
UMR-MEC Conference on Energy / UMR-DNR Conference on Energy

12 Oct 1978

LUNCHEON SPEAKER -- Future Energy Needs: Myths vs. Reality

Margaret N. Maxey

Follow this and additional works at: <https://scholarsmine.mst.edu/umr-mec>



Part of the [Energy Policy Commons](#)

Recommended Citation

Maxey, Margaret N., "LUNCHEON SPEAKER -- Future Energy Needs: Myths vs. Reality" (1978). *UMR-MEC Conference on Energy / UMR-DNR Conference on Energy*. 412, pp. 478-484.
<https://scholarsmine.mst.edu/umr-mec/412>

This Remarks is brought to you for free and open access by Scholars' Mine. It has been accepted for inclusion in UMR-MEC Conference on Energy / UMR-DNR Conference on Energy by an authorized administrator of Scholars' Mine. This work is protected by U. S. Copyright Law. Unauthorized use including reproduction for redistribution requires the permission of the copyright holder. For more information, please contact scholarsmine@mst.edu.

FUTURE ENERGY NEEDS: MYTHS VS. REALITY

Margaret N. Maxey
Associate Professor of Bioethics
University of Detroit

It is self-evident that energy is that kind of power which generates and sustains a vital, dynamic, complex, industrial, social organism. Considered in and of itself, "energy" is not the kind of power we commonly call "political." But in less than a decade, we have seen how rapidly and easily "energy" has been turned into an instrument for generating and sustaining a form of political power as pervasive and far reaching in its vital effects as energy itself. Those in an officially-sanctioned position to devise, impose and enforce an "energy policy" for a nation or a globe of humankind. As an educator, I find the level of public information about available resources, exaggerated claims about alternatives like the sun and wind and tides -- indeed the entire level of public debate and media coverage to be a matter for national embarrassment.

Wherever I go, the recurrent, fundamental question being debated seems to be this: "how much energy do we really need?" Centuries ago, Socrates articulated a truism that has withstood the ravages of time, namely, "The unexamined life is not worth living." The question about energy needs prompts me to paraphrase that Socratic maxim: "An unexamined question is not worth answering." How easily we lose sight of the fact that the most important thinking we do is not invested in trying to discover answers to questions and problems. Rather our most thoughtful reflection ought to be invested in the care and circumspection with which we formulate the questions and problems about our common humanity. Why? Because it is our horizon of vision, and threshold of perception of what a given problem is that pre-determines what we are going to allow to count as an answer or a solution to it.

On this occasion I would like to suggest for your further reflection that current policymaking appears to be increasingly dominated by myths about our energy needs and supplies. By "myth" I mean a mindset or belief-system which is preconscious, unexamined, and uncritically taken-for-granted because it sustains a different agenda.

The first myth is that a so-called "soft path" and transition thereto is a time-tested, viable alternative to pursuing the alleged "hard path" in the United States -- to the exclusion in particular of uranium in nuclear fission technology. This myth seems to be grounded in three premises which are

highly disputable. One is that the "soft" technologies are already mature, technically proven, commercially available on a scale commensurate with growing needs and human demands for adequate energy supplies. The second premise is that the cost of alternative fuels and high/hard technologies are greater than the soft technologies both in capital investment and long-term maintenance. Figures published by the Energy Research Group quickly dispel this wishful thinking: the actual capital cost of paying for the soft path would be three trillion dollars, or 5½% of the GNP -- a patently prohibitive economic outlay. Thirdly, the soft path option rests on a belief that transitional and soft technologies can sustain our highly complex, industrial society without diminishing our standard of living, experiencing any energy shortfalls, or civil disruptions. No knowledgeable person can accept such a premise. Certain facts speak for themselves: we are now a nation of 216 million at least, and the doubling time is no longer 100 years but a mere 38 years. Demographers expect an additional 20 million new households by the year 2000. If energy supplies do not at the very least keep pace with the growth of population, we as a nation face a future of certain distributional deficits and serious social disruptions. The question at hand is not mindless, unlimited growth-for-its-own-sake, but replacement in an orderly and speedy manner of nonrenewable fossil fuels by alternatives that are tested, proven, available, economically feasible, and the least socially disruptive. Instead of pursuing myths, we should be pursuing a stabilizing continuity with technologies that can be relied upon to sustain energy supplies proportional to the magnitude of population growth and the needs of a healthy economic infrastructure.

