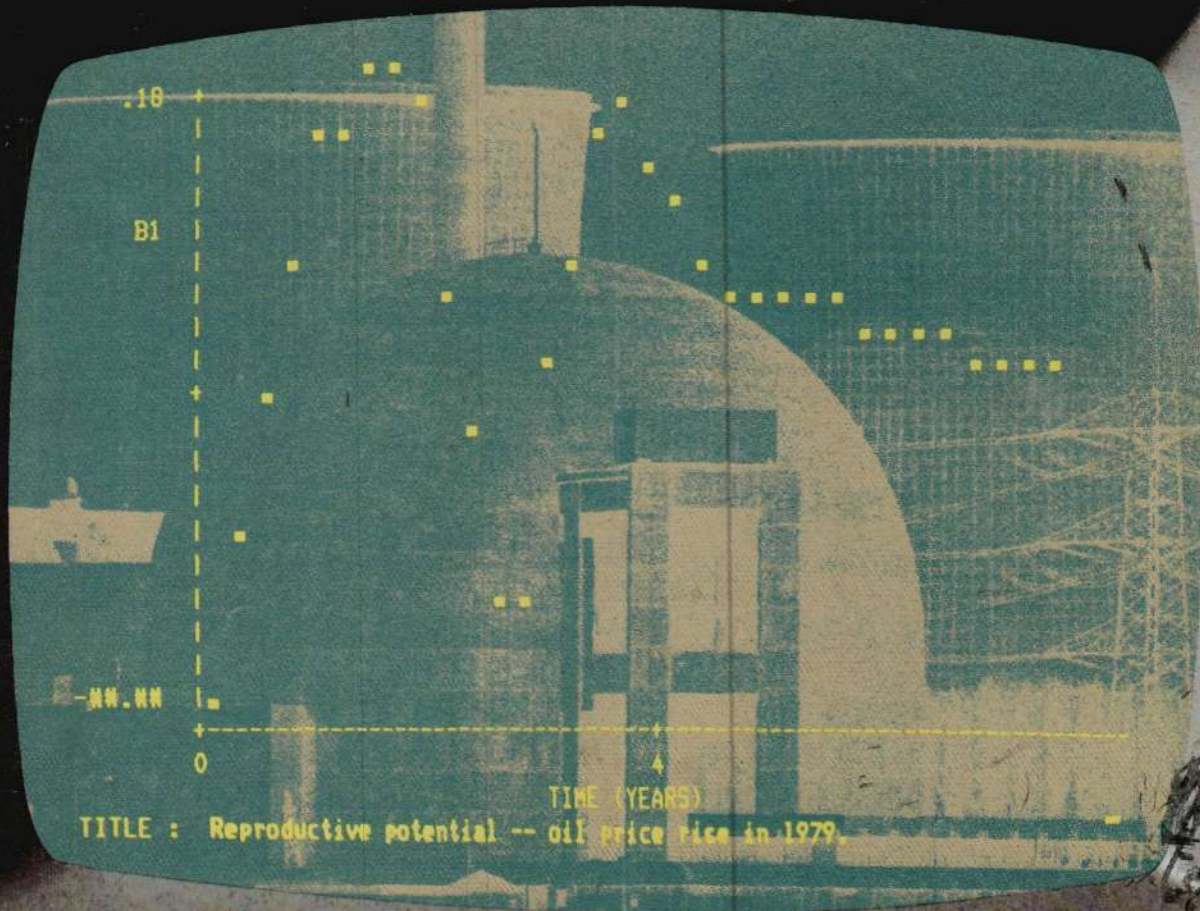


# FUSION

MAGAZINE OF THE FUSION ENERGY FOUNDATION  
July 1979

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in Canada

## Economics Becomes a Science



# FUSION

MAGAZINE OF THE FUSION ENERGY FOUNDATION

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*"... There is, in the genius of the people of this country, a peculiar aptitude for mechanic improvements. . . . It would operate, as a forcible reason for giving opportunities to the exercise of that species of talent, by the propagation of manufactures. . . . To cherish and stimulate the activity of the human mind, by multiplying the objects of enterprise, is not among the least considerable of the expedients by which the wealth of a nation may be promoted. . . ."*

Alexander Hamilton  
From the Report on the Subject of Manufactures  
December 5, 1791

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## Editorials

# July 4: Economic Shutdown or American Renaissance

This July 4 issue continues two of our grand old *Fusion* traditions: presenting breakthroughs in science and exposures of what's really behind the antiscience mob. Our lead story in the national news and the science feature on the front cover bring these two themes together as sharply as it has ever been possible to do.

On the positive side, the article by Steven Bardwell and Uwe Parpart on the LaRouche-Riemann economic model provides the means of immediately driving out all the half-baked economic schools now dominating American corporate and academic life. The model will be used to expose what the actual economic consequences of zero-growth policies are; conversely, it will show how to maximize the short-term and long-term payoff from investments in industry, agriculture, and science.

The article itself should make clear to readers the conceptual blocks they will have to overcome in order to grasp real economic science. The main point we want to stress here, however, is that the method of real economic science has to be used as a weapon in the life-and-death fight against Malthusian economic policies.

### Another Hoax

That brings us to our second topic: the great gasoline hoax of 1979.

Coming on the heels of the great Harrisburg hoax, more than one reader may have asked himself or herself whether there's a plot to shut down U.S. energy supplies. Such skepticism is perfectly well founded. As the material on Schlesinger's gas hoax (see National news) makes clear, the energy shortage has nothing to do with problems of supply and demand.

Most likely the questions that will remain in the minds of the reader after looking at the facts are who benefits from such a policy and even if they benefit monetarily; why are they implementing such madness? Energy Secretary Schlesinger's pro-Malthusian speech June 4 (see Washington news) provides a good set of clues to the answer.

The institutions responsible for setting the policy line at the International Association of Energy Economists where Schlesinger spoke included the World Bank, the International Monetary Fund, and several of the Seven Sisters oil multinationals.

Their policy? Shut down huge chunks of the U.S. and other industrial economies using contrived energy shortages and price hikes, reduce the populations of Third World countries by millions and then billions. And for what?

