been almost completely disregarded.

Even straightforward chemical methods can hardly be expected to give consistent age determinations. The x-ray diffraction method involves measurements which can be attributed to at least three compositional variables, and consequently the method is incapable of producing a reliable analytical determination of fluorine, either with or without calcination of the sample. In passing it should be noted that use of the fluorine-phosphorus ratio introduces still another variable inasmuch as the carbonate content of the apatite mineral is also likely to change with time and the phosphate content is inversely related to the carbonate content.

Because the x-ray diffraction method is unreliable for determining the fluorine content, fluorine analysis that depends upon it is unreliable as a means of dating fossils. Hence, age correlations obtained by measuring either a_0 or c/a (with or without calcination) must be regarded as fortuitous in view of present knowledge of the crystal structure of bone.

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News and Comment

Atomic Power: Cinderella Is Slipping Back into the Kitchen

The government will spend about $240 million this year on research and development applicable to the goal of economically competitive atomic power plants. Private businesses in the atomic field seem satisfied with this level of investment, but the Joint Committee on Atomic Energy is unhappy with the way things are going and is likely to remain unhappy for at least the next year or so. This leaves the Administration more or less allied with business interests against the liberal Democrats who dominate the Joint Committee.

The sore point is a $60-million item for beginning several new prototype power reactors which the AEC explains was originally included in its estimates but was deleted by the Bureau of the Budget. With this deletion the funding for prototype power reactors runs rather steadily downhill to a point where it can go down no further: For fiscal 1958, $150 million; 1959, $25 million; 1960, $45 million; 1962 (the last Eisenhower budget), $12 million; 1963, nothing. The Joint Committee, which had been badgering the Eisenhower Administration for letting atomic power slide, now finds that so far as the prototype reactor program is concerned things could not possibly be worse under a Republican Administration than they are now under Kennedy. The AEC argues that it is misleading to draw conclusions about its support for atomic power by picking out one part of the program, the building of prototype plants; it is, after all, still spending a great deal of money on work relevant to atomic power, and this will be augmented next year with the return of some money for prototype plants. But the Joint Committee is not satisfied, and indeed the zero figure for prototypes this year does reflect a change in the place of atomic power plants in national priorities.

What has happened, most briefly, is that the glamour has gone out of atomic power. Space has taken over most of the position that atomic energy so recently held as a field to be pursued, quite aside from its intrinsic value, as a symbol of national prestige and technological supremacy. Accordingly, the goal of economically competitive nuclear power, once talked about almost in the way the race to the moon is discussed now, has lost much of its sense of urgency. You spend money in quite different ways when you shift from trying to develop a technology as rapidly as possible to merely trying to develop the technology. In particular you are less interested in going in for large-scale, necessarily expensive, prototypes when you do not see much return either in showing off these projects to the world for their prestige value or in pay-

ing a premium to reach your goal a few years more quickly than you would if you limit your investment fairly well to pursuing basic technology. What you learn from the prototypes helps the work on basic technology, but beyond a certain point you are mainly buying time with money, and if you are not in a great hurry you naturally would just as soon save some money.

This, at heart, is what led to the deletion of the $60 million for prototype reactors. In such cases the Budget Bureau can serve a convenient role as a scapegoat for an agency which is not terribly interested in a program, but which wants to avoid squabbling with a congressional committee. The AEC did not argue with the Joint Committee over whether the $60 million was worth spending; it merely argued that the Budget Bureau insisted on cutting some money; that other spending, particularly for military and space programs, had higher priority; and therefore the prototype reactor program was what got the ax. The Budget Bureau, in turn, does not have to argue with Congress, for it is an arm of the President's office, and although Congress can attempt to override its decisions, it cannot call in its officials, as it can agency officials, and badger them to change their minds. Normally, agency heads would genuinely like to spend the money the Budget Bureau has deleted, but in this case there has been no indication that AEC Chairman Seaborg was disturbed by the cut, or that the program had even been included in the budget with anything much more serious in mind than taking the heat off the AEC by letting the Budget Bureau take the blame for deleting it.