From an ethical perspective, it is unconscionable that we continue to generate electricity by burning up precious fuels such as oil, natural gas, and large quantities of coal which should be preserved on a long-term restricted basis for medicines, petrochemicals, fertilizers, and other products for which there are no known feasible substitutes. These fuels should be replaced with uranium which happens to be good for little else except tinting glass yellow.

Because of environmental objections and mortality rates in the mining, transporting, and combustion of coal, converting it to synthetic

gas by on-site gasification may prove itself to be economically and technically more efficient, and environmentally preferable, than mining and direct burning. Indeed, underground gasification could convert into a precious fuel coal that is too deep and hazardous for men to mine. Instead of precipitously burning up large quantities of coal for electricity generation, the fissioning of enriched uranium is a tested, proven, and available technology.

There is a second myth about our energy situation. It is the belief that by setting a "moral example" to the rest of the world in our moratorium on reprocessing, further development of the breeder, and embargo on export of nuclear technology and know-how, the U.S. can unilaterally and singlehandedly "put the nuclear genie back in the bottle" -- thereby somehow preventing any more proliferation of weapons and nuclear devices. This myth raises a fundamental question: is the world going to have a non-nuclear future?

The empirical situation indicates that the answer to that question is an unambiguous NO. Existing deployment throughout the globe of operable nuclear plant capacity soared 33% during 1977, totaling 138 reactors (47,655 MWe). This now surpasses U.S. capacity with 66 reactors (47,186 MWe). Up to 1976, Belgium led the world in percentage of power produced by uranium fission, followed by Sweden, Switzerland, United Kingdom, Spain, and then the U.S. This year Sweden will lead the world at 14.6%. The Republic of South Korea, the Republic of China, and Switzerland will all exceed U.S. installed nuclear capacity (8.9%). By the year 2000, many First and Third World countries will have increased their nuclear capacity to these percentages of total power:

France	- 90%	Spain	- 67%	Pakistan	- 60%
Denmark	- 54%	Iran	- 50%	Egypt	- 43%
Finland, Portugal and USA	project 40%				

The fact of the matter is that we are not going to have a non-nuclear future, and that policy decisions for a civilian nuclear energy future on this globe are going to be made for good or ill. Therefore, we urgently need to consider with utmost candor, three current options and their respective consequences for a nuclear future. These have been spelled out in greater detail by Dr. E. L. Zebroski of EPRI. (October, 1977)

OPTION I. The first option is to develop internationally controlled and safeguarded civilian nuclear fuel-cycle facilities -- including spent fuel storage, reprocessing facilities, and all handling or transport operations which involve weapons-usable nuclear material. Option I would require these facilities be subject to international on-site inspection and security control. Not until a nation has 25,000 MWe of nuclear capacity does it become more economic to have domestic reprocessing centers. By the year 2000, the only countries other than Russia and the U.S. likely to opt for domestic centers are France, Britain, Germany, Japan, possibly Spain, Brazil, and Iran. For all other countries, there is now and for the time being will continue to be, the economic incentive to store securely

and then ship spent fuel to regional centers around the globe. If insecurity of supply forces it upon a country, then the proliferation of facilities which are subeconomic in size will likely be built.

OPTION II. A second option for a nuclear future is that increasingly unilateral development proceeds according to the isolated, nationalistic needs of each country -- allowing for only token levels of international inspection and control, if at all. Since the integration and civilian operations with ongoing military production has already proved to be economically convenient -- as is the case in Russia and the reactor in the U.S. (i.e. the "N reactor" at Hanford, Washington) -- nationalistic, unilateral development would likely result in military domination and control of civilian operations so as to assure security and safeguards. Nuclear technology would probably never become demilitarized, but progressively the opposite. The likelihood of accepting or implementing international inspection and control agreements would become, therefore, vanishingly small.

OPTION III. A third option is predicated on the assumption that, somehow, a "phasing out" of all forms of nuclear technology and weapons can and will occur worldwide. So great is the ideological appeal of this assumption -- no matter how improbable or hazardous it would prove to be. This nation has already seen various measures enacted -- current Carter policy, active opposition to plant construction, legal delays by career intervenors, embargoes on reprocessing and breeder reactors -- all with the hope that these measures will so disrupt the world of supply and demand that hundreds of reactors, tons of plutonium already existing in weapons, spent fuel, and millions of gallons of military radwastes will disappear somehow from the face of the earth. Wishing will make it so. Characteristically, those who passionately pursue Option III into the "soft path" of small, appropriate, neighborhood, decentralized local technologies have scarcely recognized the alternate risks induced by it. If U.S. civilian energy policy becomes dominated by anti-energy and soft-technology-interest groups, the absence of sincere and timely U.S. leadership in pursuing Option I throughout the world will not result in Option III, but in Option II.