To be sure, these institutions are realizing enormous short-term windfall profits, but their real objective is to remove the growing threat of a grand design for development from the world's advanced- and developing-sector

republics in order to maintain the existence of their warped Malthusian outlook and institutions. Mere greed or power lust cannot explain why Schlesinger, other leading cabinet members, and corporate officials would sell out their American birthright.

This July 4 represents much more than a time to symbolically reaffirm the American traditions of scientific and technological progress. Perhaps even more than in 1776, 1812, 1860, and 1941, America and the world face a historic conflict in which the real adversaries are reason and progress on one side and the remnants of feudalism on the other.

## Support the Independent Commission

As readers of *Fusion* know, shortly after the Three Mile Island incident the Fusion Energy Foundation called for an investigation into the high probability that the TMI shutdown was caused by sabotage. To ensure adequate public awareness and a proper view of the evidence, shortly thereafter the FEF formed what has subsequently become the Independent Commission of Inquiry. It is important for our readers to understand the significance of the work of the commission and why it deserves full support.

There are three levels to the fight that must be waged.

First, it is insufferable to have to endure the massive lies about Three Mile Island. A republic's citizenry needs the nourishment of truth. The commission is now the only investigative body with a mandate to set the record straight on how the TMI incident was initiated and what the actual results of the plant malfunction were.

Second, the TMI case is crucial to the fight for nuclear energy as the cutting edge of the nation's present and future energy inventory. Based on the lies preceding, during, and after TMI, approximately 19 nuclear plants representing more than 25 percent of the nation's nuclear-generated energy have been shut down.

Now the entire future of nuclear power is in jeopardy or, at best, consigned to the fate that Secretary of Energy Schlesinger indicated in his post-TMI remarks on how a few big utilities might still be allowed the luxury of nuclear energy.

Third, and most important, the fight for the truth about TMI and the necessity of nuclear energy are subsumed features of the larger philosophical policy questions posed for the nation today. As *Fusion* will document in the August issue, the ultimate objective of the most influential among the nuclear "antiproliferators" is what they call the controlled disintegration of the U.S. and other advanced industrial economies. This outlook, spelled out in a series of *Project 1980s* studies sponsored by the New York Council on Foreign Relations, has created and propagated the massive lies about TMI and nuclear energy to aid the "disintegration" they aim to control.

### A Weapon for Progress

The Independent Commission of Inquiry, therefore, is one of the weapons placed at the disposal of Americans who are still committed to the idea of progress. The full investigative report of the commission will prevent the use of TMI as a battering ram for nuclear shutdown. At its June 9 meeting, the commission reviewed the evidence that it will release shortly. This evidence makes it perfectly clear that the Federal Bureau of Investigation as well as legislative and executive investigative bodies must answer the sabotage charge.

The commission's public campaign for nuclear energy will clarify the pivotal role of nuclear energy in bringing the U.S. and world economies into a period of economic boom, followed by the transition to fusion power.

If that's a fight you believe in, now is the time to send your contribution to the Independent Commission of Inquiry on TMI. The commission is being administered by the Fusion Energy Foundation, and checks earmarked for the commission and made payable to the FEF are tax-deductible.

## Calendar

### July

2-6

International Symposium on  
Underground Disposal  
of Radioactive Wastes  
IAEA  
Otaniemi, Finland

2-6

Nonlinear Optics and Lasers  
Gordon Research Conferences, Inc.  
Wolfeboro, N.H.

13-18

Power Engineering Society  
Summer Meeting  
Minneapolis, Minn.

16-20

Sixth International Conf.  
on Molecular Energy Transfer  
Lioujas, France

16-20

Annual Conf. on Nuclear  
and Space Radiation Effects  
IEEE, NPS Radiation  
Santa Cruz, Calif.

31

Conf. on Nuclear Energy and  
the Science of Economics  
Fusion Energy Foundation,  
Executive Intelligence Review  
Chicago

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Readers are invited to submit calendar items.  
Address correspondence to *Fusion*, 304 West  
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Celebrate the  
American Tradition  
of Science  
and Progress  
with a contribution  
to the  
Fusion Energy  
Foundation

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# The Lightning Rod

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My dear friends,

Although known to the Publick for some years now, it is only in the past 60 days or so that the Honorable Dr. James Rodney Schlesinger has become the name on everyone's lips—tho' regrettably the lips are often twisted into quite gruesome poses, particularly in the vicinity of gasoline pumps.

In the interest of better acquainting our Citizens with the qualities of this remarkable man, I supply the following Psychologist's account of our Energy Czar's Childhood, Youth, and early career:

### Oral Phase

Young Rodney was known at first as a hungry baby, but quickly learned from Mama Schlesinger to control his appetites. Although a firm believer in breast feeding "on demand," Mama never allowed little Rodney access to either nipple until he was "able to articulate a rational choice." It wasn't long before Dad's pipe was clenched tightly between Rodney's gums, where it has rested to this day.

[Some think Schlesinger's famous concept of "trade-offs" is traceable to this Incident—B.F.]

### Delayed Latency

Rodney achieved his first brush with fame at the age of five, when a

mysterious toy shortage struck the Schlesingers' affluent neighborhood after a small department store fire.

"The world is running out of toys," the precocious Rodney announced. Sure enough, toys even began disappearing from kids' houses. Soon, no one had any toys at all. Everyone thought Rodney was very smart for predicting the toy shortage.

A few years later, when the Schlesingers were excavating for a swimming pool, some workmen found the missing toys, buried along with an empty gasoline can in Rodney's backyard. "That's my strategic reserve," the young Rodney explained.

### Trauma and Triumph

Consequently, his parents thought it might be better for Rodney's health if he went away to boarding school. And before you know it, puberty, as it must to all boys, came to Rodney Schlesinger.



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## Letters

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### 'I'VE BEEN DELPHIED'

To the Editor:

Your article in *Fusion* (May 1979) asks: "Have you been Delphied?" Yes, I have. I am a research anesthesiologist.

The Association of University Anesthetists a couple of years ago initiated a Delphic inquiry into problems anesthesiological research should study during the 1980s, the idea being to produce a guide for people wanting to apply for federal research support. They divvied up the territory into half a dozen fields, formed a committee for each, and each committee solicited from selected crystal gazers. Two of them asked me.

