The View from SAN DIEGO

HAROLD AGNEW SPEAKS OUT

INTERVIEW BY BARB MULKIN

Harold Agnew is famous for his casual dress—corduroy pants and jacket and Southwestern bolo tie. Today, having joined the ranks of corporation executives, the former Los Alamos director presides over an interview with Los Alamos Science in different attire. His corner office, as president of General Atomic Company in La Jolla, California, commands an impressive view of palm trees, lush foliage, and bright flower beds. The massive desk groans under a load of paper, as did his more austere working quarters in Los A lames, and he is not loath to admit that the paper mill still gives him fits.

Agnew retired as director of Los Alamos Scientific Laboratory in March 1979, after nine years at the helm. He had come to Los Alamos in the spring of 1943 as a junior physicist after working with Enrico Fermi on the first successful fission chain reaction at the University of Chicago. He has been associated with the nation's nuclear programs since 1942, when he joined the Metallurgical Laboratory of the Army Manhattan Engineer District. Agnew left Los Alamos in 1946 to earn his doctorate in physics under Fermi at Chicago. He returned in 1949 and rose steadily through the ranks until he became director.

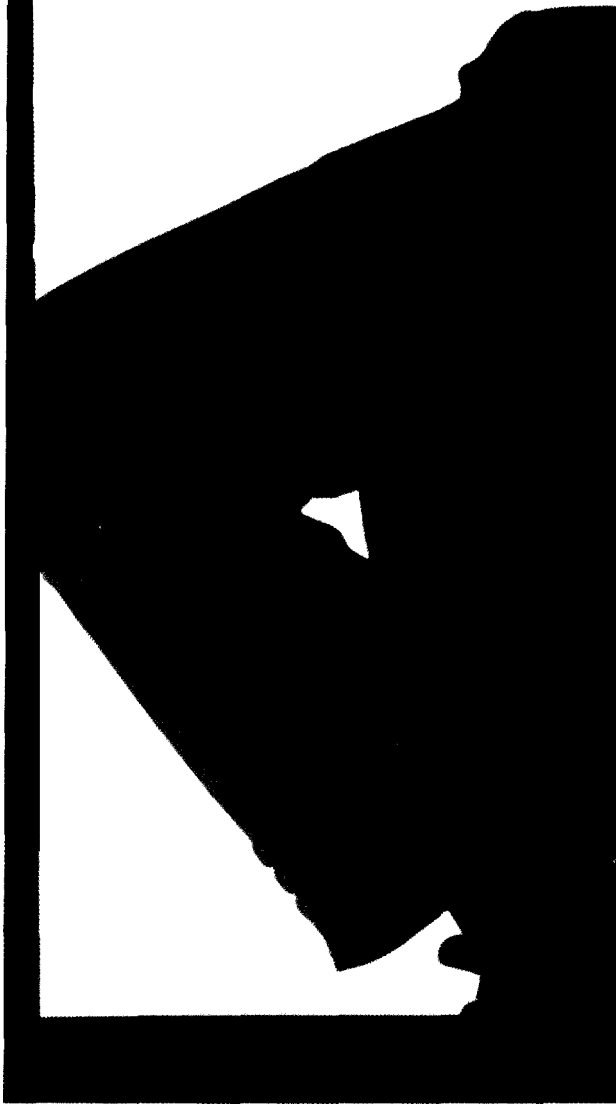
Under Agnew's tutelage, the Laboratory, founded in wartime expediency and continued as the nation's prime weapons research and development facility, became a highly diversified, multiprogram laboratory receiving funding from several Federal agencies. Agnew supervised an enormous growth period, pushed to maintain the Laboratory's academic excellence, restored its leadership as designer-supplier of all major strategic nuclear weapons systems, and redirected it to an energy-oriented mandate that complements and supports the continuing weapons research.

