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TRANSCRIPT of Carey - Stevenson Interchange,

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$30 billion annually.

What is happening? What is it doing for the general economy? What is it yielding in the way of important new pharmaceutical products, the tremendous cancer investment, for example? The big dollars in energy R&D, are they really paying off, or not?

When you have a budget in total of $1/2 trillion, which is where we are now in current dollars, and where 75 percent of that budget it relatively uncontrollable, and where the remaining 25 percent, which is marginally controllable, has a component of $30 billion charged to research and development, one of these days when the crunch gets tight, there are going to be a lot of questions asked about what we are getting for the R&D.

I think that is the blind side of the R&D budget. We don't do that very well. I think we should be doing it better.

Senator Stevenson. How could we do it better?

Mr. Carey. I think that is apparently a matter of more effort down on the Executive Branch to really justify not the input side of R&D dollars -- which is where the emphasis and justification now stands -- but on the output side. I think this is a responsibility that the President's senior advisor, with his puny little staff, ought to be leading with the performing and funding agencies.

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But I also think that it is a matter of the oversight

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process. I think that a hearing such as you are conducting here today begins to get into that. I think that if these hearings could be carried on both in the Senate and the House, focusing on the benefits, on the outputs, making the Executive Branch more sensitive to these questions, we would begin, I think, to understand R&D as a federal function and a federal cost a lot better than we understand it today.

We budget the dollars, we appropriate the dollars more or less with maybe a one percent difference by the time Congress gets through with it, and that is the end of it until the next round. And the next round comes in a big hurry.

But we don't monitor the output. We don't question the end use, the benefit. Meanwhile, the budget continues to go up. I think that we could do a lot better, but it is a function of Congress stimulating through the oversight process, and I think it is a function of the Executive Branch to be made aware of the importance of justifying the delivery on the output side.

As far as we are today with the present state of information about what is in the budget, it is probably on a scale of one to ten, probably about a .7 percent accuracy.

Senator Schmitt?

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Senator Schmitt. Thank you, Mr. Chairman.

Mr. Carey, you indicated a great concern about our patent policy. I also indicated that concern for many years. More recently in the Senate. I think it is atrocious.

If you add patent policy to regulation, excessive regulation and excessive taxes that inhibit the accumulation and use of risk captial, haven't we pretty well stymied the broad application of much of the technology that has been created over the last 20 years? Obviously, there are examples. Pacemakers, windmills, things like that, which are very impressive examples, but compared to the total investment, haven't we hardly begun with those three areas in patent policy, excessive regulation and inappropriate tax agencies? Haven't we continued to stymie the output side? I am afraid if we started to get into it, we might prove to ourselves there isn't a great deal of output compared to the investment.

Would you care to give me a specific summary of what type of patent policy you think is appropriate?

Mr. Carey. Patent policies is an arcane field to get into.

Senator Schmitt. You don't have to get into it too deeply.

Mr. Carey. For probably 30 years, to my knowledge, the government has been struggling with this problem of what an

appropriate patent policy is in terms of the government interest. The issues and outcomes in the patent policy field have been dominated by the views of the Department of Justice in terms of concern for monopoly position, for industry, firm domination within industry.

It has also been dominated by an almost theological view, Senator Schmitt, that there is something immoral in making a profit from research and development which has been funded initially at the taxpayers' expense. The current situation, as I understand it, there are some 23 different agencies, each with its own kind of patent policy, operating in this field.

In 1963, President Kennedy issued a Presidential Statement of Policy relative to patents. The general gist of it was that inventions from government funds ought to be converted into practical uses by inventors and that the inventors ought to have title, within reason, to the invention, provided the government also received free use of the invention.

Well, the way it works is that outside of the Defense Department, which has a relatively what we might call "liberal policy" of allowing inventors to hold title and to develop, the rest of the government is still hog-tied on the basis that the government should retain the title unless, on a case-by-case basis,it looks as though no great harm will

be done if the inventor had some rights to exploit. But a fraction -- there are some 30,000 government-owned patents sitting around in government that are not and have not been taken up and exploited. That is sort of bad news.

