

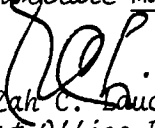
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from time to time calls attention to published material that might contribute toward the clarification or understanding of issues affecting world peace.

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by

Thomas J. Watson, Jr.

What future lies ahead?

There are many things to be optimistic about. The view from the Kremlin is bleak, with nearly everyone on the Soviet borders hostile. The view from Washington sees mostly friends, admirers, or neutrals. The overwhelming vote in the U.N. on Afghanistan should encourage all of us.

On the other hand, an anthropologist writing the history of the past forty years since the first atomic explosion might well conclude that we human beings have been preparing for our own demise.

Like many extinct species we have had a massive change in our environment. We have finally invented the ultimate weapon and in a mad technological race have connected thousands of them to two buttons -- one in Washington and one in Moscow. And with two very slight pressures we can literally do away with the world's two most powerful nations, and leave much of the rest of our planet unfit for human habitation.

Is that our future? The answer hinges on many things. But it hinges above all on us: on the United States' policy on nuclear weapons -- on what we and our leaders do about that policy in the days and months immediately ahead. And that is what I want to talk about today.

Let me start out by speaking to today's graduates and those of you who are young.

Throughout the past half century, young people have played many heroic roles. You went to World War II and brought down fascism. You fought and died in the mountains of Korea. Spurred by the challenge of the Russian Sputnik, you made brilliant contributions to American science and engineering, keeping America in the forefront of technology.

You fought heroically in Vietnam. And you worked courageously within the system, joined it in large numbers, became a potent political force, influenced public opinion, and helped bring that tragic war to an end.

We need -- and shall always need -- this kind of courage and conviction. And especially we need today the courage and conviction of youth to face up realistically to a change of course as a nation -- our course on strategic arms control and our whole handling of the nuclear equation.

The hour is late. The imperative of realism and reason is urgent. And we confront many illusions.

First is the illusion of victory -- the illusion that one side or the other can start a nuclear war and win it.

Sober common sense analysis will tell anyone that this is impossible. Consider this illusion in its most popular package:

The Soviets launch a surgical first strike and destroy most of our Minutemen and Titan missiles in their underground silos. Thus they leave us few weapons capable of retaliation in kind -- of wiping out their remaining underground missiles. And thus they force us to a choice: attack Soviet cities with our submarine missiles and bombers, thereby provoking a counterattack on American cities from Boston to Seattle; or surrender.

What's wrong with this picture? Lots of things. It assumes -- against all common sense -- that the Soviet leaders, notoriously cautious about security, would bet their total nation on at least four foolhardy all-or-nothing gambles:

-- the gamble -- against all technological likelihood -- that their first strike would be essentially perfect -- that it would leave few if any Minutemen or Titans to retaliate in kind;

-- the gamble that we would not use some of our remaining underwater and airborne weapons, nearly three fourths of our total warheads, to attack the thousands of vulnerable military targets in the Soviet Union other than missile silos;

-- the gamble that when our President learned the Soviet missiles were flying our way he would freeze and do nothing -- that he would not send those targeted Minutemen and Titans flying towards Russia's remaining silos before the enemy missiles landed;

-- and the ultimate gamble: That in desperate retaliation we would not rain down total destruction on Soviet cities, even though that might mean our own destruction as well.

Make no mistake: That scenario defies all sober analysis. It would be the most risky and ultimately costly gamble in history. By overwhelming odds, the result of any use of nuclear weapons would not be victory. It would be all out war and total destruction. And in the words of President Kennedy, "The living would envy the dead."

The illusion of Soviet preemptive victory has a corollary: the illusion of achievable American superiority -- the illusion that like the Red Queen in Through the Looking Glass we can outrace

the danger by going "faster, faster;" outproducing the Soviets in nuclear arms; playing a multi-billion-dollar shell game in the desert; hoping that somehow with exotic weapons we can erect a protective umbrella over our country.

So-called nuclear superiority assures no safety -- not for the Soviet Union; not for us; because what counts is not superiority but sufficiency -- the guaranteed power to destroy the other side under all circumstances. And we both have it.

A quarter century ago Donald Quarles, then Secretary of the Air Force and a wise scientist in a Republican Administration, put it succinctly:

"Beyond a certain point, the prospect is not the result of relative strengths of the two opposing forces. It is the absolute power in the hands of each..."