I refused. I could make useful forecasts in the few areas in which I am knowledgeable, but in my opinion the essence of the National Institutes of Health grant system is—or should be—its competitiveness. Investigators who haven't the insight to see for

themselves where they should be going are likely to be wasting their time and the public's money.

(Name withheld upon request)

### 'MAD AS HELL'

To the Editor:

Quite by chance, I was introduced to *Fusion* magazine (the Oct., 1978 issue), and, through it, to the concepts and status of deuterium-tritium fusion as a practical energy source.

Since then, I have read some generalized material from "official" sources, always downplaying fusion research, shelving practicality for the 21st century. I have, however, managed to get my hands and mind on tiny bits of technical information which corroborate and expand upon the expressions gotten from that single issue of *Fusion*, and my eyes and ears have become tuned to the buzzwords of fusion research so that they pounce at me from amid news of barn fires and garbage route changes.

I'm mad as hell, and I'm not going to take it any more! . . .

I wish to recruit others to help bring about a Mission Apollo-style funding and research program, using information from *Fusion* and other sources. Information about the Fusion Energy Foundation would be helpful,

as would information as to the availability of inspirational/informational paraphernalia to help me to get fusion on as many minds as possible. . . .

Please consider me a member of the crusade.

Paul A. Lee  
Dillsburg, Pa.

### The Editor Replies

The FEF welcomes you and other readers who are mad as hell and want to organize. We have just initiated a members bulletin that will be mailed out to report breaking news and organizing campaigns. A top-priority area for reaching a wide audience is radio talk shows, and newspaper interviews and op ed columns, especially around the FEF work on Three Mile Island. Readers who can organize such publicity should get in touch with the FEF New York office, 304 West 58 Street, New York, N.Y. 10019, Tel. (212) 265-3749.

### SUBTLETY VS. WINNING

To the Editor:

We are electrical manufacturers representatives located in Portland, Oregon. Our association with the electrical industry has by necessity made us aware of the potential of nuclear energy as well as concerned

But here too Rodney expressed certain singularities that set him apart from the common run of mankind. This phase of his life ended tragically in college, when a thoroughly intoxicated Rodney, wallowing in a house of most unsavory reputation, became excited at an offer to have himself shaved with Occam's Razor and awoke to find that some essential equipment had been carried away.

Reviewing the case, a Faculty Disciplinary Committee decided that this maturing experience qualified Rodney for a full professorship in Economics. He was awarded the Parson Malthus chair.

Further excerpts to come.  
Yr. obt. svt.

*Benjamin Franklin*

for the lack of a viable alternative. Our support for nuclear electrical generation is shared by most in the electrical industry be they manufacturers, distributors, representatives, or users.

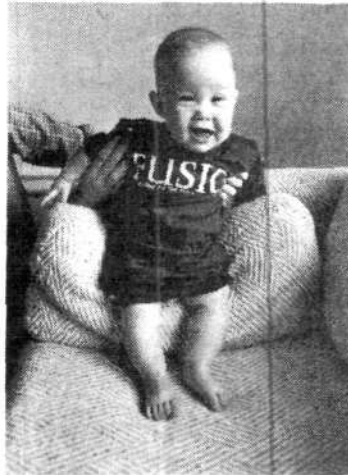
I am, however, concerned that some of the promotional slogans used by the Fusion Energy Foundation are detrimental to the cause at hand, specifically those referring to Senator Ted Kennedy and Jane Fonda. Although I disagree with Mr. Kennedy and Ms. Fonda on most occasions, the slogans are in bad taste at best and are not relevant to the issue. You may find yourselves alienating many potential supporters. One of the first rules of selling is not to turn your buyer off before you have an opportunity to make your presentation. The use of the posters I have seen in several West Coast airports are about as subtle as being hit in the head with a bat.

Let us be advocates of nuclear energy. The antinuclear people have enough zealots to go around.

The public should be hit with objective, factual information, not subjective rhetoric.

David M. Gerton  
President, Agents West  
Portland, Oregon  
*Continued on page 85*

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## News Briefs

### INDEPENDENT COMMISSION HOLDS N.J. PRESS CONFERENCE

The Independent Commission of Inquiry into the Three Mile Island incident, a group initiated by the Fusion Energy Foundation, presented its preliminary findings at a well-attended press conference in Trenton, N.J. June 15. Representing the commission were Jon Gilbertson, a nuclear safety expert on the staff of the FEF, and Walter Forbes, vice president of Aramsco. "Support for nuclear energy in New Jersey, which gets the bulk of its energy from General Public Utilities, the parent company of Metropolitan Edison that owns the Three Mile Island Plant, is critical to the state's continued industrial development. The residents of New Jersey should demand that the question of sabotage at Three Mile Island be fully addressed by all the official investigating bodies," Gilbertson said.

In addition to local television, radio, and newspapers, as well as United Press International and Associated Press, there were representatives at the press conference of trade unions, the state departments of agriculture, environment, labor, industrial development, and energy, and the state legislature's energy committee. See the Special Report in this issue for more news of the commission.



Harold Denton

### NRC APPOINTS ENVIRONMENTALIST TO HEAD TMI INVESTIGATION

The Nuclear Regulatory Commission appointed Mitchell Rogovin, an attorney with antinuclear sympathies, to head what it called an "independent investigation of the events surrounding the nuclear plant at TMI." Rogovin was the general counsel for the antinuclear Common Cause lobbying group from 1970 to 1975 and is a fellow of the Institute for Policy Studies, the group that has overseen environmentalist and terrorist groups from the Weather-underground to the Clamshell Alliance. Rogovin's firm, Rogovin, Stern & Huger, also has represented the environmentalists in some of the leading anti-industrial suits in California. The NRC investigation is budgeted at \$450,000.

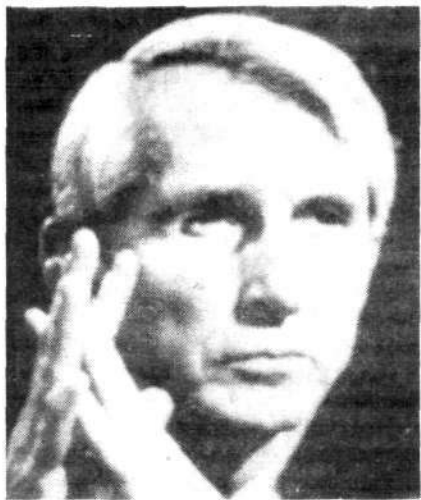
One Washington source commented that the NRC had arranged for this independent investigation to counter the work of the independent commission initiated by the Fusion Energy Foundation and to make sure that any discussion of sabotage stayed within the realm of "isolated, individual acts."

