

NCRRP

*National Council on Radiation Protection
and Measurements*

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Mr. Victor Yannacone, Jr.
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Dear Mr. Yannacone:

The afternoon panel discussion, which will be printed as a portion of the Proceedings of the Annual Meeting, is enclosed. In order to move things as rapidly as possible, I will ask you to review this quickly and return it with your comments. If I have not heard from you by 9 July, I will assume that everything is acceptable as typed.

Thank you and if you have questions I will be available most of the time.

Sincerely yours,


James A. Spahn, Jr.
Staff Assistant

JAS/cad
Enclosures

Panel Discussion

DR. MORGAN: Since the panel is totally unrehearsed, most of the discussion this afternoon will be discussion which evolves from questions from the floor.

Just so that no one feels inhibited, allow each member of the panel to add a sentence or two to what he or she said this afternoon, but it must be understood that it is very, very limited.

And just so that I have a chance to say a word, let me just make a comment or two on what I have heard here today.

Now it is perhaps especially appropriate on this, the 50th Anniversary of the NCRP, that we focus attention on the consequences of the scientific revolution through which we have been living during this period of time. In this revolution, ionizing radiation has played a vital role, and it is timely, indeed, that we as scientists and our colleagues, assess what we have wrought.

Now like all convulsions of society, the scientific revolution has placed enormous stresses on the peoples affected by it -- and since the scientific revolution is so ubiquitous, that means almost everyone.

And many of the old norms of human behavior have had to be replaced by new, as we know; value systems regarded ^{as} ~~so~~ sound in the past are increasingly proving inadequate -- and as we pursue our quest to improve the quality of life, which incidentally, is pretty fundamental, we seem to be beset with a never ending series of conflicting forces that make

adjustment to the changes imposed by this revolution frustratingly difficult.

And yet, the success with which we make these adjustments -- hopefully, wisely and judiciously, will almost certainly determine the quality of life in the years ahead.

Now it's a narrow line that we tread. On the one hand, if we approach our problems with the unbridled emotionalism of the hypochondriac, the end result can be to inflict serious loss to our well-being.

On the other hand, if our approach is to disregard the risks inherent in what we do, the result can be equally unfortunate.

Simplistically, the basic problem, I guess, is how to maximize benefit and to minimize harm. But benefit to whom? And harm to whom? Now it just so happens, listening to Dr. Slovic this morning, he pointed out that when it comes to medicine and the use of x rays, there is no great problem, in spite of the fact that medical x rays are under attack at the present time. But this attack has been going on for years, and the present attack will probably be no more successful than the past ones.

Probably because the person who benefits is also the person who is gonna be harmed -- and there the issue is simple.

But what about the case where, as pointed out in this morning's news-paper, we have the Nuclear Regulatory Commission shutting down a series of nuclear reactors, which have an effect on a large part of the population in the eastern United States because of a possible harm that will accrue

to the relatively small population living around, say, Shippingport, or around the Yankee reactor up in New England, and so on.

Now here is where things become complicated, and as Mr. Yannacone has pointed out, the processes that we have had up to this point in dealing with these issues have been uniformly unsatisfactory. To use his word, they have been catastrophic.

Now so much for this. Dr. Maxey has today provided us with a good deal of assistance in placing the benefit-harm issue in perspective; Dr. Slovic has ably pointed out the profound difficulties in dealing with the issues, particularly in light of the fact that we have done so poorly in the past. And Dr. Hoos has placed the magnifying glass, of course, on the complexities of the issue from the perspective of the sociologist.

Now, as might be suspected, Mr. Taylor's views seem to be serving only the interests of labor. Labor gets this criticism continuously. But did Mr. Taylor's views apply only to labor? Do they? Can the concerns of labor, organized or otherwise, not be an important and respected part of the process by which a sound response to the technological revolution be developed?

Now, to Dr. Hickman, we owe, among other things, a great debt this afternoon for injecting just the right amount of humor into this deadly serious program of ours. And he has been aided in this, of course, by Mr. Yannacone, and it's interesting that the last two speakers have been on the periphery of the radiation issue, and their views, I think, at the very least, can be said to be provocative.