Think of it this way: Would you, if you sat in the Kremlin, attack the United States, even knowing that you could knock out 95 percent of our weapons, but realizing that the remaining five percent could destroy literally the whole Soviet Union?

Would you, sitting in Washington, attack even a smaller country which had only a thousand warheads knowing that if you missed only ten percent they could wipe out a hundred American cities?

You know the answer: There is no safety in numbers. The war planning process of the past has become totally obsolete. Attack is now suicide.

Yet the pursuit of the mirage of superiority persists. And over the years the two superpowers have piled weapon on useless weapon.

In 1945, when we exploded our first atomic bomb at Hiroshima, we had a four-year lead over the Russians. In 1952, when we exploded our first H-bomb, we had a ten-month lead. The Soviet Union closed the gap despite having a country severely torn by the ravages of a war of a ferocity never visited on our country. And it has kept up in the race, despite the burden of a hopelessly inefficient economy, by ruthlessly channeling its resources, and by calling upon the Soviet people for an endless acceptance of sacrifice.

Between us, our two countries now have explosive power equal to a million Hiroshima A-bombs. We have between us some 15 thousand "city killing" weapons -- one bomb, one city. Bigger stockpiles do not mean more security. Enough is enough. And we are far beyond that point now.

There is a third illusion, rooted in the belief that nuclear victory is possible and strategic superiority attainable. It is the illusion of nuclear omnipotence -- that if we just have more weapons we can use nuclear threats to deter Soviet misbehavior anywhere in the world.

I can think of no quicker prescription for disaster. Our nuclear weapons are useless except for their mission of preventing direct attack on us.

Fourth is the illusion of futility: the illusion that we cannot sign treaties with the Russians because they systematically violate them.

Let us be clear about this: there are major differences between

our two countries. Soviet values are diametrically opposed to ours. Contention between us on a global scale is a fact of life. Suspicion is the keynote of our relations.

But having said that, let me add this: on the evidence, the Soviets do keep agreements provided each side has an interest in the other's keeping the agreement; and provided each side can verify compliance for itself.

Look for example at the 1972 Anti-Ballistic Missile Treaty and the Interim Agreement -- the two parts of SALT I. The Soviet Union has violated neither. For these treaties do not depend on trust or good will. They depend on cold self-interest and unilateral verifiability.

Fifth is the illusion of benign neglect, the idea that if we just muddle along, in the phrase of Dickens' Mr. Micawber, "something will turn up;" that the current aging Soviet leadership, for example, will soon be replaced by enlightened and reasonable men; that the Soviet system will crumble from within; or that we can indefinitely stall on serious negotiations, let the Soviets cool their heels waiting, and use the intervening time for our own advantage -- to arm up.

Let us not delude ourselves. We can take no comfort from all these kinds of wishful thinking.

To be sure, the average Soviet Politburo member today is sixty-nine years old. But I have met many of the possible successors, and I can tell you: I foresee no real change. I do not see the Soviet Union becoming more pro-American. I do not see a revolution around the corner. I do not foresee the demise of the rigid system or the rigid thinking that runs it. And I see no chance that the Soviet leaders will be hoodwinked by protracted negotiations while we try to jump ahead in strategic arms.

Finally, we confront the illusion of softheadedness; that anyone who favors an end to the arms race must be soft on U.S. defense or even soft on Communism. And we confront its corollary: the simplistic formula "arm up and stand firm," though war would mean losses of 50 to 75 percent on each side.

The illusion of softheadedness is thermonuclear McCarthyism. Because the search for a way out of this morass -- the search for an avenue of negotiation and survival instead of confrontation and weaponry -- has a long and honorable heritage.

That heritage includes Republicans and Democrats; military and non-military leaders, among them some of the greatest and most tough-minded of our time.

It began in 1946 under President Harry Truman with the proposal of a hardheaded financier, Bernard Baruch, for international UN control of atomic energy.

It continued with President Dwight Eisenhower, who in his first major foreign policy address denounced the tragic waste of armaments, and in his farewell message warned against the power of a military-industrial complex.

It includes another great five-star General, Omar Bradley, who nearly a quarter century ago called for the country to turn away from "the search for peace through the accumulation of peril."

That heritage embraces the last legacy of President Kennedy, the nuclear test ban treaty of 1963; the SALT I accords under President Nixon; and the SALT II treaty initiated by President Nixon, continued by President Ford, and completed by President Carter.