### NRC IMPOSES THREE-MONTH LICENSING MORATORIUM

The Nuclear Regulatory Commission ruled to impose a moratorium for at least three months on all nuclear plant licensing while safety lessons from the Three Mile Island incident are being "studied." The decision came in a ruling May 21 by four of the five NRC commissioners on a recommendation by Commission Reactor Regulation Director Harold Denton. Denton was in charge of the on-site NRC operations during the incident at Harrisburg.

NRC chairman Joseph Hendrie, who opposed any moratorium as unnecessary, was out ill. In his absence, Commissioner Victor Gilinsky, the most consistent—along with Peter Bradford—of the antinuclear NRC commissioners, chaired the session and approved Denton's moratorium plan.

The decision immediately affects six plants.



Joseph Hendrie

### MORE FUDGED DATA: THE ROCKY FLATS CANCER SCARE

Dr. Carl Johnson, whose claims that plutonium leaking from the Rocky Flats nuclear weapons plant near Denver had created another "cancer alley" were featured in the *New York Times*, used false data to prove his antinuclear point. The Colorado Health Department, the Nuclear Regulatory Commission, and the U.S. Environmental Protection Agency all believe that "Dr. Johnson's study was riddled with methodological errors and is largely useless," according to a recent *Denver Post* editorial.

Johnson's scientific method to demonstrate that people living near Rocky Flats were dying from radiation-caused cancer was simply to draw circles around the plant and compare the incidence of cancer within each circle.

Conveniently, inner-city poverty areas of Denver were considered closest to the plant while affluent suburban areas were excluded because "their populations were transient." As everyone knows, poor living conditions lower the body's ability to resist all diseases, including cancer. For these and other reasons, the study has been completely rejected by the Colorado Health Department, which had asked the EPA and NRC to check Johnson's findings. Johnson is the director of the Jefferson County Health Department.

*Fusion's* question to the *New York Times*: Where's the feature story reporting Johnson's loss of credibility?

#### SOVIET ACADEMICIAN SAYS TMI DANGER 'EXAGGERATED'

Writing in the current issue of *Problems of Peace and Socialism*, published in Prague, the president of the Soviet Academy of Sciences called the Three Mile Island incident a case of "gross exaggeration by the press." A.P. Aleksandrov also noted that without nuclear power, the United States, as well as West Germany and Japan, would "lose their economic importance." Aleksandrov criticized the Carter administration's fast breeder plan as inadequate to meet U.S. energy needs, which he said should double in 10 years.

#### SOVIET PREMIER: NO ANTINUKE 'MINES' IN SOVIET COUNTRIES

At a ceremony inaugurating Czechoslovakia's first nuclear power plant May 24, Soviet Premier Aleksei Kosygin noted what he termed certain advantages enjoyed by the Soviet Union and sister socialist bloc countries. Western nations are "mined" with antinuclear environmentalist movements that sabotage their development, Kosygin said, whereas both the Soviet Union and Czechoslovakia are irrevocably committed to the development of all peaceful forms of nuclear energy. Czechoslovak Premier Lubomir Strougal announced at the ceremony that his country intends to become the first socialist state to export nuclear industrial technology to the West.

#### IRAN'S NUCLEAR POWER PROGRAM TO BE SCRAPPED

The Iranian government of Ayatollah Khomeini reportedly plans to scrap \$34 billion worth of development projects for Iran, including four nuclear power stations, two of which were to have been built by France and two by West Germany. Attempting to justify the dismantling of Iran's development plans, one Iranian official claimed: "With our lack of technology and the problems involved with nuclear power plants, at this time it is not good to have them."

Reliable sources report that the government sent letters to Iranian nuclear engineers canceling their scholarships, since their skills are "no longer needed."

Iran's nuclear power program, set in motion by the deposed Shah, was one of the world's most ambitious and planned 23 nuclear plants by 1990. Of these, two plants constructed by West Germany in the port city of Bushir are near completion.

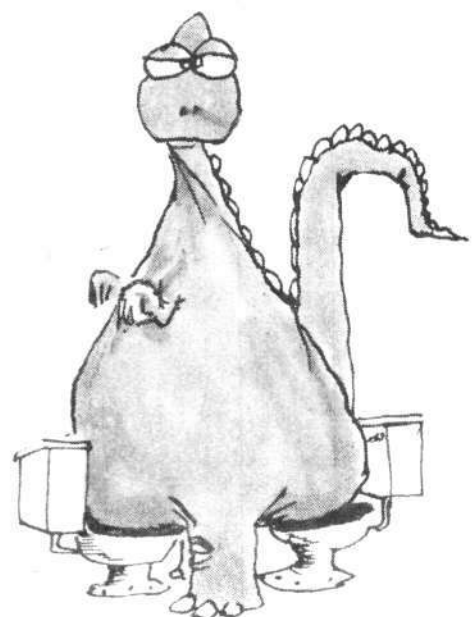
#### LOUSEWORT LAURELS TO NEW REPUBLIC

This month's lousewort laurels go to *New Republic* magazine for its latest foray into yellow journalism. In the April 14 issue, *New Republic* touts a proposal submitted by one Mary Louise Weber for dealing with the "water shortage" as a "visionary plan." According to Miss Weber, each family should have two toilets, one for urinating and a second to accommodate more substantial human wastes. The urine tank could be "filtered through a layer of organic substance and then piped through the house into the showers. Thus, the same water would serve a double purpose, eliminating the extreme wastefulness of the present system."

Urine showers are "healthful," Weber said, and less frequently necessary than other bathing. She claims that urine can act on the skin as a natural moisturizer, instead of "costly" cosmetic lotions.