AEC interest in the prototype program was apparently further cooled by the hard feelings that developed between the Joint Committee and the private power companies during the fight last year over adding generating facilities to the Hanford plutonium reactor. The Hanford reactor is being built to provide fissionable materials for weapons, but it was designed so that generating plants could be built to run off the excess heat produced. Last year the Joint Committee, supported by the Administration, included $110 million in the AEC authorization bill to allow this work to go ahead, but the private power companies led a bitter fight that ended up with the authorization being knocked out when the bill came to a vote in the House. The Democrats on the committee then made it clear that they would not be much interested in programs subsidizing the private power industry for building atomic power stations. So the AEC was faced with being caught up in the squabble between the Joint Committee and private power interests. It could neither build the prototype power reactors itself, to be part of government-owned power plants, nor work out a cooperative venture with private utility companies, as has been done in the past, without the risk of getting involved in a messy fight. This dismal prospect apparently killed whatever interest there might otherwise have been in programming new prototype reactors for the coming year. Local public and private interests in the Northwest, meanwhile, have been trying to work out a way to go ahead with the Hanford project without full federal financing, and if they succeed the atmosphere for moving ahead on some prototype power plants may be a good deal better next year than this.

Money Estimates

Estimates of the savings over the next few decades that might be made by turning to atomic instead of fossil fuels to drive generating equipment vary by more than a factor of 10. The most recent industry study suggested that something between $7.5 billion and $85 billion might be saved during the period from 1970 to 2000, but in any case with the great bulk of the savings coming after 1980. What this implies, of course, is that from an economic standpoint it does not make a great deal of difference whether the goal of competitive atomic power in high-cost areas is met a few years later than 1968, the target date established in 1958 and still the official target. If the more conservative figure of the possibilities of atomic versus conventional power plants is correct, then there need be no rush at all, on strictly economic grounds, to take the more expensive route to development to save a few years.

Precise estimates of the potential of atomic power are hard to come by. They depend not only on extrapolations from the current economics of reactor technology but also on extrapolations from the current economics of fossil-fueled power plants, against which the atomic plants must compete. Then both of these extrapolations are affected by a third set of extrapolations regarding the distribution and magnitude of the national power requirements over the next few decades. The costs of conventional power, for example, are being reduced by the increasing efficiency of the plants; the development of long-range transmission grids which promise to reduce the cost of power in the high-cost areas where atomic power was to get its big start; and the development of a technique for powdering coal, mixing it with water, and pumping it through pipelines. (If this technique works out as well as the coal industry hopes, it will substantially reduce the cost of coal, a large part of which is the cost of transportation.) The last two of these points have brought new hope to the chronically depressed coal industry. More generating plants can be built at the mine sites with the power transmitted (with some loss) over long-range power grids; the slurry technique to transport the coal by pipeline opens another possibility for reducing the cost of coal relative to the cost of oil or gas.

This is fine for the coal industry, but not so good for atomic power, which must, first, go farther to become competitive, and second, meet the argument that it now makes less sense for the government to spend freely to speed the development of cheaper power: if the program is successful, it is going to add to the social hardship already prevalent in the coal-mining areas, and may not even save the country any money; for if atomic power became a bit cheaper than coal, the government would probably just have to turn around and subsidize coal to keep the coal miners from poverty and the coal companies from bankruptcy.

Hanford

In sum, all of these economic, political, and prestige considerations add up to a considerable case for going easy on the prototype power reactor program. On the other hand, the total sum budgeted for the current year for all work directly or indirectly pertinent to atomic power is actually a few million dollars larger than it was last year, according to the AEC. Such estimates can be easily varied depending on how you define such vague categories as "pertinent" or "relating" to atomic power, so the claim that a little more or less money is being spent is not very impressive. But there is a great deal of money being spent ($240 million in the AEC estimate). In line with the kinds of considerations outlined above, the work is being directed more toward basic reactor technology, and less toward the specific development of commercial power-generating facilities. In general, the AEC is moving away from the past

tendency to concentrate its reactor work heavily on development in order to meet requirements for specific applications proposed by one or another agency, and more toward pursuing promising technological openings on the assumption that if a reactor development with special properties is achieved, practical applications to make use of the development will soon be found.