SALT II was guided to completion in large part by former Secretary of State Cyrus Vance, who sits on this platform with me today, and for whom I was proud to serve in Moscow. Though the U.S. Senate has not ratified the treaty, it was endorsed by former Secretary of Defense Harold Brown, one of the world's brightest authorities on modern armaments; by General David Jones, head of the joint chiefs of staff; and countless others.

Thermonuclear McCarthyism is a slander against the wisdom of many great Americans.

Against all these illusions, what is the reality? The reality is that thermonuclear war in any form is suicide.

Our imperative is to change our course -- to take the only road which offers a viable hope for the future: not a road to unilateral action of any kind, but a road toward the joint continuation of the SALT process; a road to a long series of mutually verifiable treaties.

I know from experience how maddening protracted negotiations with the Russians can be. I know what these negotiations will demand of us: in the words of St. Francis of Sales, "A cup of science, a barrel of wisdom, and an ocean of patience." But we have no choice. Because the longer we drift on without firmly capping the arms race, the graver the dangers we create:

- the danger that a suspected violation, some unforeseen new technology or a sudden quantitative surge will trigger a desperate response;

- the danger that we may further split ourselves from Western allies who fear we lack seriousness about negotiation, whether on SALT or on European Theater Nuclear Forces;

- the danger that each new warhead we or the Russians build inevitably increases the possibility of a thermonuclear accident;

- the danger that a growing dependence on nuclear weapons to defend our interests major and minor all over the globe will someday trap us in a choice between Armageddon and surrender;

- the danger that if we don't act now, we shall lose forever the chance to limit future new devices of unimaginable complexity.

The time for action is at hand. And that action must begin in Washington, D.C. -- begin with the same urgency and effectiveness the Administration has shown in confronting our serious economic difficulties; the same urgency and courage the President has shown in already beginning a major buildup in our conventional forces.

President Reagan has pledged to "negotiate as long as necessary to reduce the numbers of nuclear weapons to a point where neither side threatens the survival of the other." Those negotiations have not yet started, and dangers escalate. Each week's delay makes the problem greater.

In response to George Kennan's recent drastic yet creative disarmament proposal, the designated head of the Administration's Arms Control Agency, Eugene Rostow, said not only that the Administration was "taking a serious look" at this proposal but added that "the whole miserable business is mad. We must find a way out."

President Reagan is riding a deserved high tide of popularity. I urge that he seize the moment to find that way out.

The time has come for all of us, under his leadership, to listen to the honored Americans -- beginning with Truman, Baruch, Eisenhower, and Bradley -- who have called for an end to the insanity of the arms race.

The time has come for all of us to reject the scenarios of the theoreticians mesmerized by computer projections into thinking that the leaders of the Soviet Union would bet their homeland on a lottery chance at victory.

The time has come to realize that our nuclear deterrent is robust under any possible contingency. Let our politicians and arms technicians stop poor-mouthing it.

Above all, the time has come for a new effort to cap the strategic arms race -- cap it through a verifiable treaty which gives both sides the security they require.

SALT II offers a good framework. Minor changes could be made at the negotiating table if necessary. But there is little time before technology and pressures on both sides push us into a new and unmanageable spiral.

We cannot wait for improved Soviet behavior around the world, or for better U.S.-Soviet relations. Control of strategic arms is not a concession to the Soviets. It must not be linked to irrelevant issues. Those who urge delay take an awesome responsibility on their shoulders.

Twenty-eight years ago in Sanders Theater across the street, a great American journalist, Elmer Davis, delivered the annual Phi Beta Kappa oration. It was a time of darkness and witch hunts and false accusations. And in calling upon friends of freedom to stand up and fight, he quoted the first book of Samuel, which tells of the fear of the Philistines as they faced a formidable foe.

"Woe unto us!" they said. "Who shall deliver us out of the hands of these mighty gods?" But when they looked around and saw that no one else was going to deliver them, they said to one another: "Be strong, and quit yourselves like men; and fight." And they did, and they saved themselves.

The title of that Phi Beta Kappa oration was: "Are We Worth Saving? And If So Why?" The title of my remarks today might be: "Can We Be Saved? And If So How?"

I have tried to suggest some answers. And despite the somberness of my theme, I remain an optimist.

I regard the first atomic explosion in 1945 as an arrival -- a culmination of mankind's long advance in ever greater mastery over the forces of nature.

I regard that explosion also as a watershed; because it signaled

man's capability for the first time to destroy himself and the earth he lives on.