Option II increases the risks of military weapons proliferation significantly, and carries the even greater risk of massive energy deprivation if it is delayed in industrialized countries such as Japan, West Germany, France -- with clear potential for human suffering, civil strife and wars over diminishing scarce energy sources. The idealistic, exclusive, premature pursuit of Option III -- mindless of actualities in world technology, the inertia of social infrastructures, available resources, and basic needs of growing populations -- will lower the likelihood of Option I considerably, thereby forcing Option II in much of the world, and with it doubtless the seeds of World War III.

Yet a third myth dominates the energy scene. It is the belief that the major impediment to developing nuclear electricity is the unprecedented problem of radwaste disposal because (a) public perception is uneducable, and (b) no solution exists. Both in popular and scientific literature, it is increasingly fashionable to derive arguments against nuclear energy and its "waste problem" from but one factor: namely, the mind-boggling time scale measured by the half-lives of certain actinides and long-lived fission products. Using this single yardstick, molders of public perception have characterized radioactive wastes as an unprecedented, unique, man-made problem -- a "matter of life and death", (according to a recent NBC 'special report'), a "million-year risk", "a Faustian bargain", or "technical fix" made by energy junkies and bequeathed to defenseless future generations.

The literary imagery of Faust has become an especially appealing device for arguing that short-sighted technical fixes and our "hard technology" have unleashed a demonic power to destroy humanity. In exchange for short-term materialistic benefits for more and better hardware demanded by a morally decadent consumerized society, technological man has created a long-term radioactive monster against which our descendants must protect themselves for centuries. Radioactivity and radiation -- measured in thousands of years of half-life -- infuse with enormous symbolic power the reprehensible consequences of our "Faustian bargain".

Note well the assumption: the mere existence of a potential source of radiation constitutes or is equivalent to, an unacceptable, unprecedented biohazard. Moreover, the perceived risks are identified in such terms that the measure of their magnitude is assumed to be equivalent to the million-year rate of decay as well as the numerical magnitude of lethal doses associated with, or "contained in", actinides and isotopes having a potential to wipe out a population. Hence these "risks" exist in the environment until the natural radioactive decay reduces the waste to innocuous levels.

As a matter of fact, to derive the problem of nuclear wastes from this single assumption is totally inconsistent with established scientific practice and legal precedents. It is logically contradictory if not irrational. Hence it is unacceptable by any canons of sound ethical judgment.

If the measure of unacceptable risks to our environmental quality is expressed in terms of the half-life or rate of decay of toxic elements or their potential for lethal dose commitments to a population, then we would have long since undertaken permanent geological burial of lead, mercury, chromium, arsenic, chlorine, cyanide, and many other toxic elements whose half-life is infinite. They are not radioactive nor easily detected and monitored, and will never decay to harmless levels. They have been and will continue to remain in the biosphere, not for a thousand or a million years, but forever. These permanent heavy metals and chemicals are in widespread industrial use. We have learned how to control them. It is fortunate that

these elements will never decay because they are valuable, highly useful, controllable resources from which we derive countless benefits.

From the perspective of bioethics, the problem of radwaste management has not been adequately or properly formulated. We have always lived with toxic elements in our environment and they have not been sequestered with the skill, forethought, and planning that is being applied to radwastes. Public concern has not only been inflated for political purposes, but diverted away from scrutinizing the root of the problem. This is the abdication of responsibility by authorized public officials to do what we now know how to do, to make a decision to implement at least one of several feasible disposal options for which the technology exists, in fact, awaiting execution. Under the mantle of pursuing perfection, some visionaries insist on a prior demonstration; now of what might be perfected 50 years from now. Instead of tailoring the method to the present volume, paralysis reigns. The best has become the enemy of the good. By paralyzing the decision-making process, and capitulating to public misperceptions and misinformation, officials are opting society for much higher risks. The risks emoted and litigated about are minor when compared with the risks of doing nothing. Instead of positive, constructive policies of action, radwaste management options have become the instrument of political obstructionists who will use any strategy or tactic to eliminate the nuclear option in this nation.