There are some 8000 new inventions being created every year, on the average, out of this federal R&D. Perhaps 3 percent of those, one way or another, get into the market. The rest of them don't. The agencies like the National Institutes of Health, for example, some years ago worked out what we will call institutional patent agreements with universities, which was funded by NIH, and the way that was supposed to work was that each participating university would set up a special patent coordinator, invention coordinator, whose responsibility it would be, with the consent of NIH, to go out and find a developer for a drug or therapeutic device.

That worked reasonably well. Inventions actually began to get into the market, though not dizzy in scale. However, that has all been stopped now. The General Services Administration, a couple of months ago, finally got around to codifying government patent policy, including the industrial patent agreements, including the institutional patent agreement procedure, put it in the Federal Register, and trouble developed immediately.

There was intervention by a public interest group. They

said this was against the public interest. There was intervention by one of the committees of the United States Senate. The Office of Management and Budget stopped the GSA policy, put a freeze on it for, I think, 120 days, and all patent action involving the release of government inventions to the inventor had been stopped. We are in what I think is an extremely absurd situation.

I have worked in government for 26 years and have some sense of where the public interest lies. We are in an absurd situation where we are pumping $30 million a year into research and development spending, and we have got the door barred so that the invention can't get out.

I can't make any sense out of it, Senator. I think that it is a contradiction in terms to the presidential policy intentions that federal R&D must become one of the instruments for stimulating what he refers to as a new surge of technological innovation for purposes of a growing economy, jobs, trade competitiveness and productivity.

I really think that it is a serious flaw. It is a very nasty political question. It has been in that category for 30 years, and I think that if we look at the issue in terms of the research and development and innovation, then I think we have to get up the courage to take this moratorium off and to legislate a clear intention, preserving rights to the government, to place the inventor with the opportunity for a

reasonable time at least to bring that invention into commercial use with benefits to the economy that the taxpayers ought to have. That is about as far as I can go with this.

Senator Schmitt. Thank you, Mr. Carey.

We might take up the question of margin rights at some other time.

Dr. Garwin. I would like to support what Bill Carey said. It is extremely complicated, the fact that there are 30,000 unused government patents around shows no lack of invention. Giving the inventor rights to exploit wouldn't necessarily help if we are trying to facilitate exploitation of government-owned inventions, exclusive licensing or sale to the highest bidder would presumably take care of that.

In addition there is another problem of stimulating inventions. A completely separate problem. That would certainly be aided if the inventor received full rights. The government could perhaps request 50 percent of the royalties or 20 percent. Many simple solutions to this exist but in this problem, as in many, the best is the enemy of the good. It is something which would certainly benefit the country, the inventor, industry and science, but it is not done because somebody can point out an aspect in which there might be a superior solution, so we do nothing.

I think that improving the government patent policy is extremely important. Certainly nobody is in favor of excessive regulation. Too often we have a bureaucracy which is self-serving without regard to the impact on the end purpose of research and development or whatever the bureaucracy was created for.

Similarly with taxes. If one can show a certain tax structure results in less taxation, less growth, than another

tax structure which perhaps forgoes taxing at a certain level of the economy but results in more profit and more taxes altogether and more growth for the economy, the second is to be preferred.

But too often, one tends to tax away essentially everything by some person's assessment and reduces the incentive or at least the beneficial effect of incentives.

However, in the invention and patent field there is a further problem that patents only aid the exploitation and creation of things that can be patented, things that can be embodied and denied to somebody else by being written down. There are many extremely valuable pieces of information or knowledge which can't be thus protected and which then are not worked on at all by individuals or industry from a profit motive.

For instance, the knowledge that eating rice and beans together is nutritionally a lot better than eating them separately. That is of tremendous value. Yet if you set out to tell your company you wanted to work on that because it would benefit society, they would say, let somebody else work on that.

We can't make a nickel out of it. After we have told the world that, where are we? Why should we spend the money? Somehow there has to be a way, whether it is a system of prices — especially for those discoveries which can't be

embodied in hardware and sold — or something else which I haven't thought of.

I don't know, but something must be done to support and to reward research and development, simple effort, popularization of knowledge which is valuable to the consumer-- whether that consumer be an individual or a company or the government — but can't be incorporated in a product which is sold or in a patent.