But I do not regard that explosion of 1945 as a beginning of the end. The time has come for all human beings to realize that we must live together or die together.

I believe we have the reason and the realism and the common sense to choose life.

*(Reprinted by permission of Mr. Thomas J. Watson,
former head of IBM and US ambassador to Moscow)*

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Israel

By David McReynolds

Because the issue of Israel is so controversial, let me explain this is my own position, offered as part of a continuing dialogue on the Middle East. I know of no single question which is more likely to result in resignations, protests, and general anger than a critical article on Israel.

The reasons for this are easy to find, impossible not to view with sympathy. Jews have been an oppressed people for the better part of 2,000 years, trapped by history which they did not make, into a role they did not desire. They have been scapegoats and victims, enduring both systematic discrimination and repeated outbursts of violence, culminating in the Holocaust of World War II which took the lives of six million Jews—one out of every three Jews then alive on the planet.

It is not surprising that Jews are sensitive to any criticism of Israel, and tend to confuse that with an attack on Jews. If the Jewish community was not easily disturbed, it would suggest they were totally indifferent to the past. War Resisters League counts Jews not only among its current leadership, but among its founders. The League played an outstanding role in the 1930's in protesting Hitler's policies and in aiding refugees seeking entrance to the United States. But it is this very debt we owe, philosophically, to the Jewish tradition of justice, a tradition which is so deeply a part of our roots, our awareness of the ancient Judaic cry, "Justice, Justice Shalt Thou Pursue," which now compels me to address in a direct and blunt way recent Israeli actions.

We have always opposed terrorism, and have been emphatic in rejecting the use of terrorism by the PLO. What, then, can we say of the Israeli air strike at Beirut, where 400 civilians were killed? This is an act of State Terrorism which exceeds anything the PLO has done. What are we to say of the Israeli pre-emptive strike at the Iraqi nuclear power plant?

One must note that while WRL has said repeatedly that the State of Israel has a right to exist, and we have called on the PLO and the Arab states to recognize that right, it does not follow that the State of Israel has the right to exist on any terms it may set.

Nor does it follow—sobering thought—that the State of Israel, unlike all other states, is immortal in its present form. Given the current departure of Jewish Israelis for Europe and the United States, and the increase of the non-Jewish Israeli population because of the higher Arab birthrate, it will be impossible, within one or two decades, for Israel to be both a specifically Jewish State and a democratic one in which Arabs are free to vote. Already Israel finds itself in the appalling position of an occupying force on the West Bank, where it has ruled over another people since the 1967 war and shows no sign of meeting the conditions of the Camp David Accord. If Begin had the right to engage in terror to drive out the British and establish a Jewish National Home, can he logically deny to the PLO the same right in regard to Israeli control over the West Bank? Can American Jews, committed to a deep belief in justice, continue to give virtually uncritical support—or, in fact, any support—to a Jewish State which increasingly assumes the characteristics of an outlaw in terms of international law, which now counts as its only two firm allies South Africa and the United States, and which supplied arms to the Somoza government until it was overturned and is today engaged in the heavy supply of arms to the junta in El Salvador?

Is there not a moral problem that Israel grants to any Jew in the world the automatic right to settle in Israel and become a citizen, even though that person had been born ten thousand miles away, while Palestinians cannot return to the homes of their fathers, from which they were driven by the violence of the Irgun when the State of Israel was founded? These questions cannot easily be turned aside, and they press hard upon us now with recent Israeli actions.

Is it time for Begin to realize that his bombing of Beirut—not to speak of his relentless and appalling attacks for more than a year on populated areas of Lebanon—has now erased any moral distinction between the Israeli government and the PLO? The last barrier to dialogue is surely gone. More important, when Begin asks rhetorically if we would urge him to sit down and

talk to people committed to the destruction of Israel, our answer is yes. When you have a war, you do not negotiate with your friends but with your enemies. That is what negotiations are about. And Begin is unlikely to enter those negotiations so long as he continues to have a blank check for his actions from the major Jewish organizations in this country.