Now, I said we'll give each of the speakers a limited amount of time to say anything extra before we throw the program open to discussion, and since Vic Bond arranged the speakers in a nice, orderly progression here today, we will follow the same rules as he has adopted. This suggests to me that we start off with Dr. Albert.

DR. ALBERT: I might make the comment that in relationship to the resolution of scientific controversy, that there are some aspects that are just not resolvable. I'm thinking in terms of differences among pathologists' diagnoses.

The only practical approach that we've taken that we could think of in the carcinogen assessment group in EPA is to include this into the general estimate of uncertainty and the risk assessment. It's simply not possible to resolve this sort of thing, simply because there is no basis for doing so. And it certainly couldn't be resolved in an adversary framework.

I might comment on that. I think that the last speaker made an impassioned plea for it, but pointed out that most everybody has had a bad experience. I've had a bad experience with it. I take the kind of skeptical point of view that good is as good does. If one had a set of philosopher kings as lawyers and judges, I think this would be fine, but in practical life in an adversary context, the opponent or lawyers are out to win the case, not to display the truth.

DR. MAXEY: Yes. I certainly share the concerns that Mr. Yannacone identified about the institutional problem. But I think before we venture out into these unchartered seas of innovative means of getting institutional

processes in place, I hope that we would read an article in Harpers, October, 1977 -- entitled "A Plague of Lawyers." It seems to be quite revealing that there is a legal mentality that might exacerbate the problem, rather than resolve it.

And another difficulty I have about his proposal is distinguishable from Dr. Arthur Kancuwicz's notion of a science court.

But in any case, there are two very distinct institutional problems, and it seems to me that that proposal -- both Mr. Yannacone's proposal and Kancuwicz's proposal, is simply trying to find some preponderance of scientific truth or fact.

But the kind of problem I tried to identify was the policymaking problem which was very different than the finding of scientific fact, because you are involved in value judgments. And I for one do not think that the adversarial model is any way to go, and I think we had a marvelous example in Mr. Yannacone's impassioned plea. Because it will be the forensic skills and the rhetoric that will decide the issue, and not the merits of the case.

DR. SLOVIC: I'll just briefly summarize what my approach was this morning. I really tried to place the familiar problem of public fear and opposition to nuclear power in a somewhat different perspective, based primarily on psychological research.

I guess the main message I'm trying to convey is that the problem of the gap in perceptions is perhaps greater than any of us realized, and

harder to reduce than we may have imagined.

Any approach that suggests the simple presentation of information will -- sort of the right message, will reduce this gap. I think it may be naive, and we'll have to consider the implications of that.

With regard to the discussion of the adversarial approach we just heard, I think it's interesting to consider how this might impact people psychologically. It appears to me that just from the first reaction, that the adversarial approach may raise the level of emotion to a point at which the natural tendency to block out messages that we don't want to hear might be further enhanced, leaving the situation with the public perhaps in much the same state, or even worse than it was before we attempted such a procedure.

DR. HOOS: Well, we all seem to be taking the lead from Mr. Yannacone, so I think I will, too. So when he decides to hit back, I will be protected, because all of us will be in the same boat, you see, adversarially, we will be on the other side.

He mentioned that...first of all, I'm not too sympathetic about lawyers being the knights in shining armor, any more than scientists, as such. He sort of pitted them one against the other. As far as the use of certain techniques, and he said that systems techniques will be applicable -- I was reminded that in many ways, systems techniques are like chicken soup -- they may not cure appendicitis, but if that's all we've got, we'll use it.

In fact, one comment on systems analysis that I was reminded of when Mr. Yannacone was talking about the oldest profession, was that Mr. Cheetham,

who is Vice President of Grumman, when he was criticizing the systems approaches being applied so ubiquitously and inappropriately, said that there were two professions for which previous experience was unnecessary, one being systems analysis and the other streetwalking.

The concept of the kind of approach that Mr. Yannacone gives to us embodies many of the problems that I hoped I had suggested this morning, one being information, and information being, as I had said, that it was a matter of who put what in the sack.