Mr. Carey. Let me add one other thing. We have a situation where thse patent practices and policies are giving us another kind of trouble. If you take the situation in the NIH Cancer Institute, where government-supported research on the so-called cancer scanner, a very advanced piece of technology, and the research, as I recall it, was supported by industry, but because the invention was tied to government funding, the inventor and industry was not given the right to exploit ~~a company~~ — the company concern, as I understand it, would be to go out of business and the so-called CAT scanner is now being developed and sold in the U.S. by a British firm.

I am all for the British — they have their own problems-- but this is a strange kind of foreign aid. It certainly means that we are subtracting from the American work force, labor force, jobs that we could have, earnings that could be generated and taxed. This is sort of a microcosm, some

illustration of the policy contradictions in which we find ourselves.

Senator Schmitt. I think that is an excellent example, one with which I am familiar. There are many others where the same kind of thing happened where we ended up importing our own technology, which is very unfortunate, when we could have been exporting it as well as doing it internally.

Just as a comment, as you continue to look at the federal R&D budget, I detect some of your comments — I detect that in my colleagues and others also — this is not necessarily a criticism, I realize some of it is necessary — but we tend to compare our budget with the R&D budgets of the past.

We tend to neglect the question of what is the need of the present versus the need in the past? I believe you, Dr. Garwin, mentioned the budget in 1968 as being in real dollars comparable to what we have today. I think our needs today are maybe even an order of magnitude greater for research and development, apparently because we haven't done enough in the last 10 years.

In defense, our domestic needs in terms of environmental technology, energy technology, the export economy is lagging, largely, I believe, because of a lack of technological innovation. I just would suggest that, wherever you can, you

analyze the need as well as what it was in the past. In that regard, I would like you to comment very briefly on the question of R&D for problem solving versus R&D for symptoms treatment.

The classic example, or course, is the question of cancer. The scanner, as important as it was, is still a means of determining what to do about cancer once it occurs. The basic research, the biomedical and biochemical research, to get to the business of how do you prevent it from occurring is lagging, I believe, greatly behind what we could conceivably use and, of course, would be of much greater benefit to individuals since cost is less.

Once you prevent something from happening you don't have to pay the cost of treating it after it occurred. There is a very strong tendency. Politics is one of the drivers to fund those things that treat disease, that treat environmental pollution, that treat the symptoms of problems versus those very fundamental research and engineering areas that will actually solve the problem which is creating the symptoms.

Again, I think our research budget, even though we point to real dollar growth in some areas, is wholly inadequate when you get down to where is the basic concentration of the research dollar.

Dr. Garwin. I entirely agree.

If you think back about polio what was visible in the

'30s was the treatment of victims. That had a lot of money and a lot of public sympathy. What really solved the problem was basic work in biology.

Unfortunately for the support, as I indicated in my testimony, you can't say that a given piece of work in tissue culture or whatever is going to result in curing or preventing a given disease. The fact that it may prevent some other disease, though, than the one you have in mind shouldn't keep you from supporting it.

But it does show the problem of identifying the outcome of this very basic kind of work. The result is that it is underfunded.

The answer is that we ought to support people efficiently, competitively, who will work on these problems for which there is no competitive — for which there is no industrial profitmaking motivation.

For instance, we are in a perilous state on immunization. With the development of new agents for immunizing against diseases, even those we know about, it is not one of the high priorities of the pharmaceutical industry. In fact, they see very little but problems in doing that. This will lag unless the federal government does it in the interests of the individual citizen.

After all, the federal government is, in my opinion, the world's largest volunteer organization. We all got

together at the time of the revolution and the Constitution and organized this government to serve us in those things which we can't do individually. It should continue to do those that it can do efficiently.

Senator Schmitt. Thank you.

For our record, if you have information that is pertinent, that results from your analysis of the budget, would you provide the committee with your analysis of the effect of zero-based budgeting on this budget? The reason I ask that question is that in several examples I have run across it seems as if zero-based budgeting works very well for big projects that cost a lot of money and works very poorly for little projects that cost very little money but still are very efficient.