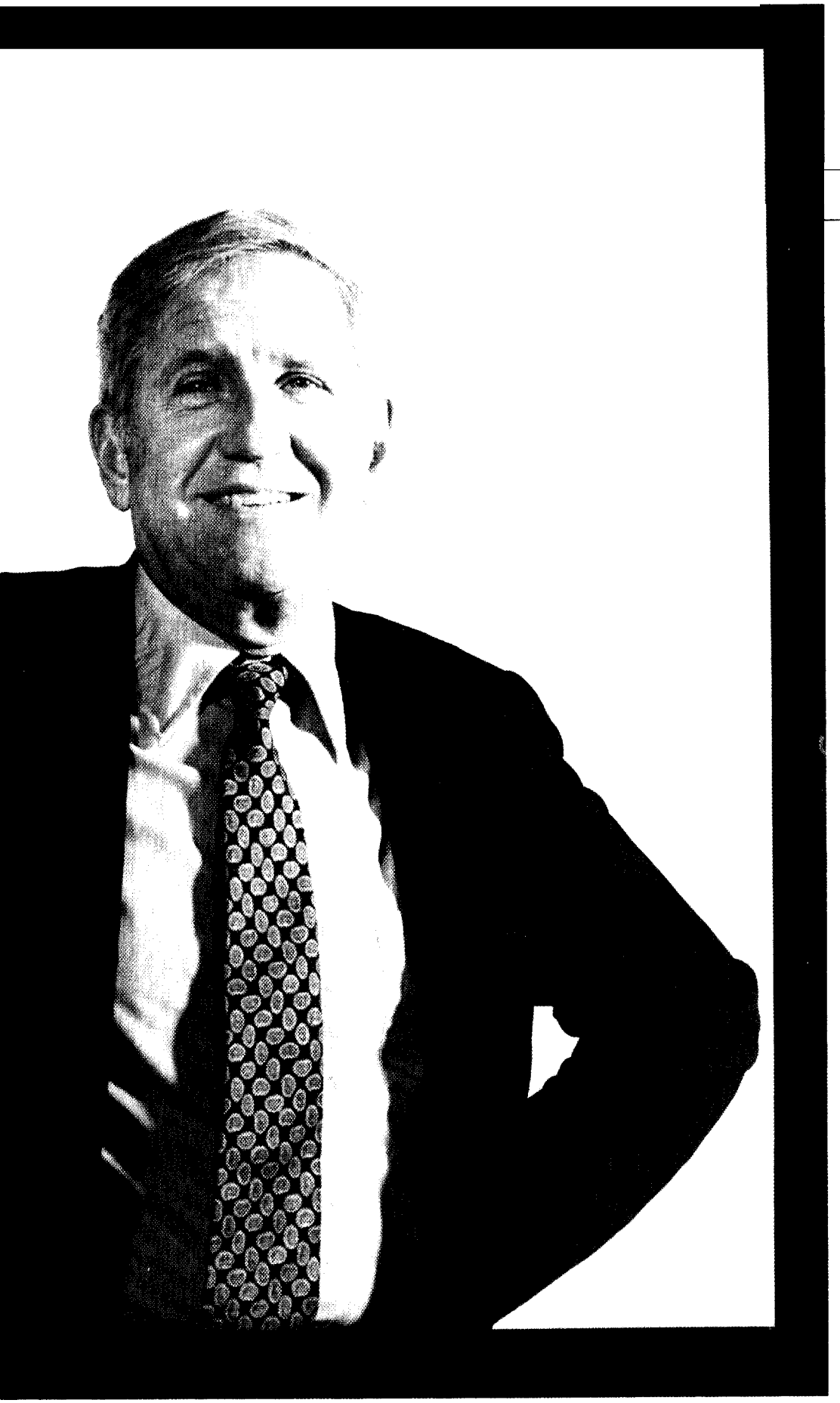
Agnew's efforts did not go unrecognized. On specific matters he served as an adviser to two United States presidents. He was the recipient of the Fermi A ward, the highest given by the Department of Energy, and the E. O. Lawrence and National Aeronautic and Space Administration Awards for his contributions to the nation's nuclear programs and to NASA space epic, the Apollo Program.

An outspoken proponent of a strong deterrent for defense and the benefits of nuclear power, he now heads the only United States company with an operating high-temperature gas-cooled reactor, the Public Service Company of Colorado's Fort St. Vrain plant at Platteville, Colorado.

Still an admitted hawk, Agnew now pushes just as vociferously for acceptance of the new gas-cooled reactor technology, and in inimitable style holds forth on this and other subjects with wit, incisiveness, and clarity.