Availability of information, accuracy of information, and adequacy of information are all evaluations; they are qualitative matters. And in the area of radiation and the risk of radiation, I hope that if I didn't make the point adequately, my printed words in the proceedings will demonstrate that availability, accuracy and adequacy -- and I do like alliterations -- are certainly not there. Moreover, assuming a set of standards, as he has, because these would be according to certain standards, really begs all of the important questions, and really, is why we are here, so that I would certainly say that if we go in that direction, we've got then to review all of the basic issues that we've covered so far today, which would be, again, the veracity of facts to the roles and the tendency of experts to polarize.

And, three, again, the methodological ruins that will perform however they will be paid to perform. Thank you.

DR. HICKMAN: Thank you very much. I'd like to make just a couple of comments; first, a footnote on Dr. Slovic's presentation. You'll notice that one of his key graphs, you got the idea that people would tend to

underestimate causes of death or threats that were very important, and overestimate the small ones.

This is quite common -- not just with respect to this risk, but most people tend to have that pull back. They really think there is more uncertainty in the world than there really is. You ask most people in a class what their probability of death is in the next year, and they'll give an answer that will stagger you, because they wouldn't be around to 30, if that prevailed.

So what he showed you this morning is certainly true and fairly common with the way people perceive uncertainty. They tend to overstate it. They pull down those things that are more certain, and they push up those that are really quite rare.

I would like, in keeping with the rest of my colleagues, to just talk a moment about the last presentation, but in a little different light, I hope. I think I'm talking in an appropriate place. This is the home of the National Research Council, in addition to the National Academy of Sciences.

I'm not a revolutionary. I think you have to start from where you are, and one of the facts of life is that both in the courts and the legislative system, people with legal training have a disproportionate amount of power. Like it or not, that's the way it is -- and has been, at least since the Constitution was written.

Therefore, we have not only in scientific regulation, but economic regulation, a lot of problems, because legal training, admirable as it

may be in my opinion, does not train one to deal with the tools of science or the tools of economics.

The reason I say this is an appropriate place to talk about it -- under the National Research Council there has been a Committee of National Statistics headed by Bill Creskil of the University of Chicago -- part of their work has been simply to review some of the federal statistical agencies. One of the projects that I suspect, regrettably, hasn't gotten too far, is to try to get more statistics into the legal curriculum. Based on the assumption that we will, one way or the other, be suing the legislative and judicial systems to make these judgments, all we've got, and that we may modify it a bit, that, rather than try to create a total new institution, maybe the best thing to do is to try to educate the ones who organize and run that system a bit more in science and scientific method.

That's high on my priority list. I think it's really one of the important things that we can do. I don't call for the creation of all new agencies, but simply better trained people to run the agencies we already have.

DR. MORGAN: Finally, before calling on Mr. Yannacone, let me remind you that immediately after his rejoinders, the floor and the panel will be open to your questions. Mr. Yannacone?

MR YANNAZONE: It appears [^] *that most of you were frightened by the* [^] *would* [^] *from some of your* [^] *the comments on the dialectic of litigation* [^] *who hold scientific degrees.*

MR YANNAZONE: It appears [^] *that most of you were frightened by the* [^] *would* [^] *from some of your* [^] *the comments on the dialectic of litigation* [^] *who hold scientific degrees.* inquisitorial process of your doctoral examinations; but how would every one of you with a degree [^] *Scientific* [^] *related in some way to the nuclear industry* [^] *like* to be characterized generically as either Dr. Sternglass or Dr. Tamplin?

Dr. Albert

I trust that because most of you are reasonably intelligent and do make statistical inferences, you realize that perhaps that would not be a fair comparison. Dr. Albert made a very telling point about the problem with pathologists, and as far as the simple question of deciding whether this mouse has got cancer or not, I suppose it is an unresolvable problem.

But how would you all like to wake up some morning, having just buried your spouse, with a DA's investigator knocking on the door and saying that Dr. So-and-So down at the medical examiner's office has just decided you poisoned your wife with a poison that leaves no traces?

As you walk down the steps with the detectives on each side, being helped because you're handcuffed, and find out there is no bail for murdering your spouse, and you await trial, you begin to question the nature of the adversary process you're about to go through.

Hopefully, you're smart enough to question it carefully and realize that matters of pathological dispute can be resolved by laymen. And guess what? If they resolve yours wrong, you may be ~~dead~~ *executed*.