The whole dispute over the prototype reactor program, meanwhile, illustrates an amusing facet of the public relations side of government. The AEC almost fell over itself rushing to confess that the reason the program had been deferred until a later year was to cut the budget. On almost any nondefense program, this is the indicated approach. It saves you from having to argue with supporters of the program about whether it is really worth the money it would cost and at the same time lets you pose as sober, conservative guardians of the public purse, deferring desirable projects in the interests of "fiscal responsibility." With a defense program, on the other hand, you virtually never admit that keeping within a budget had anything to do with your cuts, for if you do, no matter how marginal the value of the program, your liberal critics will argue that you are putting the almighty dollar ahead of the safety of the country, and your conservative critics will argue that you should cut domestic welfare programs instead of risking the safety of the country to allow room in the budget for programs designed merely to win votes.
—Howard Margolis

Space Notes: Soviet Guests; Restrictions on Military Developments; West Ford

The current Soviet affability on space cooperation has revitalized a guessing game that might be called "Invitations." It is based on the uncertainties of (i) will the Russians accept a given invitation and (ii) if they do, will they show up.

If the first answer is "yes," the record demonstrates that the odds favor an appearance. But there have been occasions—most provocative for the craft of Kremlinology—when the acceptance of an invitation to a technical or scientific meeting has not been followed by the guests. This happened last September when the Soviets did not show up for a physics conference at Brookhaven. Two months later another Soviet delegation failed to attend a conference here on weather satellites. And a few years ago the Soviets failed to arrive for a study of American broadcasting techniques, a study that was written into the Soviet-American exchange program at Soviet insistence. In none of these cases was an official explanation forthcoming. On some occasions, the Soviet failure to appear has been followed by charges that the State Department is maliciously playing games with visas, holding up their issuance until the last minute. The State Department denies this and contends that last-minute visas are nothing more than the product of last-minute applications.

Invitation Accepted

The latest round of "Invitations" was played last Tuesday at the United Nations, when the Soviets accepted an invitation to visit Cape Canaveral, but failed to join the party. This was not surprising to old-timers in the exchange business, some of whom maintain that on occasion the Soviets have carried the game even further by turning up after turning down an invitation. Specific information on this refinement of the game is hard to come by since those associated with fostering cooperation have no desire to emphasize difficulties and are happy to see the Soviets arrive, despite violence to the R.S.V.P. custom.

The U.N. incident involved a State Department invitation for the 28-nation U.N. Committee on the Peaceful Uses of Outer Space to tour Cape Canaveral and witness the firing of the first international satellite, a British scientific payload atop an American Thor Delta rocket. The Soviets were among those who accepted the invitation, but even before departure time, their delegates were indicating that the home office had had second thoughts. When the plane left for Canaveral, the Soviets were not aboard; however, delegates of six other Communist nations—Bulgaria, Czechoslovakia, Hungary, Outer Mongolia, Poland, and Rumania—went through with the trip, becoming the first Communist representatives to visit the base. (Representatives of Tass, the Soviet news agency, and other Communist bloc news services were included in the blanket invitation for the world's press to cover the manned space launchings from the Cape, but they all stayed away.)

Administration officials see no point in attempting to read any deep significance into the Soviet absence from the Cape. The initial acceptance of the invitation by the U.S.S.R., plus the attendance of the other Communist nations, would seem to indicate that although the Soviets had some doubts about the precedents involved in the U.S. opening a launching site to Communist visitors, the doubts were not overwhelming. (One Administration official noted, "There is nothing to make them give us a look at their launching sites just because we took them inside Canaveral." He added, "Anyone who thinks they might be embarrassed into reciprocity has a very naive view of what makes them tick.")

The official's comments, of course, still leave open the question of why the Russians did not come along. Since the Russians are not telling, the best speculation seems to be that Soviet politicians do not fully share the cooperative spirit which has been quite conspicuous among Soviet scientists. They seem to share it far enough, however, to leave the Administration fairly confident that the Soviets are moving along in good faith toward a series of technical talks endorsed by the U.N. Space Committee. One source of assurance is the fact that the subject of space cooperation seems to have been placed out of bounds for propaganda exploitation.

Military News Curb

While the Administration has been broadening opportunities for other nations to get a look at and join in the civilian side of this nation's space program, it has taken steps to restrict information on military space activities. This development has led to reports that the most politically sensitive element in the military space program, the Samos reconnaissance system, is either (i) doing so well that it would provoke the Russians if we revealed its quality or (ii) is doing so poorly that there is nothing to write home about. In either case, the Air Force is not talking, and the field is left to the speculators, who claim equally reliable sources and offer conflicting conclusions.

From its first days, the Kennedy Administration has been whittling down on the flow of information about military space exploits. One of its first steps was to abandon the announcement of forthcoming launchings, a practice that gave away a good deal of information about the reliability of military rockets. The new policy was first put into effect