You lcave an interview like this one with the feeling that whenever Harold Agnew retires, it will be to New Mexico, where, in whatever capacity, he will continue to speak out, as he would put it, on a "whole gaggle of issues. "





The View from SAN DIEGO

I would urge, though, that if at all possible, the national lab people get out into industry for a year or two, so they can appreciate what it's like on the other side of the fence.

SCIENCE: You *retired from the Laboratory, but obviously, you haven't retired. Why did you leave Los Alamos?*

AGNEW: I was there 35 years and director from 1970 to 1979. Nobody should run the course that long, A director doesn't remain vigorous beyond 10 years—after that you can't do what you should. You can't rattle cages. Also, there was the matter of remuneration, although I think the University of California has done something about that since I left.

SCIENCE: *What problems did you face in your new position?*

AGNEW: The difficult part, really, is coming into a place and not knowing the people. You don't know who the con artists are, who are the real pros. I sort of grew up in Los Alamos. I started as a technician, and all of us knew where the strengths were, whom to believe, who were very brilliant but sometimes got off the track. In a new place, you don't really know whom you can rely on, and it takes a while to learn.

SCIENCE: *What are the major differences between running a national laboratory and a commercial company; are there advantages of one over the other?*

AGNEW: One thing that's really quite different is that as one of the national labs, you're "part of the family" while industry is not. We may have had problems in the national laboratories with budget cuts and so forth, but you find that private industry is the first to get the axe when it comes to Federal funding—you really are not part of the family, and so you're viewed quite differently. The feeling is clear that government can get more from the labs because the labs don't get a fee, but the labs get their buildings free, their land free, whereas in private industry, the company has to provide everything. Also, the labs, in the old days, at least, had great freedom to use their funds to start new ideas. We could take money from one project and put it into another. This great flexibility was due to the enlightened management of defense programs by the Division of Military Applications—they understood the situation. In industry, you simply can't do this; you must budget in advance, and although you have a reserve for contingencies, it is nowhere near the amount of money that I had at Los Alamos. Also, in industry you don't have the flexibility of personnel—that is an ideal situation. I think these are the reasons we did so well at Los Alamos over the years.

SCIENCE: *Do you think this situation has changed? Had it in fact started to change before you left the Laboratory?*

AGNEW: It is harder now, and in fact it got harder for me because of the attitude in Washington (D. C.) and the increasing regulations. Maybe the whole thing will be easier again, under the Reagan Administration. I think Don's (Laboratory Director Donald Kerr) experience in Washington before he became director will help him to get things done. I believe he's just what Los Alamos needed.

SCIENCE: *Do you feel that as president of General Atomic Company you have less influence, especially on policy, than you had as director of Los Alamos?*

AGNEW: Well, certainly I think we're viewed as more suspect, presumably because there's something in it for us, some sort of material gain. It's clearly known that the people in the national labs aren't going to make something out of it for themselves. I would urge, though, that if at all possible, the national lab people get out into industry for a year or two, so they can appreciate what it's like on the other side of the fence. Also, I think this would promote cooperation of government and industry on the international scene. Look how the Japanese work—government is a partner with industry in Japan. But I experienced a real adversary relationship between our own government and American industry, especially under the Carter Administration. I hope this changes under Reagan, but there are many problems. There are so many antitrust laws, conflict of interest laws, that it will be very difficult to attain a partnership status.

SCIENCE: *Did you feel when you were at Los Alamos that you had a direct influence on national policy, especially the defense posture?*

AGNEW: No question about it. I met with President Carter for almost two hours on the (Comprehensive) Test Ban Treaty, through (Energy Secretary) Schlesinger's intervention, together with Livermore's Roger Batzel. We influenced Carter with facts so that he did not introduce the CTB, which we subsequently learned he had planned to do. There's no question in my mind that Roger and I turned Carter around because we incurred so many enemies from the other

side! It was obvious we had had an impact,

SCIENCE: *Were there other incidents such as this one?*

AGNEW: Yes. I had a hand with President Kennedy in the permissive action link. This was the matter of electronic locks on our warheads so that if they fell into the wrong hands they could not be used.

SCIENCE: *Other people could not launch them?*

AGNEW: Oh, they could launch them, but they couldn't fire them. Some of us realized that it was imperative that we install these locks, but the military fought the issue.