Although I was a part of the EPA, I found that the Environmental Defense Fund, for those of you

~~with memories that go back that far~~ -- I am no longer with the Environmental Defense Fund. After we got the *obtaining* injunction which stopped the *Gross* Florida *Barge* Canal, my last service for ~~the EPA~~ *EDF* -- in October of 1969, there was a question over whether we should ~~have~~ *hold* a press conference, guaranteed page one, and announce that on the basis of one, relatively poor study, DDT caused cancer. And at the levels now present in everybody's liver and fat, we were all in danger of imminent death. *the media could infer that*

Yet, there is no public concern here. I guarantee you, if I called up any one of the major news media and I announced that the ~~cancer~~ ^{cancer} ~~causer~~ of the week ~~had just been~~ ^{was going to be} identified ~~it~~ ^{have several} be on page one. The only forum we have which can command public attention and maintain some semblance of reasonable, rational, disputation is the courtroom. Otherwise, you're all victims of ~~nonsense~~ ³

with what is going on

If somebody stood up and said DDT caused cancer, and then had to prove it subject to relevance, competence and materiality -- he couldn't do it. He who has the burden in this kind of litigation generally loses. That's one of the fundamental rules of ~~this~~ ^{litigation} involving complex ^{questions of causation.}

Give it a try. Just as most biologists were frightened by integral ^{scam} ~~science~~ at birth, and seemed to have a congenital antipathy towards mathematics -- ~~especially in the environmental fields~~ and most statisticians were reputed to have been frightened by human beings of both sexes somewhere ^{during} ~~along~~ the course of their lives, it is still necessary for all of you to deal with things that are inherently frightening.

Try the law. Try it, you'll like it!

DR. MORGAN: First question back here. Come up to the microphone and identify yourself. There's a mike right there beside you, and indicate to whom your question is addressed.

MR. BECKER: May name is Daniel Becker, and I wanted to first ask Mr. Yannacone, but also, other members of the panel who may be interested -- how would the process of litigation, or any other proposed solution to the problems that Mr. Slovic indicated earlier, solve the problems of risk

and distrust that society has? This seems to be another one of many environmental problems, which the nuclear industry and the people here are facing.

MR. YANNAKONE: Litigation is an educational process. Litigation, because of its media ^{attention} ~~attention~~, focus public attention on ~~matters and were~~ ^{discussion controversial public issues} on the rational ^{aspects} ~~aspects~~ of ~~them~~ ^{them} than any other ~~media~~ ^{event} that I know of. The intelligent use of litigation is a threat and deterrent to irrational statements.

Let's put it this way -- if you honestly believe that something Ralph Nader said is patently, egregiously wrong, sue him!

MR. BECKER: I happen to work for Ralph Nader.

MR. YANNAKONE: Okay! (LAUGHTER) Then let me give you the Ralph Nader half of that statement. When John ~~Bonsor~~ ^{Ralph} who, together with Ralph Nader and I, were colleagues back in ~~the old days~~ ^{the 1960s} in the early days of ~~this~~ ^{the Eisenhower} ~~government~~ ^{administration}, decided that the message about the dangers of cigarette smoking was not getting through, he brought an action, and that action resulted in equal time for anti-cigarette commercials in the media.

There are three representative ways to handle these problems. There's

that manifested by Nader's Raiders, there's ~~Bonsor's~~ ^{Ralph's} Bandits and there ~~was to be~~ ^{was} the Baker Street Irregulars, ~~which I used to work for~~ ^{which I used to work for}

^{with Nader's} ~~The~~ ^{went going} ~~problem is~~ ^{my} ~~Ralph's~~ ^{was that it} ~~method, which were~~ ^{ing} ~~to the Congress, and focused~~ ^{ing} dramatic public attention on abuses, is not susceptible to rational disputation where there are subtle questions of values, and extremely divergent

scientific views that have to be accommodated in the framework of theories that are not complete. That's why I prefer litigation.

Smyth
John splits the difference, and goes both ways.

DR. MORGAN: Any other panel members wish to comment? Okay. Gene?