Finally, I would ask that Begin keep his hands off the six million victims of the Holocaust. I am appalled at what I consider his obscene effort to base current policies on the death of the six million. Since the majority of Jews that survived the Holocaust did not choose to go to Israel—however much they defend the right of other Jews to go there—one must assume that the six million who died did not authorize *any* State to speak on their behalf. More urgent, one must insist on the fact that the Holocaust is a matter that concerns all humanity, not Jews alone. First, because the six million were sisters and brothers of us all, and only after that were they Jews. True, they were chosen for death solely because they were Jews, but the tragedy of their death is not that they were Jews, who are not worse or better than others, but that they were innocent of any crime. True also that Black Americans were subject to slavery solely on the basis of color, but our reason for shame over slavery is not that the slaves were Black, but that we had made slaves of our brothers and sisters. Alas, suffering may transform individuals, but it does nothing positive for the mass of people. From the death camps of Hitler has come a State which engages in torture, in pre-emptive strikes, and in terrorism. Swiftly vanishing is the dream of the Zionist pioneers, who had thought to build a utopia in the desert.

One must, in the face of recent Israeli policy, suggest that unless that policy radically changes, the future of Israel is bleak beyond words. We speak bluntly because to fail to speak directly will be no service at all to the people of Israel, Jews and Arabs alike, who are not served by those who would approve every action, but who instead most urgently need friendly critics.

David McReynolds is a WRL National staff member.

Fallout from the Raid on Iraq

*By leveling a "peaceful" reactor,
Israel flattened the credibility of international atomic safeguards*

When Israel dropped a barrage of "iron bombs" on a French-built reactor in Iraq on 7 June, the damage extended beyond Baghdad, for Israel shattered a convention that has sustained a decade of trade in nuclear technology. In addition to life and property, the idea that went up in smoke was the notion that the industrialized countries can give the less developed world an expertise in nuclear power and at the same time withhold expertise in nuclear weaponry.

As Senator John Glenn (D-Ohio) said during an inquiry on the raid, Israel has

spectator Roger Richter, was doing his utmost in Washington to expose the agency's inspection process as a charade. He appeared as a surprise witness at the Senate Foreign Relations Committee inquiry on 19 June, summoned there by Senator Alan Cranston (D-Calif.). Cranston, an advocate of strengthening controls on fuel shipments, had spoken with the 33-year-old inspector earlier in the week and persuaded him to speak publicly about problems inside the agency. Richter agreed, and 3 days before the hearing, he quit his well-paid position as

problem, to no avail. When Richter began to read from a letter he had sent the State Department a year ago, he was told he was in danger of violating secrecy regulations. He had to paraphrase his letter. Here, in part, is the text he was not allowed to read in the hearing room:

The available information points to an aggressive, coordinated program by Iraq to develop a nuclear weapons capability during the next 5 years. . . . The IAEA safeguards are totally incapable of detecting the production of plutonium in large-size materials test reactors under the presently constituted safeguards arrangements. Perhaps the most disturbing implication of the Iraqi nuclear program is that the NPT agreement has had the effect of assisting Iraq . . . by absolving the cooperating nations of their moral responsibility by shifting it to the IAEA.

The Foreign Relations Committee also heard Cranston's charge that the January inspection of Iraq's reactor was conducted with the lights out: "It was limited to a visual inspection of the fuel. And the whole operation was conducted by flashlight." Several fuel elements could not be checked, Cranston added, "because they were locked in a vault and the key could not be located at that time."

As of this writing, the State Department's only comment has been that a response will be forthcoming.

The Richter testimony calls into question the present scheme of IAEA inspections and raises a general question about the law that governs them. Does the NPT really encourage only peaceful uses of atomic power, or does it indiscriminately stimulate all kinds of nuclear trade?

Despite Israel's many pleas not to do so, France shipped 13 kilograms of highly enriched uranium (93 percent pure) to Iraq in July 1980. This was done in accord with a 1975 Franco-Iraqi agreement in which France promised to build and fuel a pair of small reactors to be used for research. The agreement took shape under the duress of the post-embargo scramble for oil suppliers. France assured its continued access to desperately needed Iraqi oil and at the same time sealed a \$1.5-billion arms deal. In return, Iraq got some reactors.

Italy, also resisting Israeli protests, agreed in 1980 to supply Iraq with equipment to handle nuclear fuel. Richter claims that the Iraqis are getting shielded

"The IAEA safeguards are totally incapable of detecting the production of plutonium in large-size materials test reactors under the presently constituted . . . arrangements."

cast a vote of no confidence on the Non-Proliferation Treaty (NPT), the 1968 agreement designed to contain the spread of nuclear weapons. Under the provisions of this treaty, Iraq received the shipments of nuclear fuel and laboratory equipment that provoked the Israeli action.