SCIENCE: *Why?*

AGNEW: Because they wanted full control over the warheads. At that time they considered the concept an insult to their integrity and felt that it would deny personal control to them, but it was a matter of national security, and it had to be done. We instituted the program. and after I talked to Kennedy, I think my influence was felt. There again, that's an advantage of being associated with a national lab. Everyone knows you have nothing personal to gain, so you have good credibility.

SCIENCE: *What kind of incident was the permissive action link designed to avert?*

AGNEW: Well, suppose two countries set to, and we had our weapons in both countries. They could take them over, but if they did, they couldn't tire them. That's the type of thing we were trying to guard against.

SCIENCE: *You've been at General Atomic for more than two years. From this remove, do you see the role of the national laboratories changing?*

AGNEW: No. I think they are still centers of excellence, and I think the biggest fault of Carter's Administration was that they never really appreciated the strengths and contributions of the national labs. They didn't recognize what the national labs could do, say, for the energy program. They fumbled and bumbled and brought in other organizations to do the job—I won't call them "beltway bandits," but fly-by-night outfits-when in fact the government could have used the labs at much less expense and with much better results, much better continuity.

SCIENCE: *What do you think will happen to our defense programs under Reagan? There are those who think he's a hawk. . .*

AGNEW: I'm a lot more of a hawk than he is! I think Reagan is a very prudent individual, and so are many of those associated with him. I feel the defense policy will not be imprudent or provocative, but I think it will satisfy, to some degree, those who are much to the right.

SCIENCE: *Do you know Mr. Reagan?*

AGNEW: No, but although I've never been associated with him, I think he's decisive, that he makes good decisions the way President Kennedy did, and that such decisions are based on good, solid advice given to him by professionals in the field.

SCIENCE: *What about the future of nuclear power under the Reagan Administration, especially after Three Mile Island. The problem was contained, but hasn't the biggest effect been the enormous public impact?*

AGNEW: Yes, and it really has been enormous. It gave fuel to those who were, for whatever reason, opposed to nuclear energy, but I think in the long run, the effect has been to settle the public safety issue. As Edward Teller says, he was the only one who was injured—he had a heart attack! I think Three Mile Island showed one thing, and I was heartened because this is something I've been preaching ever since I came to General Atomic: the issue is not public safety, for that has been settled. The issue is this: if we are going to maintain public utilities, using money invested by private citizens, then we're going to have to do more to protect the equity of these individuals. *That's* what Three Mile Island showed—that you can lose equity in a plant, and that it is more at risk in water-cooled reactors than it need be. It's been shown clearly that gas-cooled reactors have better thermodynamic efficiency, better uranium fuel utilization, and in fact, that they are much more *forgiving!*