DR. SAENGER OR DR. CRONKITE? I was very much interested in what Dr. Maxey had to say, and I guess this question is addressed to you, Dr. Maxey -- because I would tend, in this disagreement between you and Mr. Yannacone, to side with Mr. Yannacone for several reasons.

This last year, I totaled up the number of responses I made for several scientific organizations, or quasi scientific organizations -- to things in the Federal Register, and when I was all through looking at what I'd done, and having attended several of these sessions where we had a chance to comment, I was singularly impressed by the lack of impact which our statements had on the regulatory agencies. It was as if we had said nothing.

And so when you say to me that we should sit down and have reasonable people determine reasonable approaches to rule making, I find this a somewhat tenuous concept -- although I have had experiences with the NCRP and similar organizations here and elsewhere, where this type of judgment has been, or this type of decision had been made and published, and reasonably accepted by the scientific community.

Where I find that it is of some difficulty is with our rule making organizations, and I just don't quite understand how you would expect us to proceed.

On the other hand, in the courtroom, although I may not like the outcome, it is quite true that whether I am making a direct statement or being cross examined, I get to speak my piece and speak it fully in a way that we all understand the rules going in.

DR. MAXEY: Thank you. Because that gives me an opportunity to clarify where I really stand on this question.

I am not opposed to a science court concept -- provided that it is simply finding the preponderance of scientific fact. But I think there is a better way to go, as far as policymaking or standard setting. For over 50 years, we have had in this country -- the example of the ASTM -- the American Standards Testing of Material, and the kind of rigorous peer review that goes into their standards setting, gives us an example of a track record there that could very well be emulated for standard setting.

But I couldn't agree more with Mr. Yannacone's contention that there has to be a way of getting beyond the trial by media, and therefore, maybe the science court would be the optimal situation in which you could have a Sternglass...

MR. : Well, the science court as described by Dr. Kanterwicz -- I mean, why would that court be any better than, say, a court of law -- where at least in a court of law, they are accustomed to taking up different topics on different subjects from time to time -- and the judges, at least in my experience, do this extremely well. I think the Rulison case was an elegant example of a very serious matter in which the judge wrote a very, very impressive opinion.

Now, a group of scientists are sort of self-constituted, and we're just good folks all getting together in a club, whereas in the recognized courts of law, at least we have several hundred years of experience with this, and I don't quite understand what this science court of Dr. Kanterwicz's would really replace.

DR. MAXEY: Simply the fact that you would have this kind of cross examination of individuals who are making, you know, egregious statements about, say, radiation exposures.

If you could have a finding of scientific fact on that, that could feed into a standard setting process, which, from my perspective, must be quite distinct from this other process.

And isn't it the case -- I stand to be corrected, of course -- but the model of the legal system is attempting to find fact after some event. The guilt or innocence of individuals involved. That's very different, it seems to me, than some kind of anticipatory finding of scientific fact.

So I would be in favor of the science court concept, if procedurally, it had a different kind of program. I hope I'm coming across as agreeing with you to a certain extent, but I just do not want the adversarial process to be in place as far as standard setting is concerned. I'd be happy to discuss it -- there's a smile on your face, but I'm a chicken.

DR. MORGAN: Mr. Yannacone, I can see that you're just dying to get to that microphone.

MR. YANNACONE: Science courts are like sanitary land fills, which are neither very sanitary nor very filling. Science courts are neither courts nor scientific.

What Dr. Maxey has pointed out is the need for process, which is as well established in the law as 900 years. The declaratory judgment or the declaratory ruling, where the adversary aspect is directed towards the challenge of the bases of data, and the purpose is a declaration of either a fact or a policy statement, as the case may be.

And in the science courts, what has always intrigued me, here you've got an eminent scientist talking about courts, when his exposure to courts is relatively limited, and I hope the science exposure is considerably more significant.

The problem with it is -- who are going to be the advocates? You're going to cross examine -- one scientist is going to cross examine another scientist? I don't practice brain surgery. I do know the reasonable rudiments of it, I've read some books on it, I've talked to neurosurgeons, but I'm not going to practice brain surgery. Don't you practice litigation. The lawyer's job is to ask questions. That's what we're trained to do -- the good ones who try cases.