Dr. Carl Johnson: no credibility





# Investigating The Harrisburg Hoax

1. Commission Presents Evidence of Sabotage
2. The Case for Sabotage: Human Error Ruled Out
3. The Big Lie About Radiation
4. Waste Disposal Dispute Threatens Cancer Research

## 1

### Commission Presents Evidence of Sabotage

The Independent Commission of Inquiry into Three Mile Island has held several meetings and press conferences in Pennsylvania to compile and publicize evidence on the probability of sabotage at the Three Mile Island nuclear plant. The commission, which was initiated by the Fusion Energy Foundation in April, has 11 members, representing industry, labor unions, and nuclear science.

To make sure that the question of sabotage is fully addressed in all the official governmental investigations of the TMI incident and to counteract the antinuclear propaganda, the commission has launched a fundraising campaign to put full-page advertisements in the *Harrisburg Patriot*, the *Journal of Commerce*, *Nuclear News* and other national press. The commission is administered by the FEF, and contributions earmarked for the commission ad campaign and made payable to the FEF are tax-exempt.

The commission held its first official meeting at the State Capitol building

in Harrisburg, May 24. In the private part of the meeting, FEF executive director Morris Levitt laid out the TMI situation in the light of the recently published Council on Foreign Relations' *Project 1980s* scenario for the "controlled disintegration" of the U.S. economy.

The commission members resolved to raise \$5,000 to fund a complete report on TMI and \$10,000 for the full-page advertisements mentioned above. They defined the ad campaign as "urgent" in light of the mounting propaganda to kill nuclear energy in the United States.

After the commission meeting, members met with State Representative Jim Wright, chairman of the Pennsylvania Legislature's Investigating Commission on TMI, the legal counsel and secretary for the state commission, and other state legislators. The state commission offered time for the independent commission to testify at state hearings.

#### Key Questions

The independent commission recommended three key lines of investigation to the state commission:

(1) What will be the effect on the U.S. economy of shutting down nuclear power?

(2) The admitted sabotage at the Virginia Electric Company's Surry II nuclear plant makes it completely irresponsible not to seriously and ade-

quately investigate the likelihood of sabotage at TMI.

(3) Is the federal government's policy on nuclear power, as well as the national antinuclear press coverage, a result of the influence of zero-growth philosophy?

The commission members also held meetings with the American Legion, the State Chamber of Commerce, farm and labor groups, the State Department of Agriculture, and the coordinator of the governor's commission to investigate TMI.

The commission has defined two essential goals. First, to provide the sharp cutting edge of a campaign for nuclear development to counter the rapidly increasing attacks on nuclear power. Second, the commission intends to force the sabotage issue to be considered by the public and the official commissions investigating TMI.

Commission members feel that at this point the nuclear industry has adopted an official policy of "sitting this one out," while the guttersnipe environmentalists and their more respectable collaborators in the government are tearing the industry apart, brick by brick.

Readers who can arrange publicity for the commission campaign—radio and TV interviews, for example—should contact Jon Gilbertson at the FEF New York office.

# 2

## The Case for Sabotage: 'Human Error' Ruled Out

by Jon Gilbertson

Although none of the official investigations of TMI has publicly addressed the sabotage question, some of the evidence presented in recent testimony has backed up the case for sabotage. In fact, testimony on the first two events of the sequence of failures of the TMI plant has confirmed that mechanical failure was not involved.

Both events were instead caused by what the Nuclear Regulatory Commission calls "human failures" or "operator error." However, the NRC has provided absolutely no explanation of how this could be possible. To date, in fact, it has been impossible to get anyone in the know to discuss these two events or to give any kind of explanation of how human error could account for them.

Before reviewing the recent testimony on the sequence of events leading to the TMI incident, I'll summarize what I reported in the May issue of *Fusion*. At the time of the incident, the Fusion Energy Foundation raised the question of the extreme unlikelihood of the then-known sequence of failures at the plant. The probability that mechanical failure could have caused the first two failures in series—that is, the main feedwater flow loss followed by the loss of both auxiliary feedwater flow systems—was less than 1 in 1 million. If you added to that the 1 in 1,000 probability that the pressure relief valve would fail in the open position, the probability of the sequence of failures became 1 in 1 billion.

Either of these extremely low probability sequences would lead any person knowledgeable in probability analysis to conclude—as the FEF did—that mechanical failure was not the cause of the incident; human intervention was.

What follows is a point-by-point review of the technical facts of the

case surrounding the complete loss of both feedwater flow systems, the main and the auxiliary systems, as they have been presented in public testimony.

### Auxiliary Feedwater Flow System

Both auxiliary (or emergency) feedwater flow systems had been manually put out of operation before the incident by the closing of two separate valves. These two valves, one each in two completely separated auxiliary feedwater flow systems, are "presumed" to have been shut off for 42 hours preceding the incident. At that time, these two valves had been tested as required by NRC regulations, during which they were closed and reopened over a three-hour test period.

Although the written test records show that these valves were reopened—they were signed off as such by the operator—it is now "officially" assumed that the valves must have remained closed from that time on until the incident. That is, it is assumed that the operator actually *forgot* to reopen the valves, even though he signed and checked off that he did. Further, this means that the valves remained closed as at least five different shifts of skilled and experienced operators came on and off duty, never noticing or checking the red alarm lights, tags, open switches, and so forth that would alert them to such circumstances on two of the most important valves in the plant.

Operation of a nuclear plant under such conditions is strictly prohibited by regulation and protected against by various electronic means as well as by rigorous sign-off and checking procedures, as all operating personnel are aware.

Accepting "human error" as responsible for this is asking the public to believe that all the protective measures were bypassed or ignored

## Initial Members of Independent Commission

### Prof. Charles Bonilla

Former Chairman  
Chemical Engineering Dept. and  
Former Director, Nuclear Program  
Columbia University, New York, N.Y.

### Robert Dabler

Dabler Steel  
Berkeley Heights, N.J.

### Emil Decembre

President  
Building and Construction Council  
Beaver County, Pa.

### George Diamond

Diamond Aerosol Corporation  
Glen Gardner, N.J.

### Walter Forbes

Vice President and Consultant  
ARAMSCO Corporation  
Thorofare, N.J.

### Jon Gilbertson

Director of Nuclear Engineering  
Fusion Energy Foundation  
New York, N.Y.