SCIENCE: *More forgiving?*

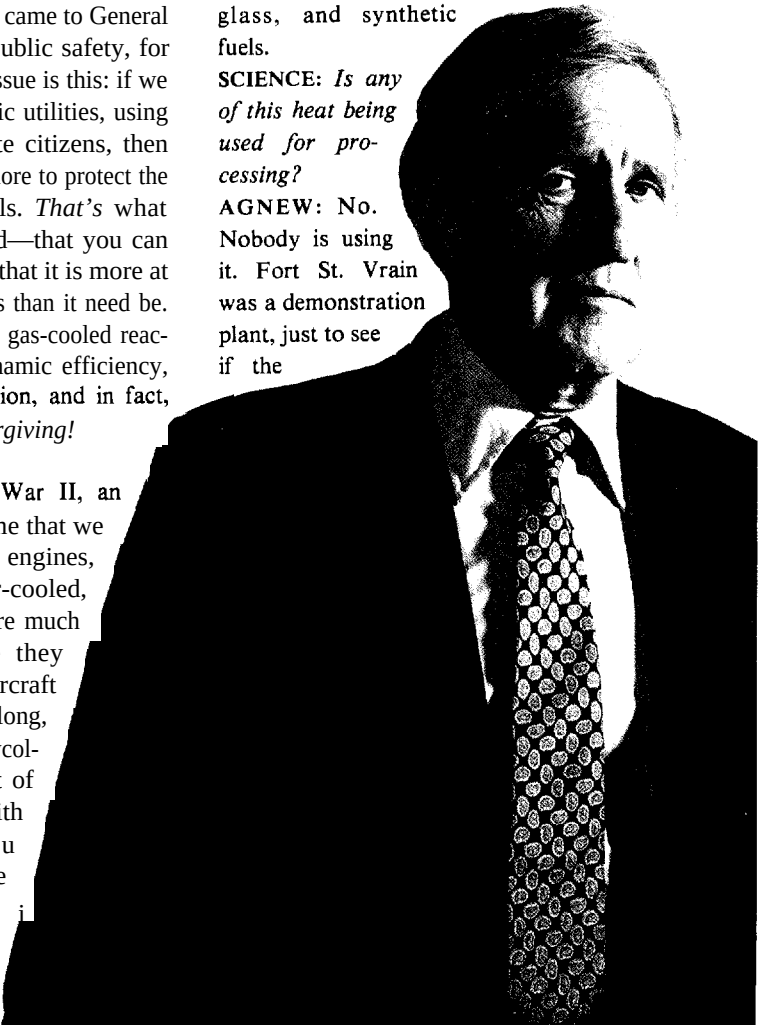
AGNEW: Yes, In World War II, an English friend reminded me that we had two kinds of aircraft engines, glycol-cooled and air-cooled, and that the air-cooled were much more forgiving because they could take abuse—antiaircraft tire, shrapnel—and limp along, but if you cut a line on a glycol-cooled engine, you're out of luck! It's the same way with gas-cooled reactors. You can't lose cooling because even if you lose pressure in the core, you can still cool the system with air. We're finding another thing that's extremely important—that radiation exposure to plant personnel in water systems is becoming a nightmare.

SCIENCE: *The situation on reins per man year is better in gas-cooled systems?*

AGNEW: Yes. In the Fort St. Vrain gas-cooled reactor, the coolant, helium, does not become radioactive. In our last refueling there was essentially no exposure to people. We took out a circulator that had been in the reactor for over a billion kilowatt hours and within one week, we could do hands-on maintenance. I think that's something that would relieve the public's worries about nuclear power. We cannot continue to ignore gas-cooled systems—and they have been ignored. The Japanese are particularly interested in them for process heat for industry. General Atomic has a license arrangement with Japan right now for them to use high-temperature gas-cooled reactors for such heat. Our Fort St. Vrain reactor has 1350°F outlet helium temperatures available right now, and this is going to be awfully important for industry in processing cement, glass, and synthetic fuels.

SCIENCE: *Is any of this heat being used for processing?*

AGNEW: No. Nobody is using it. Fort St. Vrain was a demonstration plant, just to see if the



The View from SAN DIEGO

INTERVIEW

A decision by a nation to develop nuclear weapons will be independent of its decision to reprocess spent nuclear fuel.

technology would work, We're getting a lot of black names because the plant is running consistently only at about 70 per cent rated power, but when you consider that it was a demonstration plant, and that the Germans started their pebble-bed (gas-cooled) reactor two years before General Atomic started Fort St. Vrain, and they still don't expect it to become operational for three or four more years, then St. Vrain is quite remarkable. It's already delivered a couple of billion kilowatt hours.

SCIENCE: *With this record, then, why is there an apparent bias toward water systems?*

AGNEW: Because the utilities are paranoid on this subject. They and the manufacturers have a pipeline of orders for water-cooled systems and just won't face up to the fact that we ought to bring in this new product line. It's like the car dealer who has 1980 models left when the 1981s come in. It's pretty difficult to sell the old models while you're touting the new ones as the super-dupers of the world, so they won't put them on the lot. There has been little improvement in water-reactor technology since the first water-cooled reactor climbed out of the ocean from the submarine program, like an amphibian. The bias toward water reactors is there because of the tooling, the commitment on orders, the worry of rescrambling to get in line on new technology. I don't know how to change this, except to say that the water-cooled reactors have been great, but have served their purpose, and now it's time to go on.

SCIENCE: *Do you think the new technology will make nuclear power more acceptable?*

AGNEW: We have to bring in the new technology if we are to make it acceptable.

SCIENCE: *Did you feel this strongly about gas-cooled reactors when you were at Los Alamos?*

AGNEW: I didn't know anything about them, then. Nobody knows much about them really, and that's the biggest part of the problem.