The scientist's job is to find answers. Don't cross them.

DR. MORGAN? Dr. Albert?

DR. ALBERT: I think it's worth mentioning that the Swedes have a system that I understand works very well. It consists of a panel of people

that cover a variety of aspects of the scientific questions. They commission papers that relate to a particular subject, they listen to people presenting views, and they make judgments. It's as simple as that. It doesn't involve lawyers at all, and it's done at a competent level with no fuss.

MR. YANNAcone: There's a fuss, all right -- they banned DDT in 1969 and sent their rapporteur over to Madison to testify at the hearings in 1969. Just try that in the United States, as they're doing right now; banning something of economic significance, and see how far and how much public respect the panel of distinguished scientists get.

You can do that in certain systems where there is a bias on the part of the people to accept the pronouncements of those who hold doctorate degrees. We are not so cultured here.

DR. MORGAN: We'll take two more questions -- the one on the far end?

MR. TANNER: Dr. Slovic indicated that a need for the appreciation of the benefits of nuclear power was needed.

I'm Allan Tanner, a member of Scientific Committee 43. I propose an argument that might be both valid and effective in raising the public perception of the benefit of nuclear power in a context of real alternatives, with qualitatively similar, but very different degrees of potential harm.

The possibility of nuclear war arising from conflict in the Middle East, which is motivated largely by energy needs, seems to me, and in my opinion, to the public, to be quite real.

I personally would be happy if I thought the odds were as favorable as one in 50, of such a war materializing. The nuclear power alternative offers potential harm that is both less likely and would affect a smaller population.

Society has not elected to forego the energy requirement, nor does it have an alternative energy source adequate to escape the need for Middle East oil at the present time. Therefore, the choice between the possibility of harm through nuclear war and the possibility of harm through nuclear power is real.

What is the choice of the sane person?

DR. MORGAN: Who do you address that question to?

MR. TANNER: Dr. Slovic.

DR. SLOVIC: I took that as a statement rather than a question. I think that these kinds of considerations should be discussed. One implication of some of the data that we have that perhaps the nuclear problem should be viewed in a broader context than -- that it's not really wise, really, to point to one source of energy and to debate or critique it and so forth; I think one has to look at a much broader picture, as you're doing.

Maybe that will change perceptions. Perceptions of benefit are probably a little bit easier to get at than and change than perceptions of risk.

DR. MORGAN: Question back here?

INDIVIDUAL IN AUDIENCE: To Dr. Maxey, when you're dealing with a public health issue or policy information thing, whether it's incomplete scientific or inconclusive scientific knowledge and it's really a matter of social judgment, what role do you perceive the public playing in public policy?

DR. MAXEY: Well, certainly through elected representatives. The whole standard setting process has originated, for example -- the Delaney Amendment back in 1959. It's the legislation that has set up the proliferation of regulatory agencies, which, from my perspective, have compounded the problem, because each one has tunnel vision, and you don't have any umbrella oversight or monitoring way of doing a comparable risk assessment, and also a cost benefit -- risk benefit assessment.

INDIVIDUAL IN AUDIENCE: Are you saying that the system is not satisfactory in terms of the public, or are you saying that the system was created by the public, and therefore, that's where it's at right now?

DR. MAXEY: It was created through our elected representatives, and, in that sense, the constituencies of those elected representatives may have had a minor input, and perhaps that picture will change.

But I find there are great deficiencies in the way the regulatory system is now set up, and I am certainly in favor of that kind of overhaul. But you're really speaking to the public participation issue, and it seems to me that we have to somehow have innovative means to change that particular process.

But, to say that there hasn't been public participation heretofore, I cannot accept that kind of statement.

DR. MORGAN: Mr. Yannacone?

MR. YANNAZONE: Uh...

DR. MORGAN: Okay, Mr. Hickman first.

MR. HICKMAN: I think we settled part of that in 1787 when we decided we were going to have a republic rather than a democracy; that we did decide that public policy would be set through elected representatives --- and I guess I don't get enormously upset that the public perceives not as scientifically as I would, not only nuclear power risks, but an awful lot of other risks; as a matter of fact, we can make a list as long as your arm where I think the public does not perceive it well.