Israel was not convinced by the reassurances of the International Atomic Energy Agency (IAEA), which said that Iraq had obeyed all the rules of peaceful nuclear research. As overseer of the system of safeguards meant to guarantee that atomic fuel is not diverted to warlike purposes, the IAEA had said as recently as January 1981 that nothing was amiss in Iraq. After the bombing, Sigvard Eklund, director general of the IAEA, said that he thought his agency had been attacked along with the reactor. The incident, he said, would have profound and far-reaching effects and "could do great harm to the development of nuclear energy for peaceful purposes." Indeed, the IAEA's first impulse after the raid was to ask other members to offer emergency assistance to help Iraq rebuild its reactor. The NPT requires members to promote peaceful uses of nuclear power.

While Eklund was trying to restore the status quo at headquarters in Vienna, a lower level employee of the IAEA, in-

the only American inspector in the IAEA division that watches the Middle East.

Richter has never been to Iraq, but he claimed to have good information about the situation there and about the limitations of IAEA inspection procedures. The latter, he said, amounted to a flawed system of accounting in which the inspector checks a list of shipments against a list of receipts made available by a country and then makes a perfunctory tour of "declared" facilities. Richter said that it is impossible to conduct a surprise inspection since one must obtain a visa beforehand. He also said that the type of reactor acquired by Iraq (a 70-megawatt materials testing device) could be used secretly to manufacture weapons material.

To support Richter's argument, Senator Cranston released several internal IAEA documents dated February and March 1981. These revealed that staffers at the IAEA had been concerned for more than a year that Iraq might have found a loophole in the inspection system. These staffers had recommended, unsuccessfully, that the IAEA adopt a more aggressive inspection policy for this type of reactor.

Richter said that he, too, had asked his superiors many times to address the Iraq

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laboratories for handling radioactive samples and possibly plutonium separation, a radiochemistry laboratory, a pilot reprocessing facility, and a fuel fabrication laboratory. For this, the Italian company providing the equipment has reportedly been paid a little over \$50 million, and Italy has won a contract to build military ships for Iraq.

In addition, several countries—Portugal, Italy, Niger, and possibly Brazil—have sent or are planning to send large quantities of semi-processed uranium known as yellowcake (U_3O_8) to Iraq. Estimates of the volume range from 100 to 300 tons. Iraq apparently has no plans to build facilities to convert the ore to fuel, but the ore could be irradiated in the French reactor to produce plutonium.

Even before the Italian deal, Israel announced that the situation was becoming intolerable. Israeli officials made threats in public and private, suggesting that if the big powers did not intervene, Israel would act to crush the growing nuclear program in Iraq. Some examples are worth citing. The chief aide to Menachem Begin was quoted last July as saying, "Israel cannot allow itself to sit back and wait for an Iraqi bomb to fall on our heads." Former chief defense scientist and Begin adviser Yuval Ne'eman warned at the same time that Iraq would be able to build a bomb within 2 years. Deputy defense minister Mordecai Zippori was quoted as saying of the campaign against Iraq, "We will explore all legal and humane avenues. If pressure doesn't work, we'll have to consider other means." At that time Israel had already been accused of directing murder and sabotage plots against Iraqis (*Science*, 29 August 1980, p. 1001 and 31 October 1980, p. 507).

Although Israel did apply diplomatic pressure in the United States and Europe, it never made public its full case against Iraq. Perhaps Israel found it awkward, having never signed the NPT, to demand that restrictions be imposed on Iraq, a seemingly obedient follower of NPT rules. Perhaps Israel's military did not wish to draw attention to the bombing plan.

In any case, the failure to make a formal case against the Iraqis before the attack is now seen as a breach of international law. Undersecretary of State Walter Stoessel, Jr., told the Senate Foreign Relations Committee on 18 June: "The United States was not consulted in any way about any phase of the Israeli action, nor were we informed of it in ad-

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vance. Although we had concerns about the potential of Iraq's nuclear program, we do believe that the Israelis had not exhausted all the diplomatic options available. . . . For these reasons we condemned the attack."

In the hours just after the attack, Israel



Roger Richter

Having quit the IAEA on 16 June, he testified that Iraq was planning to make atomic bombs.

issued some information to justify its action that has since proved false. For example, Begin mentioned that there was a secret bomb factory which he said at first was 130 meters and later 13 meters beneath the reactor. There was no such factory. A State Department technical expert, John Boright, acting deputy assistant secretary for nuclear energy and energy technology, said in the Senate hearings that the only thing that might fit Begin's description was a fuel transfer tunnel running between the large reactor (Osirak) and the small backup reactor.