SCIENCE: *Why is that?*

AGNEW: I guess because we have the only reactor and General Atomic is a very small company.

SCIENCE: *Didn't General Atomic at one time have orders for about 10 of these reactors?*

AGNEW: Yes, but in order to get going, you have to estimate you'll lose money on the first orders because of paying for the tooling and so on that goes with the first-of-a-kind cost. Two things happened: the market fell back and some orders were cancelled. The company knew it could not break even financially on the remaining orders, so it cancelled them.

SCIENCE: *Then the orders were not cancelled out-of-hand by the utilities?*

AGNEW: Not quite: the utilities cancelled six orders and with only four in hand, GA thought it prudent to cancel these. In hindsight, they should have tried to renegotiate the contract for one. It cost the company a boodle. In fact, it cost them close to a billion dollars! Imagine that, a billion dollars! The owners won't put any more money into this, and I don't blame them, so that's where we are right now.

SCIENCE: *General Atomic owns half* of *the nuclear fuel processing plant at Barnwell, South Carolina?*

AGNEW: The Barnwell plant is another example of a vacillating government policy that paralyzed the nuclear industry. Because General Atomic was led to believe that reprocessing, with proper safeguards, would be encouraged in the private sector, GA and Allied Safeguards spent close to half a billion dollars to build the Barnwell plant—a beautiful plant—and then Mr. Carter decided it was not in the interest of national policy to reprocess and so refused to license Barnwell.

SCIENCE: *Well, the plant's still there. What do you see for it in the future, under Reagan?*

AGNEW: I don't know, but to me it seems criminal not to reprocess and consolidate the spent reactor fuel. I think by not doing so, we are being absolutely hypocritical! The rest of the world certainly sees us this way because, of course, the United States is reprocessing for the military at another facility. Presumably we're not going to reprocess commercial spent fuel so that we can set an example for the rest of the world. They consider us hypocritical, and they've laughed at us and have gone their own way and are reprocessing. A recent *Financial Times* article points out that the United Kingdom has reprocessed spent fuel from its Magnox reactors and has supplied plutonium to our weapons program; in return they get tritium and enriched uranium for their weapons program. A decision by a nation to develop

nuclear weapons will be independent of its decision to reprocess spent nuclear fuel.

SCIENCE: *What has this situation done to us in terms of slipping technology and loss of leadership?*

AGNEW: We've lost the technical and moral leadership anyway, and the rest of the world is doing what is prudent for them. It amazes me that people talk about problems with storing long-lived transuranic, when it fact, if you reprocess, you recover them, plus the uranium, which you can then put back into the reactor. The rest of the materials, after a couple of hundred years, have the same level of radioactivity as the uranium you took out of the earth in the first place. I've talked to (California) Governor Brown about this, but he simply doesn't understand, any more than most of the public; his eyes just glaze over,

SCIENCE: *Is anyone with a scientific or technical background advising Brown on such matters?*

AGNEW: I don't know. The fact is there are some people who have certain beliefs—I won't call them religious beliefs—but still, these beliefs are like a religion.

SCIENCE: *Fanatical beliefs, perhaps?*

AGNEW: Exactly. Fanatical. I remember during World War II when I was with Luis Alvarez, we had an associate who read the Bible all the time. Luis used to attack this guy, in a very friendly way, and he would say: "How can you believe in this stuff'? How can you believe in miracles?" We used to have long discussions about the miracles, like the Red Sea dividing. Finally, this man, who was a scientist, said: "Luis, either you believe or you don't believe. It's that simple. It has nothing to do with anything concrete—you just believe!"

SCIENCE: *You're saying that belief has nothing to do with facts?*

AGNEW: Right, and I draw this analogy to the antinuclear people. What they believe has nothing to do with the facts. I used to argue with Fermi, who was always very interested in cosmology—the big bang theory and all that. I would tell him I was mystified because when I looked at this theory, I couldn't figure out where all the original *dirt* came from. He would laugh, and we would talk about protons, and I would say: "O.K. Tell me where the protons came from, then." Fermi couldn't, of course. Nevertheless, they had to come from somewhere. The question is, where? I don't care if you start with energy or with mass, but you have to start with something, or it simply can't be. Yet it is there, and it really can't be—guess I'm getting old!