The public is an awful lot of people out there, and you just can't expect them to perceive various risks and opportunities with a great deal of precision. I think that's always been true and always will be true --- that I think is part of the genius of the Founding Fathers.

I think it's difficult to expect the public --- that big mass out there --- to take a decided stand on anything less than a crisis --- and that's one of the reasons we have a legislative branch, it's one of the reasons we have a bureaucracy, to define these issues and bring them to the attention of the Congress and the legislative branch.

I don't think the stakes may be a bit higher, but I don't think that we are any dumber than we were a long time ago. I think that a lot of issues that we can point back to in the history of our country that turned out to be very serious, and almost ripped us apart at times, were perceived very poorly up until the time of crisis.

I think that's just one of the prices we pay for democracy.

MR. YANNACONE: Dr. Hickman is not only an eminent mathematician or actuary; he's also historically sophisticated. What we need are ecologically sophisticated, environmentally responsible, socially relevant and most important -- politically feasible regulations of toxic substances.

The problem is that since the Supreme Court ruled one man, one vote, and all the legislatures were reapportioned so that we are a democratic republic, or a republic that is more democratic -- there are still Italians, Irish, Poles, Germans, Slavs, Blacks, Jews, Puerto Ricans, Mexicans, teachers, students, steel workers, miners, farmers, ranchers, cattlemen, sheepmen, oilmen, gasmen, city dwellers, suburbanites, commuters, industrialists and industries of all kind, public power interests, private power utilities, the highwaymen, the senior citizens, the teenagers, the young people, the middle aged, in the old days -- the hawks and the doves, the hippies, the yippies, the conservatives, the liberals, and yes -- even Democrats and Republicans!

Each individual voting group must be at least partially satisfied with the overall legislative program of the Administration in office, or that Administration will not be returned to office.

Even scientists and environmentalists are beginning -- and notice I used two words when one might have done -- are beginning to understand that no elected representative is of any use to the long-term interests of society unless they can steer effective legislation through the legislature -- or, if they can't, be reelected.

The courts exist to provide a place for making unpopular -- but necessary -- decisions on matters that are politically untouchable. That safety valve enables the judges who do read the daily papers religiously, usually in the morning and the evening, and are rarely very far behind or far ahead of the general public's consensus as reflected in the media, to make unpopular decisions because of their insulation.

And, the legislature many times will create a regulatory structure so the gut issue of jobs versus safety, benefits versus risk, are decided on a case by case basis in a litigation forum so that if it has to be changed because of overwhelming public reaction, they can all come forward on a reelection bandwagon and do the changing.

It's one of the inherent safeguards of the tripartite system of government, that in matters of environmental crisis and toxic substance crisis, is being ignored by the one group that should look to it first.

DR. MORGAN: Anybody else want to comment? Okay. I'll be eaten alive by this lady over here if I don't

MS. LAWS: I'm really rather thin; I don't eat very much!

DR. MORGAN: Well, that's a saving grace.

MS. LAWS: My name is Priscilla Laws, and I would like the Committee to respond to a statement that I want to make, because I've been working in my own research on the question of risk assessment in radiation, and that is, that it seems to me that although the nominal title of this session has been perceptions of risk, that implicitly, what you're all talking about is perceptions of harm -- and that the difficulties we have are separating out what Ms. Maxey talked about as risk, which is -- given a certain dose of radiation or what have you, what biological, or with what probability will certain biological endpoints occur. That would be what I'd call risk.

Harm has to do, as she had said, with the perceived value, perhaps socially decided upon, or detriment associated with certain risks, and we all recognize that there are a lot of different risks associated with different kinds of either radiation exposure or chemical carcinogens or what have you.

So that, it's the case that even if there were no controversy about the linear hypothesis, and even if there were uniformly, or universal agreement about the level of exposure to carcinogens of any sort or radiation -- that we still are confronted with the problem of comparing apples to oranges, comparing leukemias to thyroid cancers to genetic defects -- and in trying to sort out what kinds of things we want to protect people from.

It seems to me that the essence, then, of things is to try to separate these two issues. On the one hand, we have risk and on the other hand we have the values of how much do we fear certain things. And, one of

the things is that a scientific committee gets together and they talk about these risks, but they sort of fold in a few of their values and come out with pronouncements.