These three myths would have no plausibility whatsoever if it were not for the cultural climate of opinion in which we have been living for the past fifteen years. It is a mindset dominated by "the environmental crisis", "our crisis of finitude", and our "discovery of an ecological conscience".

Without a doubt, we are the best informed society in history. Consequently, we are the most forewarned, anxiety-prone, exhorted, and quilt-ridden of cultures. This state of affairs is unprecedented for three reasons:

- (1) dire predictions are being made, not simply by run-of-the-mill alarmists, but by several "authorities" or "experts" who appear credible;
- (2) their projected catastrophies are not local or national, but global;
- (3) their credibility is enhanced by the dramatic medium of mass communication, and the public's insatiable thirst for bad news.

At least since Earth Day 1970, we have been inundated with allegedly hard evidence that the deterioration of the human species and our natural environment is accelerating at an exponential rate, and that our only habitable planet has been raped and polluted by technological man, recklessly driven on by rugged individualism and selfish greed. The damage inflicted seems gargantuan. Rivers and streams have been turned into sewers; Lake Erie is dead and Lake Michigan is fast dying. Species of birds and animals are supposed to be becoming extinct at a rapidly increasing rate: the last dodo died in 1689 with hundreds of other species dying since. Our insecticides and weed poisons may have increased food

supplies for an exponentially-increasing population, but these toxic chemicals appear to have found their way up the food chain to enter and poison ourselves. The "green revolution" in underdeveloped countries seems to have had disastrous unforeseen consequences: soil depletion, followed by erosion and floods, plus provision of food that has helped to sustain an upward spiral of already vast and starving populations. More people to feed, clothe, and shelter means a greater consumption of energy and an eventual exhaustion of nonrenewable resources.

Technological interventions, pretending to be "solutions" to problems we had not thought through adequately, are indicted for being not only insufficient but downright dangerous: it is advanced technology in industry, agriculture, and medicine that has generated the environmental crisis in the first place. Our high-technology society is accused of having done more than any other to release toxic chemicals and radiation sources into our environment. Allegedly, radioactive carcinogens have made the preparation of food a lethal operation. Expert environmentalists testify at congressional hearings that even mother's milk is now poisoned. The world has become dismally unsafe.

Permit me to suggest that this environmental crisis-mentality, plus the broad social movement, the federal legislation of 1969 (NEPA) and all the regulatory machinery generated by it, constitute the more fundamental problem we need to address: namely, how are we to recover and maintain some historical and scientific perspective that will introduce some balanced judgment about the alleged environmental hazards posed by advanced technology? There are many who insist that these bio-hazards have generated a self-evident crisis. But no crisis is self-evident. There are only recognized problems which have, in some people's minds, assumed critical importance.

Are scientific advancements and technological applications in industry, agriculture, and medicine causing the world to become dismally unsafe? What does the historical record show?

Those who express a profound aesthetic disgust for "technological pollution" and a nostalgic wish to return to nature, to a simpler and purer life such as humans enjoyed a hundred years ago -- free from technology-induced environmental degradation -- would profit from a reading of Otto Bettman's book: THE GOOD OLD DAYS--THEY WERE TERRIBLE. As we condemn Detroit and auto emissions for making city air unbreathable, let us also remember a New York in 1900 with 150,000 horses in its streets and the emissions they produced. Let us recall the local waste-management accepted as standard procedure: kitchen slops, coal soot, cinders, and other trash piled high on city sidewalks. When the younger generation tells us that our air and rivers would be clean and potable if only they had not been befouled by profit-seeking corporate industrialism, some educators should invite them to re-read several pages from history. Past civilizations have handled human wastes with such primitive sewage-management that water pollution was worse than it is today in many

places. During an entire lifespan on earth, the quantity of air pollution produced by mankind does not begin to equal the quantities of toxic gases and particulates spewed forth into the atmosphere from just three volcanic eruptions: Krakatau in Indonesia in 1883; Mt. Katmai in Alaska in 1912; and Hekla in Iceland in 1947. Mother-Nature releases ten times more carbon monoxide into the atmosphere than all the activities of man.