SCIENCE: *Do you think Governor Brown's views on nuclear power are influenced, perhaps, by the threat of earthquakes in California?*

AGNEW: Well, I don't know, but I do know that if we had gas-cooled reactors instead of water systems, we would have a lesser problem because we wouldn't be faced with millions of gallons of radioactive coolant spewing out and soaking into the ground.

SCIENCE: *But what if a quake caused gross structural damage to a gas-cooled reactor—wouldn't that be bad?*

AGNEW: You'd ruin the reactor, perhaps, but you wouldn't have the major decontamination problems. You remember in the old Rover* days, we blew up a reactor—we had Roman candles—but then we went out into the desert and picked up the hunks. The decontamination was a piece of cake!

SCIENCE: *The Rover reactor used solid fuel. Is that the key—the fuel—in this case?*

AGNEW: Yes, and the HTGR uses the basic Rover fuel—coated particles—and that's what impresses me. Ted Taylor (a thoughtful critic of our nuclear posture) called a while back and said: "You know, HTGRs are great for use in troubled parts of the world, the Middle East and so on, because you can't get into a mess with them. You can handle the decontamination because of the type of fuel and solid moderator used. And single-phase coolant has tremendous advantages." There's no question that in a catastrophe, like an earthquake or a conventional war, you might lose equity in a plant but you wouldn't make a mess which would be comparable to that from water-cooled systems.

SCIENCE: ***Even if this is true isn't it too late to change the public's opinion about nuclear power?***

. . .if we don't bring in new technology, I think the nuclear power industry is doomed to extinction.

. . .in the old Rover days, we blew up a (gas-cooled) reactor but then we went out into the desert and picked up the hunks. The decontamination was a piece of cake!

Project Rover was a joint Atomic Energy Commission-National Aeronautic and Space Administration program to design and build a nuclear-powered rocket for interplanetary space missions. The rocket engines were powered by ultra-high-temperature gas-cooled reactors that used fuel particles similar to those in the Public Service Co. of Colorado's Fort St. Vrain plant.

The View from SAN DIEGO

INTERVIEW

I think the talent is really in Los Alamos, Sandia, and Livermore in the context of what Energy's real job is. . . There are no ultimate goals right now in DOE, no focusing at all, except, perhaps, in the synthetic fuels program, and that may be on the skids.

AGNEW: I think we can. Other countries are preaching that nuclear power is a good thing, but we have been remiss. We must begin explaining to schoolchildren facts about the atom—facts and not emotion. You see, people still don't realize that radiation doesn't creep and crawl!

SCIENCE: *Meanwhile, though, we have our current crop of reactors. Are you suggesting. . .*

AGNEW: No, we need them still, and they will serve their purpose, I think the things industry has done—put in improved management systems, reporting systems, and components, as well as better trained personnel—has helped the situation. But let's face it, we're still in our infancy in nuclear power. The present generation of reactors has served its purpose, and somewhere in the world the new gas-cooled systems will be adopted. If England and France had had sufficient helium for cooling, they would have stayed with these reactors, but instead, they had carbon dioxide and that is not very good, neutronically or as a coolant, and it also has temperature limitations. They also had metal-clad fuel, which limited temperature. With our Triso-coated fuel particles, the system is very good. You must remember that about a third of the electric generating capability in the United States belongs to the Gas Cooled Reactor Associates,* and they are saying to the government: "Look, we know nuclear power is cheaper, more reliable, and less insulting to the environment, but we need your help. This technology is too expensive today for any one utility company to pursue." These companies have teamed up to push gas-cooled reactors, but they don't want to jeopardize their present systems. However, if we don't bring in new technology, I think the nuclear power industry is doomed to extinction.

SCIENCE: Flow *many member utilities are there, and how much of the present nuclear generating capability do they have?*

AGNEW: About 30 to 40 companies and they own about 40 per cent of the nuclear generating capacity in the U.S.

SCIENCE: *They have a common bond; do they differ on technological approach?*

AGNEW: No, they don't. Here is another vacillation of the Carter Administration—early in that Administration, the Office of Nuclear Energy said if the utilities were in favor of new technology they should form an association and then they would be included in program management. As soon as they formed the GCRA, the Administration zeroed out the budget for the HTGR! We had to go to Congress to get it restored. We had absolutely no support from the government or from the Department of Energy.