### Frank Hewes

Corporate Treasurer  
Adirondack Steel Casting Corp.  
Watervliet, N.Y.

### Henry Hill

President, Central Labor Council  
Cumberland County, N.J.

### Dr. Morris Levitt

Executive Director  
Fusion Energy Foundation  
New York, N.Y.

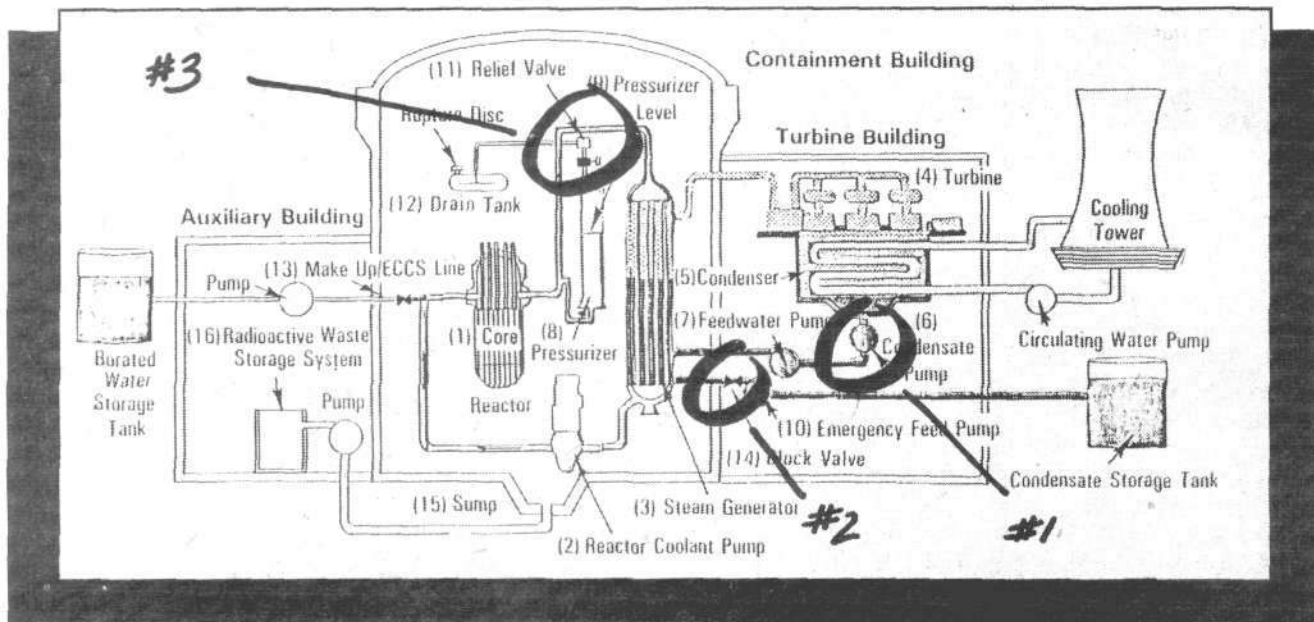
### Jim Rebman

Manager, Field Sales Dept.  
ACME Corporation  
and formerly Nuclear Navy  
Fort Worth, Texas

### Ira Seybold

Senior Engineer, Dosimetry Systems  
Yankee Atomic Power Company  
Westborough, Mass.





This schematic of the TMI plant was part of the testimony of Herman Dieckamp, president of the General Public Utilities Corporation, at congressional hearings May 24. Fusion has circled the locations of the three failures mentioned in this text.

and, furthermore, that the operators were totally incompetent. Such a situation is not credible in any power plant, not to mention a nuclear plant.

A more likely explanation is that these valves were closed intentionally sometime before the incident, perhaps within minutes or even hours, for the purpose of creating a potentially serious incident at TMI. All that would be necessary to produce such an incident is to somehow cause the main feedwater flow system to trip out and shut itself down.

Under normal circumstances, after a main feedwater flow loss, three separate and independent auxiliary feedwater pumps automatically would come on, pumping sufficient feedwater through any one of three pumps to cool the reactor in a shutdown condition. In the TMI incident, these three auxiliary pumps, in fact, did come on within two seconds after the main feedwater flow shutdown. However, the pumps could draw no water because their water source was shut off by the closure of the two feedwater valves for the two separate, independent flow lines. Therefore, at least until this condition was discovered and corrected by the plant operators, the reactor core had no means of transferring its heat outside

the reactor building and it had to begin to heat up.

#### Main Feedwater Flow System

Circumstances surrounding the shutdown of the main feedwater flow system and the resulting turbine trip are even more cloudy than the explanations given for the failure of the auxiliary flow systems. However, the one thing that now appears certain is that its shutdown was also *manually induced*. It was the loss of main feedwater flow that initiated the TMI incident and, with both auxiliary (backup) feedwater systems suspiciously out of service, led to the subsequent more serious events.

The main feedwater flow loss was triggered approximately as follows. Maintenance was being performed on the condensate polishing (filtering) system during the one- to two-hour period preceding the incident, which consisted of cleaning several partially plugged filters. This cleaning process involved opening a valve on a pressurized air line on each filter, which forced air back through the filter (against the direction of water flow) thus blowing out some or all of the residue clogging it.

Apparently, after at least one filter had been successfully cleaned this way, the maintenance crew went on

to another filter to begin a similar process. However, it now appears that the maintenance person or persons failed or forgot to shut off the air valve on the first filter, as the procedure calls for, before moving on to the next. Since the compressed air lines on all these filters are manifolded together, the opening of the second air valve while the first air valve was still open somehow (the exact explanation is not available yet) caused water to back up into the air line of the first filter arrangement.

This manually initiated event caused a condensate pump to turn off, which, in turn, caused an automatic tripping-off of both main feedwater flow pumps. There was also an automatic turbine trip when the main pumps tripped out, since this condition cuts off the heat load to the turbine, which must then shut down to protect itself.

The loss of the main feedwater flow is not such an unusual event; it has a rather high probability of occurrence of about 1 in 100. However, when this has happened before on other reactors, there have not been any serious consequences because the auxiliary feedwater systems automatically came on to remove the heat from the shutdown reactor.

The unusual circumstance about the TMI main feedwater flow loss is, that it was initiated manually, as was the subsequent loss of both auxiliary feedwater flow systems.