When consumer advocates go through their litany of technology-induced hazards in the biosphere -- citing in particular excessive radiation-therapy, pesticidal chemicals, carcinogenic food additives -- educators ought to restore some historical perspective to the mounting crescendos of fearful protest. Among others, William Lowrance (in OF ACCEPTABLE RISK) reminds us of what a life without advanced technology applied to medical care, to agriculture, and to widespread generation of electricity was really like: spoiled food, impure water, boiling laundry kettles and the backyard lye pot. The major insecticide 75 years ago -- sprayed on everything from apples to strawberries to grapes -- was not DDT, but lead arsenate or "Paris green". Women canned food with such preservatives as boric acid and formaldehyde in high concentrations. Red food coloring was not red dye #2, but lead chromate -- a horror to today's biochemist. Fatal diseases were not leukemia or Hodgkins disease or subtle forms of cancer. They were pneumonia, influenza, tuberculosis. Average life expectancy was 40-45 years at the turn of the century. More than 13% of all infants died before their first birthday. The leading antiseptic in homes and hospitals was corrosive carbolic acid. Today, as some people worry about the disinfectant hexachlorophene in soap, why do they so easily forget the harsh carbolic acid it has replaced, and the surgical operations it has made safer?

Certain persons have grown fond of identifying themselves as technological pessimists, victims of "high technology" rather than beneficiaries, paranoid about the hazards they are suffering from a "loss of confidence" in scientific expertise. In fact, they are suffering from a severe case of historical amnesia and cross-cultural blindness.

A new Quality of Life Index (PQLI) devised by the Overseas Development Council uses three criteria to measure how well nations are meeting basic necessities for food, sanitation, medical care, and education. These are: (1) life expectancy, (2) infant mortality, and (3) literacy. Those nations which rank highest on this index are: Sweden=100, United States=97, USSR=94; all technologically advanced. Those nations which rank lowest are: China=59, Algeria=42, India=39.

Has our world become "dismally unsafe" because of advances in scientific research and technology? Have environmental hazards increased in fact, or only in our levels of perception? Lowrance puts the case well:

"We now have the luxury to worry about subtle hazards which at one time, even if detected, would have been given low priority beside the much greater hazards of the day."

Not for a moment am I suggesting that we should abandon attempts to (a) control technology-induced biohazards, (b) to teach industries better habits of efficient use of resources and of waste-management, or (c) to insist that social costs should be internalized by industry so that consumers are not forced to pay for what they disapprove of. But I am suggesting strongly that those responsible for educating present and future citizens of this nation, and those responsible for setting regulatory standards, must meet ethical priorities for maximizing public health for the many -- that is, for the working classes, the poor, the elderly, the vulnerable persons in our society - and not for the vocal minority.

Let us not lose sight of the fact that the ecology movement flourishes only in affluent nations, and only among groups of persons whose socio-economic level and quality of life have guaranteed that basic subsistence and security needs have already been abundantly met -- usually by parents, or a network of charitable or self-appointed "public interest" organizations. When the more articulate and powerful middle classes pressure government agencies to remedy certain features in their environment, let us ask an important ethical question: do these priorities reflect the concerns of blue-collar workers and the poor and elderly? -- or do they represent a narrow set of private judgements about public priorities, based on the concerns of a rather well-off leisured minority? For decades, the trade union movement has been struggling to improve the working environment -- without any help from latter-day environmentalists whose complaints are about relatively esoteric problems: fluorocarbons, toxic chemicals in the food chain measured in ppm and ppb, pollution of beaches and wilderness areas, encroachments on their landscape, invasions of their exclusive vacation resorts. What proof do we have that advanced technology is alienating? When one listens to blue-collar workers, what do they complain about? The internal social structure of a factory or company; the public behavior and policies of a corporation. The do not complain about the advanced technology, but rather about the lack of better technology to improve their working conditions in steel mills, mines and factory assembly lines.

George Lock Land, author of GROW OR DIE: THE UNIFYING PRINCIPLE OF TRANSFORMATION, has this to say about environmentalist priorities: "Even the most calculated over-dramatization of future environmental horrors has not yet begun to approach the realities of a world in which most people live without the (so called) 'malevolence' of man's evolutionary technology.

Frenzied alarm over 'ecocide' generates an insidious camouflage that hides the truly apocalyptic human suffering of today. Pollution? Eight of ten humans lack sanitary disposal and seven of ten still are without an adequate supply of safe water. Waste of resources? Over half of the human race lives with hunger, which drains energy and stunts body and mind...