SCIENCE: *What do you think Reagan will do about the Department of Energy? Is it too unwieldy?*

AGNEW: Clearly, something has to be done about it. I believe the (synthetic) fuels have to be pulled out, and they will be, under the Synthetic Fuels Act. I can anticipate that someday the defense programs will be pulled, but whether they'll go to the Defense Department or to a separate organization, I don't know. Either way, I believe it's inevitable.

SCIENCE: *If defense programs are pulled, will this be an improvement?*

AGNEW: It's too bad in a way. I think the talent is really in Los Alamos, Sandia, and Livermore (National Laboratories), in the context of what Energy's real job is. The labs understand projects, how to get them on line, on schedule, and within budget. Look at the Los Alamos plutonium facility, and Sandia's electron-beam facility. Or check on what's been done in the weapons program—when they had a commitment for a new weapons system, then by God the system was built because Herm Roser's DOE Albuquerque Operations Office really understands how to run production facilities. But then, this has led to a problem–-there's resentment in the rest of DOE at how well managed the defense side has been. As a result, they don't want these people involved, for it would show up the rest of them.

SCIENCE: *If you were in a position to influence the new Administration, what would you do about the Department of Energy?*

AGNEW: I'd focus on special projects. The space program was an outstanding success because it had a specific objective. There are no ultimate goals right now in DOE, no focusing at all, except, perhaps, in the synthetic fuels program, and that may be on the skids.

SCIENCE: *The syn fuels goal must have*

***A consortium of utility companies interested in developing HTGR generating capability.**

been started by the Carter Administration, then?

AGNEW: Yes, but it was really done by the Congress.

SCIENCE: *You've often been quoted as saying that a terrible communications gap exists between those in science—and especially those in nuclear science—and the public. Is this still true?*

AGNEW: We've always had a communications gap, especially in research and development, but it can be wiped out. The Russians are doing it, by making it mandatory that elementary and secondary schools stress a strong background in science, mathematics, and related technologies. It's an absolute requirement; they don't graduate if they can't hack it. Under our system today, everybody passes, no matter what subjects they take. This philosophy is having a tremendous impact, and will have even more of an impact down the road, for the era of learning on the job, of not needing a background in science or technology, is passing rapidly.

SCIENCE: *Do you think this problem extends through the ranks?*

AGNEW: Well, yes, because as we move into more automation with computers and other machines that are almost hands-off, the people running the machines cannot just poke here and there or pound with a hammer to fix things. They will have to have a background in science—physics, chemistry, whatever—to work the machines from the floor.

SCIENCE: *You're comparing the educational philosophy of the United States with that of a totalitarian society. Are you* suggesting. . .

AGNEW: I'm saying it can be done here. If school boards were worth a damn—and most of them aren't—they would insist that the curriculum go this way. I was listening to Buckley (conservative commentator) the other night, and he commented that if Einstein were alive today he couldn't teach in our public schools because he lacks courses in education!

When we were in New Mexico, years ago, my wife Beverly was serving on the State Board of Education and I was serving in the New Mexico State Senate. We tried to get a provision in the state code that if a person had a degree—an advanced degree—that person could teach in the field of that degree without having to be certified in the History of Education, the Psychology of the Child—all of those nonsense courses required to get a teaching certificate. Let's face it, either a person can teach or he or she can't. We've gone the wrong way in our educational system. It's terrible that many qualified people aren't teaching because they refuse to take those ludicrous courses and as a result cannot obtain a certificate.

SCIENCE: *When* you *left Los Alamos in 1979 you said you had a three-year contract with General Atomic and that you consider Los Alamos home. Are you looking toward a change in the future?*

AGNEW: In a way I am. I do know I don't plan to drop dead working! Bernd Matthias's passing really shook me and Beverly up—hell's bells, he was a contemporary. I want to do some art. That sounds weird, maybe, but I was pretty good at carving. I used to do silver work. I want some time to do some of these things, and Beverly is still improving her tennis—maybe she'll be in the next Miss Clairol Tournament! ■

It's terrible that many qualified people aren 't teaching because they refuse to take those ludicrous courses and as a result cannot obtain a certificate.

* U S GOVERNMENT PRINTING OFFICE 1981—576-088/1