Given this combination of manually initiated events, which insiders now agree started the incident at Three Mile Island, it seems absolutely incredible that sabotage would not be the first of two possibilities that any investigation would start with, the second, much less likely possibility being human error.

### Primary System Pressure Relief Valve

The third major failure in the sequence of events at Three Mile Island was the sticking open of the pressure relief valve on the primary system pressurizer tank. This does appear to be a mechanical failure, although even here some highly suspicious evidence is beginning to be uncovered that must be investigated thoroughly with respect to the first two failures. It has been reported and documented that this type of pressure relief valve has been known to stick in the open position before. In fact, the NRC stated that it now felt that this might happen as often as 1 or more times every 50 times the valve was activated.

Anyone knowing how to manually set up and initiate the first two events would certainly know about the potential vulnerability of this pressure relief valve and perhaps even plan on its failure. Furthermore, with the reactor in the condition of no heat being removed because all feedwater flow was shut off, this pressure relief valve would have had several chances to fail open. That is, the heat-up and pressure increase in the primary system would have continuously opened and closed this valve until the transfer of heat was finally restored to the steam generators.

In the TMI incident, it took the operators more than eight minutes to realize that the auxiliary feedwater flow valves were closed, at which time they opened them. However, as is now known, the pressure relief valve, which opened within a few seconds after the incident was initiated by loss of all feedwater flow to the steam generators, failed to automatically

close. In fact the valve remained open for two hours and fifteen minutes before the operators recognized the condition and closed a separate backup block valve. The extended opening of this relief valve and the resulting continual blowdown of primary coolant water into the containment building, combined with the operator's inability to clearly recognize and understand the actual situation, led to the damage of the reactor core some time toward the end of this two-hour period.

The events following the first two failures, and possibly the third failure, may not have been intentional although looking back at them today, it is clear that core damage could and should have been avoided. It is no doubt the case that given the difficult situation the operators found themselves in during the first minutes and hours after the incident, they did everything they thought appropriate for the situation that they presumed they were in.

However, there is every reason to believe that the initiating events of the TMI incident were intentionally set up and triggered by one or more persons inside the plant. The aim of the person or persons involved in collaboration with people on the outside would have been to create a serious incident at a reactor plant in order to discredit nuclear power in the eyes of the public with a scare campaign. To create such a situation required only the loss of all feedwater flow followed by (a) overheating of the reactor coolant water, (b) several openings of the pressure relief valve with primary coolant blowdown, and (c) activation of the emergency core make-up water system or possibly the emergency core cooling systems.

Even if the TMI incident would have been terminated within the first 15 minutes, the failure of these feedwater flow systems followed by the activation of other emergency systems would have been unprecedented and would have been used to create negative publicity for nuclear power.

*Jon Gilbertson, director of nuclear engineering for the FEF, is a well-known nuclear safety expert.*

**Danger: Radiation!**

Are we being contaminated?

DID YOU KNOW?

**FORUM: WEDNESDAY, JUNE 6**

7:30pm at the Bennett Ave. Lutheran Church

**3**

**The Big Lie About Radiation**

by Dr. Richard Pollak

An invisible but deadly force is sweeping down upon us, bringing silent death wherever it goes. At least, that's what the current barrage of nuclear scare stories would have us believe. In the aftermath of the Three Mile Island sabotage Joseph Califano, the secretary of Health, Education, and Welfare, ominously declared that 10 people would be dead, struck down by radioactive puffs of vapor. Dr. Spock gets up before crowds of confused parents and warns them to stop nuclear power if they love their children because radioactivity is just too dangerous.

Newspaper stories, movies, books, speaker after speaker barrage an increasingly frightened public with the myth that nuclear power is the genie out of the bottle, a technology that will envelop and destroy us because

**Table 1**  
**SPECTRUM OF ELECTROMAGNETIC WAVES**  
**RANGING FROM LONG RADIO WAVES**  
**TO SHORT COSMIC RAYS**

$10^4$	Radio waves
$10^3$	
$10^2$	
$10^1$	
$10^0$ (1 cm)	
$10^{-1}$ (1 mm)	Infrared
$10^{-2}$	
$10^{-3}$	Visible light
$10^{-4}$	
$10^{-5}$ (1 m)	Ultraviolet
$10^{-6}$	
$10^{-7}$ (1 m)	X-rays
$10^{-8}$ (1 Å)	
$10^{-9}$	Gamma rays
$10^{-10}$	
$10^{-11}$	Cosmic rays

**Table 2**  
**THE CONTRIBUTION OF NUCLEAR POWER**  
**TO RADIATION LEVELS**

Type of radiation	Millirems per person
<b>Natural radiation (per year)</b>	
Cosmic radiation	35.0
Airborne	5.0
Terrestrial	26.0
Food	25.0
Building materials	30.0
<b>Manmade radiation</b>	
One coast-to-coast flight	5.0
Color television (per year)	1.0
One chest X-ray	35.0
<b>Nuclear plant radiation</b>	
Living within a 50 mile radius of a nuclear power plant	0.01
Total from the "disaster" at Three Mile Island	1.5*

\* Acknowledged to be an overestimate. See box on page 14.

we're just too weak and stupid to handle it. Nuclear accidents will destroy entire cities, radiation will kill and maim present and future generations, and a legacy of poison will remain for our children.

This atmosphere of hysteria, engineered with such skill and at such great expense, is intended to keep us from thinking, calmly and rationally. But what are the actual facts?

A close look at the most quoted reports ostensibly damning nuclear energy shows that they do nothing of the kind. Instead, they demonstrate that nuclear energy generation is the safest known power method, that the levels of radiation involved with nuclear power are so negligible that their effects at worst are not detectable within the population, and that the hypothesis that low levels of radiation are harmful has never been accepted by the scientific community as a whole.<sup>1,2,3</sup>

So how did Califano arrive at a figure of 10 dead from Three Mile Island? Assuming for the moment that his honesty is not in question, let us examine the methodology used to generate this number. The argument goes as follows: Exposure to extremely high doses of radiation over long periods of time will result in a significant increase in the incidence of cancer. Therefore, low levels of radiation over long periods of time will also result in a significantly increased incidence of cancer. In other words, since drinking a glass of fluoride will kill a child, fluoride should not be added to our drinking water. . . .