Rebalancing the books of disease, starvation and misery is our mission, not pro-

tecting nature's (presumed balance and its extravagant claims on the suffering of the human race."

Rene Dubos, Thomas Derr, and many others have argued: ecology is first and foremost human ecology. The working classes and the poor at home and abroad express profound resentment when "ecological realists" recommend a freeze on growth, conservation, anti-consumption, and self-denial. These "ideals" may be an attractive option for those who are already well-off, but they are not optional for the working classes and the poor; they are a steady, grinding, harsh pattern of everyday life.

Thinking small, freezing growth, and going local is one of the surest ways to guarantee a global catastrophe. If international inequalities continue, the end of hope and optimism about the future in poor nations will force them to demand immediate relief -- even at the price of a suicidal war.

The only known device that will effectively stabilize population and domestic unrest is the achievement of moderate levels of prosperity and health for those deprived of it. It is time we recognize the difference between undifferentiated growth-for-its-own-sake, and an organic development in which our priorities are dictated by the basic needs of the world's poor for food, clothing, shelter, and a kind of security that does not depend on breeding more children than can be cared for. Social justice and protection of the environment demand a global policy that will undertake vigorous efforts to meet Third and Fourth World needs for reliable technology and energy resources applied to agriculture and medical care. Otherwise the leaders of the poor will justifiably reject ecology as their enemy, and pursue their own national development without any concern for possible damage to global environment.

We are not going to improve the quality of the environment apart from improving the quality of economic justice. Environmentalist priorities are not primarily, much less by definition, ethical priorities.

* * * * *

George Will, in his syndicated column, has said, "Few things are as subversive in public reasonableness as the misdescription of social issues."

Ostensibly, our society is democratic, yet its social structure, as Mr. Will reminds us, is more like the Titanic. When the Titanic rammed into an iceberg, the consequences of that disaster were far from democratic. Of the 143 first class passengers, only four were killed. All the others who died were not in first class. It is a fact of life that those whose lives are lived at or below the waterline in any society are harmed first and worst when the necessities of life are denied them. Energy in general, and electricity in particular, constitute the essential lifeblood of our social organism.

If our future as a nation is to be an ethically responsible and reliable source of betterment for humankind on this globe, we must recognize that the bridge to a just,

sustainable, and environmentally preferable society lies in developing cooperation and interdependence among nations as a matter of rewarding self-interest. The indispensability of adequate energy-sources is best summed up in the words of Dixie Lee Ray, set down four years ago:

"Energy is the sine qua non of a modern society's ability to do the things it wants to do.

Such goals as maintaining the standard of living for a growing population, national security, improved quality of life, increased affluence and increased assistance to less developed societies can only be obtained with increasingly large amounts of energy.

While lower energy costs allow society more freedom of action in seeking goals, the availability of energy is the first requirement for having any freedom of action at all."

Two prominent solar researchers, Marjorie and Aden Meinel, caution us against becoming entrenched within simplistic versions of the multiple problems which surround any energy option. They also urge us to bury the polarized rhetoric -- growth vs. no-growth, solar energy vs. nuclear energy, soft path vs. hard path, etc. We need all the options we can muster in the next 50 years if we are going to avoid socially disruptive and harmful distribution deficits. They also remind us that solar energy and nuclear energy share a fundamental association. Large-scale solar energy was reportedly first used by Archimedes as a weapon, and only later was it tamed for domestic uses; nuclear fission was also first used as a weapon, and now we have learned how to demilitarize it and tame it for domestic uses. Just as there is nothing that predestines sulfur, charcoal and saltpeter to be skillfully combined into gunpowder, there is nothing that predestines plutonium to be made into weapons. It is a precious resource, more valuable than gold, and treated accordingly. Anyone who wishfully believes that the military mind will not find ways to harness solar power for destructive weaponry, if and when that becomes feasible, is living within a world of illusions.

Abandoning polarized rhetoric is not enough. We must also recognize that the most paralyzing, debilitating, and manipulable human emotion is fear -- fear begotten from ignorance.

For that reason, among many others, I want to yield the final word to a woman for whom I have the deepest admiration -- one whose name you will recognize as having pioneered research in the properties of uranium and radiation: Madame Marie Curie. She wrote this:

"Nothing in life is to be feared;
it is to be understood."



Dr. Margaret N. Maxey
Professor of Bio-Ethics
University of Detroit

Luncheon Speech
October 11, 1978