Israeli officials also said it was necessary to move quickly because the bomb program would soon be under way and the reactor would be charged with hot fuel. Attacking a hot reactor, it was said, would cause radiation deaths in the city of Baghdad, 12 kilometers away. Thus, the bombing was presented as a humane act.

Physicist William Higinbotham of the Brookhaven National Laboratory says it is very unlikely that bombing such a small reactor would produce any radiation deaths. Yet, as several congressmen pointed out, an attack on a hot reactor would have produced horrible political fallout, even if it produced no deaths.

No one has claimed that Iraq was actually building a bomb or even producing weapons material at the time of the attack. Although several scenarios have been proposed to illustrate how Iraq might have produced bomb material in the future, none suggests that Iraq could have made a bomb sooner than a year from now.

In the most likely scenario, Iraq could have used its French reactor to irradiate natural uranium, thereby producing plutonium, which could have been extracted and used in weapons. All the technical witnesses who appeared before the Senate Foreign Relations Committee in June said this was the most credible scenario. Yet even Richter, who believes Iraq is already headed down this path, agrees that many obstacles blocked the way.

A large-scale irradiation program would cause the reactor to burn fuel more rapidly, for instance, perhaps requiring twice the scheduled number of fuel shipments each year. Higinbotham says. The French would have to cooperate in the deception, which seems unlikely. It might also be necessary to rearrange the reactor's plumbing to remove excess heat. Large casks of irradiated material would have to be trundled from place to place, out of sight of the IAEA inspectors. Tons of material would have to be processed through the laboratories. Would the 75 to 150 foreign technicians running the reactor fail to notice? Would they keep quiet if they did notice? And how would the extra fuel shipments and the irradiation program be explained to the IAEA?

If all this activity could have been hidden successfully, and if a miracle of industrial productivity had occurred in a country not noted for technical feats, Iraq might have collected enough plutonium for two or three bombs at the end of a year, according to Richter. Higinbotham disputes this estimate, based on his own recent calculations of the uranium-to-plutonium conversion rates possible in Osirak. He says that even under the most favorable conditions, Iraq could have produced enough material for only one bomb a year.

France has not been entirely straightforward in describing the Iraqi program, and this may have led to confusion. For example, French officials have told the IAEA and the press that the reactor is producing 40 megawatts of power, while a small-reactor specialist at the Department of Energy tells *Science* that he has learned from French engineers that Osirak is capable right now of running at 70 megawatts, without major mechanical

changes. The higher the power, the greater Osirak's weapons-producing ability. In addition, many observers have questioned France's wisdom in waiting until 2 weeks after the bombing to reveal an agreement that reputedly guarantees French control of Osirak until 1989.

There is little reason to fear that Iraq was on the verge of producing a nuclear weapon. Yet there is evidence of a hidden agenda in Iraq's nuclear program, which may come to the surface 5 to 8 years from now. As Boright noted during the Senate hearings, the United States has been worried by the breadth and the pace of Iraq's investment in nuclear technology. It seems unusual at so early a stage of development.

If Iraq is truly interested in research and training, why does it need any fuel processing equipment? And its choice of the Osirak reactor as a first purchase seems unusual. According to a Department of Energy physicist familiar with research reactors, this type of reactor was really meant to be used in conjunction with a thriving nuclear industry. A materials test reactor is designed to generate a large neutron flux, and it is shaped with extra space in the core to hold test samples. It is a builder's tool, used to test fuel rod alloys and other materials used by reactor manufacturers. The materials test reactor may also be used to manufacture large quantities of

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weapons material.

radioactive isotopes for basic research and radiomedicine. Iraq has no nuclear industry and no pressing need for radioisotopes. Thus, the reactor may have been destined to serve as an expensive training device and perhaps as a plutonium factory.

The most striking anomaly, of course, is the notion that Iraq, with potential oil reserves that rival the Saudis', finds it necessary to resort to atomic power for electricity. Last of all is the fact that Iraq's president has said he would like to bomb Tel Aviv off the map. Taking this into consideration, it is not difficult to understand why Israel was unwilling to trust its fate to the deliberations of the IAEA.—ELIOT MARSHALL

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