of economic and political preferences are suspect. The decision-making focus is opened to the long-term, the cumulative, the not-easily quantified effects of human action. Those actions are thus viewed, not so much as produced by wants, but as generating conditions that then limit and foreclose otherwise available opportunities.

Interestingly, the sharp differentiation between the private and the public that is deeply imbedded in both Enlightenment and utilitarian thought appears to be breaking down. Each kind of governmental initiative manifesting this view of the human as shaper of his own conditions has its "private" analogues. Consider, for example, the success of efforts like The Nature Conservancy to raise funds for purchase of lands and other natural resources to be held off-limits to market and politically driven decisions on use. And consider the recent creation of mutual funds with portfolios restricted to stocks in "environmentally sensitive corporations", which, presumably, brings market pressures to bear in shaping the products and activities of those companies. In many ways, individuals are beginning to see themselves as "trustees" of environmental conditions. Witness the grass roots recycling boom, the highway clean-up designations, the market demand for recycled products, and so on. These developments, I think, rise out of a deep sense of regret that we have permitted ourselves to engage in a great deal of unnecessary destruction of our circumscribing physical conditions. The regret is not so much about our day-to-day activities. We know that private auto use stifles public transport, but we also recognize that that makes driving a car (and so adding a bit more to congestion and to hydrocarbon levels) more, not less, essential. Rather, the regret is that we have permitted conditions to become such that our opportunities are shaped in the ways that they are. So we push for the opening of recycling facilities, for reservation of wilderness areas, and for other structural changes that alter those opportunities.

This environmental ethic does not appear to be a "back to nature" move. Rather than rejecting technological advance and market forces, it uses them. It sees "back to nature" as back to ignorance. Nor, it seems to me, is it based on any notion of obligations to animals and plants and soils. We humans are much too anthropocentric for that. Instead, it dramatically broadens our conception of what it is to be human. It has us as consumers and as self-developing individuals, but also as trustees of the conditions within which we consume and develop. It rejects the sense of 'nature' according to which we distinguish the natural from the artificial. It says everything is artificial, everything is influenced by human hands.

NEW MEMBERS

BUSSLER, PhD, Brett H.; 800 N. Lindbergh Boulevard - Monsanto; St. Louis, Missouri, 63167; U.S.A.; Manager, Tech Development; Monsanto Company; (314)-812-6532; FAX (314)-812-6543; E-MAIL brett.bussler@monsanto.com.

GILLET, MD, Lorna E.; 107 B Johnson Avenue; Thunder Bay, Ontario, P7B 2V9; Canada; Physician; St. Paul Medical Center; (807)-346-1860; FAX (807)-346-8020; E-MAIL smythr@tbaynet.net.

SMITH, PhD, Mark E.; 800 North Lindbergh Blvd; St. Louis, Missouri, 63167; U.S.A.; Research Scientist; Searle/Monsanto; (314)-694-1692; FAX (314)-694-8948; E-MAIL mark.e.smith@monsanto.com.

TORKELSON, PhD, Anthony R.; 1404 Chandellay Drive; St. Louis, Missouri, 63146; U.S.A.; Catalyst consultant; (314)-569-2913; E-MAIL ethnobot@mvp.net.

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GATSCHET, PhD, Mark J.; P.O. Box 542196; Houston, Texas, 77254-2196; U.S.A.; Attorney; Jenkins & Gilchrist; Life sciences and law; (713)-951-3309; FAX (713)-951-3314; E-MAIL mgatschet@jenkens.com.

HILL, Rev. John; 8a Missenden Road; Camperdown, New South Wales, 2050; Australia; Rector; St. John's College/within Univ. of Sidney; Ethics, sacraments; 061 2 9394 5202; FAX 061 2 9394 5212; E-MAIL johnhill@stjohns.usyd.edu.au.

MARTINO, Dr. Rocco L.; 512 Watch Hill Road; Villanova, Pennsylvania, 19085; U.S.A.; Consultant; Theology and science; (610)-989-9330; FAX (610)-989-9366; E-MAIL rmartino@cyberfone.com.

MATIS, SJ, P. Eugenio; P.O. Box 7-471; Taipei 106, Taiwan, ; R.O.C.; Socius to the Jesuit Provincial; Society of Jesus; Relation of science & theology with faith; +886.4.7223954; FAX +886.4.726.4045; E-MAIL esj@ms48.hinet.net.

MITCHELL, Prof. C. Ben; Trinity International University; Deerfield, Illinois, 60015; U.S.A.; Professor of Christian Ethics; Trinity Evangelical Divinity School.

O'NEILL, RSM, Mary Aquin; 909 Poplar Hill Road; Baltimore, Maryland, 21210-1221; U.S.A.; Theologian; Theological Anthropology; (410)-435-7500; FAX (410)-435-9522; E-MAIL msa@msawomen.org.

SAVINO, FSE, Sister Damien Marie; 14 Kings House Court; Silver Spring, Maryland, 20905; U.S.A.; Soil Scientist/Student; Catholic University of America; Ecological ethics, genetics, theology; (301)-879-1573; FAX (301)-879-1574; E-MAIL fsesilverpring@worldnet.att.net.

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IN MEMORIAM

Dr. Robert Doyle
Most Reverend Daniel Sheehan

We also ask your prayers for ITEST members who are ill. May they feel the restoring hand of the Lord.