It has to do with the size of the lobby within an organization for that particular budget. I may be wrong in this analysis, but I have seen some very, what I think, pennywise/pound-foolish decisions based on ZBB. I would appreciate your comments.

Dr. Garwin. This has always been a problem under whatever system of budgeting and decisionmaking and is the first item on the part of my testimony which I didn't rea I won't read it now. The heading is "Small Programs May Be Very Important. Big Programs May Be The Place to Save."

For precisely that reason, if a program does not exist

or is at a very low level, there are very few people in the government who can speak for it, who know about it. There is very little constituent pressure to support it. Industry does not know which company is going to get the contracts. They don't want to spend their money in lobbying.

The situation is very different for programs which are imperiled because of a potential decision that they are no longer desirable or cost-effective, where individuals and corporations tend to put very large amounts of money and effort into the preservation, into self-preservation.

I will respond.

Senator Schmitt. Thank you.

Mr. Carey. I might add a word, Senator.

When ZBB reared its head, some of us who studied this scene with rather apprehension because the hardest thing in the world to do is to quantify costs, benefits and effectiveness in research, particularly in the area of basic research.

As matters have turned out, I feel bound to say that the President's budget for research and development does a pretty good job considering, I think, the constraints on the size of the budget, the size of the deficit, and the impact of zero-based budgeting in general terms, it has not been adverse. I think the science advisor, Dr. Press, and his people have worked very well with OMB and have come up with

reasonable general answers and arrangements. Better, I think, than we have seen for some time. It could very well be that in particular situations, mainly in the particular agencies and bureaus of agencies where the rationing problems are acute in living within the budget ceilings, zero-based budgeting may have turned out the wrong way.

But certainly ZBB has not damaged the general budget outcomes and strategies in the research and development area in the 1979 budget.

Senator Schmitt. Thank you.

Senator Stevenson. Thank you, gentlemen.

I have some more questoins but I would prefer, if you could, to hear the next three witnesses and then go to a panel, if you can remain.

To get more efficiency and recovery of this loss of momentum, this production activity urge which goes all through the R&D system from basic research on up, I think we should, without getting romantic and thinking small on some of these fantastic and silly writings that have come out now, we should look hard at some of the huge projects in the basic research area, some of the huge cancer investments before squeezed, a lot of funds available for the creative individual and great big demonstration projects, as opposed to something for small business for the creative individual is something I think we should look hard at. And I hope you will look hard at it.

Senator Stevenson. Thank you. Mr. Carey?

Mr. Carey. A few comments, gentlemen. I recently was involved with the National Research Council in the National Academy of Science in a study commissioned by the Energy Research and Development Agency, before it disapppeared. The problem was somewhat of an odd one to throw at the National Academy of Science.

It was the problem of how would ERDA could get better advice, better communication with industry in its R&D planning and priorities. So, a group of us tackled the question, looked at it in the framework of the new Department of Energy, and generally, came to the conclusion, for what it was worth, that there wasn't any quick, wonderful, creative

organizational invention that would make this possible. This is what ERDA hoped we would discover for them. The truth of it all was there are so many barriers, many of them legal, to the free intercourse between a government agency like ERDA, DOE, and industry people, that the folks from industry faced serious deterrents in sharing ideas and thinking with government in the energy field.

These are conflict of interest rules in laws; these are sunshine laws; these are limitations and inhibitions on the use of advisory committees and how they behave. The list goes on and on, and it is a dangerous business for a businessman or person to try to take his shoes off and talk openly to the government because something unfortunate might happen to him.

I think that perhaps what it all suggests is that we have, for very good reasons, set up such a collection system of checks and balances in our relationships between government and industry, that they all effectively cancel each other out, and nothing can happen, and nothing can work.

In the area of patents, that I alluded to in my testimony, the evidence seems to be that while the Department of Energy, for example, can get somewhere in contracting with medium-sized and small firms, it is very rare that they can do this through grants or contracts, or similar arrangements with significantly large and high technology firms in the industry business.

Really, the industry bucks of the R&D money, all of that dazzling R&D money that DOE has, really can't be put out to work because at the end of it all, you can't say to the firm that has taken it: "Well, okay, now you have done it. You have found it. Now, go with it."