On the other hand, the court of law which is, I think, oriented toward ethical questions and values, tries to listen to some of the scientific controversies. And I think we have both -- people with training in both areas trying to do both at one time, and what I would like to ask the panel is -- do you think it is desirable and possible to separate these two issues and try to make decisions about what I would not call risk benefit, but, rather -- harm benefit or harm cost analysis, what have you?

DR. MORGAN: Dr. Maxey, let's have you start.

DR. MAXEY: Well, I simply would just concur with her analysis and statement.

DR. MORGAN: Let's see, who else would like to respond?

DR. HOOS: May I just respond for a minute and say only that I'm afraid that except for a matter of definition, we run into pretty much the same problems. The same problems of who would be our experts; the same problems of what would be the responsible data sources, the same problems of methodology, and then the tradings off.

So, that although this might refine something, I think ultimately, we still wouldn't come any closer, and we'd still be begging some of the same fundamental questions.

DR. MORGAN: Dr. Hickman, did you want to say something?

DR. HICKMAN: Yeah. There is yet another institution, of course, that helps us articulate those values, and that's the good old market. And those things that keep the price from being right are therefore, working against the market working well to help us make these decisions. That's what a marketplace is for. It's where you trade your time which is part of your life, in order for other things that you want.

Now it's easy to overstate the importance of the market, and I'd be the first to say that there are lots of things that are poorly valued in the market. But -- don't understate it, either. Because as I referred to today, it's a historic fact that people in hazardous occupations, in 1969, earned about \$400 more than of those in non-hazardous occupations. Somehow, the market was putting a dollar value on that. We're putting the dollar value, and that means not just money -- it means your time, your effort. This isn't just crass money -- it's you that we happen to express in those terms.

We're doing it all the time, and therefore, there is another institution, and that institution should be permitted to work for us. For example, I'm opposed to the Price Anderson Act, because I think, for one thing, I don't think it's needed -- and secondly, I think it does prevent nuclear power from being properly priced.

And I can give you other lists of things that I think prevent things from being properly priced and prevent the market from helping us make those decisions.

But don't underplay the market as another institution. It isn't just money -- it's more than that.

DR. MORGAN: Can we have a short response?

DR. ALBERT: As to the issue of the difference between risk and harm, I would guess that what's meant by harm is how much it hurts.

I might say that there are people that resent the great emphasis on cancer as an endpoint these days. There are some that will feel that renal damage is something that really ought to be considered; teratogenic effect -- there's really nothing more important than that, or, central nervous system damage. Each of these things, to be sure, is a valid endpoint for concern.

I think the reason that cancer has such power these days as an endpoint of concern is that it not only combines in many cases, an extremely unpleasant way to die, but it has the acceptance of a non-threshold character as a toxicant, which combines the nastiness of the disease with the lack of any safe dose.

And that really can't be said for some of these other endpoints of medical disability. Because we just don't know enough about dose response characteristics for anogenetic -- or teratogenic effects is really in a very primitive stage, and the same thing can be said for other things.

And that's why I think cancer these days has so much persuasiveness as the dominant focus of concern in the protection against deleterious health effects.

R. MORGAN: Dr. Maxey, can you straighten out for Dr. Albert, the
rence between risk and harm?

DR. MAXEY: Oh dear; I thought I did!

DR. MORGAN: The vaccination didn't take! Mr. Yannacone will give
you the last word.

MR. YANNAZONE: And, true to my calling, I will leave you with a series
of questions. When we talk about risk, the questions are these -- risk
of what, attributable to what, and perceived by whom?

And, by way of thank you, I leave you with one more question: how
is it that in organizations so involved with regulatory affairs in one
of the most regulated industries in history, does not avail itself of the
agency of the legal profession in its regulatory committee work? It's
a bizarre and curious situation that your committees deal with the every
day mechanics of regulation, and lack sophisticated counsel in the regulatory
areas, during the deliberative stage where the input might be useful.

Thank you all.

DR. MORGAN: To our panelists, thank you very much, and to Vic Bond,
sorry for running a little over.