There are checks and balances. We have gotten the situation terribly confused. This little study we did at the Academy opens a window on the problem to which there really aren't any available immediate answers, much less flashes of inspiration that there is an easy cure for it.

With all respect to Ellis Mottur, for whom I have great regard and friendship, I have lived long enough in Washington to have a dismal view of great, comprehensive national policies, from the top, down. I think I would have to apply that to the problems of innovation in a very large market economy that is in real trouble, and is likely to be in a whole lot more before we see the end of it.

I happened to be around in '72 or thereabouts when President Nixon seized on the problems of lagging technological innovation and set about to invent a comprehensive national effort, led by government. I think we all remember that it got exactly nowhere, ran out of steam, and was a bust.

Now, I think, as I look at the general situation, a good half of the problem is that government, as you said, can't

seem to get its act together. Again, government itself, if you don't look beyond government, it still has the same crosscurrents of checks and balances.

There are agencies to protect and defend one idea, and other agencies to protect and defend others, or to advance certain ideas. They all come into collision. It is the checks and balances again, and it reflects what we all, fundamentally, believe about the way we ought to run our affairs, except it doesn't work out too well, sometimes.

Senator Schmitt. Could I interrupt again in the role of the great peacemaker?

Mr. Carey. Have I contradicted myself?

Senator Schmitt. No, but I don't think you and Mr. Mottur are in disagreement if he would allow me to substitute the expression "national capacity" for "national policy." The reason I feel comfortable in doing that is because you threw it back to our committee rather than saying it ought to be the Administration that establishes some policy. That is why I have been using the term in terms of our trade policy for a strategic capacity.

I don't think any of us are smart enough to establish national policy on issues of this magnitude, and this complexity. But if you start to lay the groundwork so the capacity is there for interrelation and cooperation, then I think we have got something we can work with.

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A national policy, no. I would disagree with you also, if you mean a true national policy. If you mean a national capacity, which is the way I interpreted what you finally said, then I would very much agree with that.

Mr. Mottur. Could I comment a second?

Mr. Carey. I yield.

(Laughter.)

Mr. Mottur. I do mean national capacity. I don't think there is disagreement, as I understand what Bill is saying. I think the effort in '72 to come up with a technology -- I think it was called "new technology policy" or something like that -- was very much oriented toward very, very heavy government spending.

The initial problem on that was many billions of dollars. It just was a huge, white elephant, and just collapsed. What I am talking about is an attempt to free up the private system to do the innovative process by trying to untangle the regulatory framework, and to untangle a lot of the things holding it back.

I agree, it is certainly nothing the government can, in and of itself, do; but I don't think government can just sit back and wait for the private sector to pull it together. It has to come in a way that — government has a very, very key stimulating role to play in this.

Mr. Carey. I think the capacity is there. I think we

have it. I think the problem is that we are constraining it. Some few years ago, in a room very much like this, I went out on a limb with the observation that if we had such a thing as an index of potential for American technological innovation, and we took that index as 100 and graded our then performance against that index, it would probably come out at about the midpoint of the potential.

I can't prove that. I would still tend to make the same remark, however. The potential is there, and the capacity is there. What is wrong, I think, is that there are blockages and impediments. I think if we can recognize and identify those impediments to the release of this capacity and gradually remove them through some politically acceptable transition process, then, I think, the capacity will begin to run, and exercise itself.

I feel that part of the problem in government — and we can't just say that it has to be Congress who straightens it out — I think the Executive has to do its share of straightening the problem out. Part of the problem is that nobody has been in charge of the question of technology and its vitality.

Not long ago in an editorial in a magazine I have something to do with, I suggested that some of the 600 people who are down around the White House working on reorganization matters might take a look at the idea of transforming the Department of Commerce into a different kind of department, a Department of Industry, Economics and Technology, and give it a job to do, and give it a charge, and put somebody, finally, in the driver's seat, to attempt to hew out the stages of correction in our present policy muddle, with regard to industrial innovation and technological movement.

That, in a way, is a kind of organization fix, and it is not a self-fulfilling prophecy, but it would be a beginning.

I also see in the statements of President Carter the encouraging first steps toward a policy understanding that we have problem. I take that as a plus. I don't know what Frank Press is going to emerge with in his study of the problems of innovation, which sounds to me as if it is going back to zero base and trying to document the predicament and examine its various aspects.

I am glad to hear about it. I suspect that it will land in the hands of the Commerce Department to do it, because Dr. Press doesn't have the troops, and he is not about to be given the troops.

If I find myself being too optimistic about the prospects of that study, it is only because a hard life has taught me

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that interagency studies are not always too fruitful. But at least there would be a beginning.

One of the hats that I wear -- as you can see, it is necessary for me to wear a hat --

(Laughter)

-- is to chair the American side of the detente business in the field of science and technology policy. That has been a mixed experience, but it is interesting in a sense.

As you have cited the Japanese capacity to get their act together and to get results and benefits that are scaring us to death, so in an authoritarian society one finds that the Soviets go through a very explicit long-term planning process stretching over not five years, but fifteen; and built into those planning processes are some 250 major national problems or headaches that they have got.

They build through that 15-year process explicit efforts and strategies, including a comprehensive R&D strategy, and they pour their resources in, and they follow it through.

Now in many ways they are no luckier than we are in getting from here to there, but they have a process. They ask me: Now in your society which does so superbly well in advancing technology and in using the outputs of research, you must know something that we don't know. You must have some arrangements that we don't have. We would like to hear what they are.

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They say to me, for example: Industry and government must collaborate very, very closely all the time in looking at opportunities and in measuring resources.

I say: No, that is not the case.

Then they say to me: Well, then, at the level of the industry sectors, the firms do converge their R&D goals and resources.

I say: If they did, they would be put in prison.

The conversation goes nowhere. What I try to explain is that we have something called a market system and competition, and the function of entrepreneurship and opportunity and all of these things, when they come into the right combination, like the stars, produce innovation.

They haven't got anything to match it. Their concern -- their big problem is thatthey can't very successfully integrate research results with follow-through. But it is for different reasons than ours. So you get these contrasts. They are instructive.

In terms of any exchange of ideas between their system and our system, they are going to be very much at the margins. But it seems to me that in light of much that has been said here, that my head suggests that we try to identify where the principal blockages are, whether they are legal, whether they are institutional, whether they are traditional, whether we have carried over into the very difficult economy of the

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'80s -- which we might as well call it -- arrangements that worked very well in a simpler, less congested, less high temperature economy of the '20s and '30s, when it didn't matter so much where we stood relative to the global economies, and see whether we have gotten ourselves into some trouble that we now need to deal with.

I think that I would rather see us tackle such problems as the patent policy problem one at a time, and try to deal with it, than to wait until we have an ideal formulation that will carry us for the indefinite future. I don't think the politics in government work that way.

Thank you.

Senator Stevenson. Thank you.

Senator Schmitt?

Senator Schmitt. Two or three comments. The hour grows late.

Mayor Horn, I first of all am very sympathetic to your testimony and the thrust of it. I would, however, say that I think you may have been a little too -- had too fine a filter on what was helping the cities and what was not related to the cities, particularly in the service-delivery area.

I think over the last decade or decade and a half, you look at the communication, use of computers, law enforcement capabilities we have, air transportation, environmental technology, energy technology, medical technology, there has

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been a great spin-off -- indirect in most cases, but nevertheless a very direct spin-off -- into the problems of the urban areas.

They have not solved those problems, and that is why I agree with you completely that there are many areas where specific targeted applications of science and technology would be appropraite.

But in the basic R&S base, science and technology base, really, that we create in this country, whether it is created by the private sector or by government, it is amazing how often there is this spin-off into direct application, an almost inadvertent or unanticipated application, sometimes unrecognized application to the problems of the urban areas.

I do think it is very important what your group is doing, and I will look forward to further information from you.

I also, Professor Smith, would like to suggest that in the next edition of your book -- which I look forward to scanning -- on the state of academic science, that you include a chapter on earth science. It is an area of some interest to me, and also one which bears very, very closely to the major problems affecting the country: resources: availability, how do you find them, how do you get at them when you do find them; the predictive technologies and predictive sciences: earthquakes and other processes involved with solid earth and the gaseous/fluid spheres around it. Nuclear material storage