It is this method of *linear extrapolation* that is patently incorrect; at best it stems from a lack of understanding of biological processes, at worst it represents black propaganda. A fact of life is that overdoses of biologically necessary substances may be life-endangering. But it has never been demonstrated that the levels of radiation associated with nuclear power are harmful:

"It is not known whether dose rates of . . . radiation around 100 millirads per year are detrimental to exposed people; somatic effects would be masked by environmental or other



factors that produce the same types of effects on the health of those exposed as does ionizing radiation. It is unlikely that carcinogenic and teratogenic effects of low-LET radiation [radiation characteristic of X rays and gamma rays] administered at this dose rate will be demonstrated in the foreseeable future."<sup>1</sup>

### Radiation

Radiation is a common, necessary part of our lives (see Table 1). Ultraviolet (UV) radiation is the radiation from the sun responsible for sun tans, vitamin D production—and skin cancer. In the visible-light area of the electromagnetic spectrum, solar radiation is responsible for photosynthesis, by which plants turn the sun's energy into a form of energy that supports all life processes on earth. Radiowaves give us television, radio, radar, navigation, and so on. Radiation in the short-wavelength part of the spectrum gives us nuclear power, industrial testing methods, and medical diagnostic-therapeutic techniques. Any radiation, if used carelessly, can be harmful.

The nuclear radiation (Table 2) in the shorter wavelengths produces *ionizing* reactions in biological and other material; that is, when the radiation collides with atoms it releases electrons and changes a stable atom into a reactive ion (with positive charge). Along a track of high-energy radiation a train of ions is formed that can initiate a chain of chemical reactions. This property is believed to be responsible for the transformation of a healthy cell into a malignant one. It should be remembered, however, that in healthy cell metabolism ionic interactions are constantly taking place.

### The Effects of Radiation

It has been demonstrated that large doses of radiation over short time periods are harmful. Very large doses, over 500 rads, are lethal to 50 percent of the population exposed. Lesser doses, over 100 rads, will cause radiation poisoning—nausea, loss of hair, lethargy, fatigue—but full recovery is usual (even for the victims of Hiroshima). An increase in cancer, however, has been documented for persons receiving over 100 rads in short



*The natural radiation produced by the granite used in the construction of Grand Central Station would classify the building as a dangerous health hazard—according to environmentalist logic.*

time periods. In Great Britain, over 15,000 patients received medical irradiation that averaged about 400 rads; of these, an estimated 100 suffered cancer deaths in excess of what would be expected for such a population sample. That is, radiation doses 10,000 times the doses involved in relation to nuclear power plants or medical X-rays caused a 0.7 percent incidence of cancer.

The incremental increase of radiation from nuclear plants, when added to the natural radiation we receive every day, is so small as to be virtually undetectable by any means. The increase is less than 1 millirem per person per year, which is less than 0.5 percent of normal exposure from the sun, buildings, other people, and so on. And since biological research indicates that low-level "insults" to the body from any source are repaired, there is no relationship between high-intensity induced disease and low-level effects.

The extrapolation of large-dose effects to low-dose effects results from the state of ignorance that exists in the biomedical sciences today. Let us examine this method of linear extrapolation in greater detail. The first step is the gathering of evidence that high levels of radiation, over 10 rads per dose, are carcinogenic.

One study of workers who had ingested large quantities of radium from licking their paintbrushes to get fine points while painting watch dials with this radioactive material showed that they developed bone cancer more often than would be normal. These data led investigators to conclude that radium caused the bone cancer. Other human studies as well as animal studies demonstrated that substantial exposures to radiation led to an increased incidence of cancer.

But at what level would the detrimental effects not appear? Because it is so difficult to determine that an effect has occurred when the statisti-

cal data are close to the natural levels, investigators who are not scientists have arbitrarily decided to draw a straight line from the point of high-dose, high-effect down to the point of no-dose, no-effect and then assume that this line represents the reality of dose-biological effect relationships (see Figure 1).

### Snowball Reasoning

Another example of this linear reasoning would be: since a person hit by 500 snowballs at once will die from this event, a linear extrapolation predicts that a person hit with one snowball a day for five winters will also die. Similarly, throwing 500 snowballs at 500 people in one day will kill 1 person, since for every 500 snowball-people-days 1 death will result. Absurd, no? Yet this is the basic reasoning behind Califano's dire predictions.

A less absurd example is demonstrated in our daily lives: The chemical zinc is a vitally necessary ingredient in has a positive curvature for low doses of low-LET radiation, i.e., the slope of the curve increases with increasing dose. . . . It seems probable that, for most types of radiogenic cancer, linear extrapolation from incidence at high doses results in an overestimate of risk associated with doses of a few rads of low-LET radiation. Neverthe-

the claims that every industrial process exposes the population to an increased likelihood of cancer are outright lies, based on manipulations of data. The incidence of cancer in the United States for 1900-1978, the period of intense industrialization, has remained constant (once increased life-expectancy, absolute population size, and smoking-correlated lung cancer are properly incorporated into the data).

But, you might ask, what of specific inducers of cancer? Couldn't radiation be this kind of case? A report released by the Consumer Product Safety Commission April 26 further attested to the known carcinogenicity of vinyl chloride, a common substance used, for example, to coat photocopying paper. Experiments with rats and mice showed that large doses of vinyl chloride produce tumors in mice but not in rats. Considering the close similarity between mice and rats, this should make reour diets, found in all vitamin supplements. But you will die from this deadly chemical poison if you drink a cupful at once.

You might say that although this linear-extrapolation method is a poor excuse for nutritional science, it still might be valid for carcinogenic events. But, as was detailed in *Fusion*,<sup>4</sup>

though a cumulative exposure to the chemical lowered this threshold level somewhat, small doses over a longer time period still showed the threshold effect. In other words, as this study proves, although there are substances that should be handled with care, it is fallacious to assume that the mere presence of the substance ipso facto means death for a predictable number of people, Califano's environmentalist claim to the contrary.

### The Low-Level Question

What about low-level radiation? Even the most ardently antinuclear scientists will admit that threshold levels may obtain here as well. To quote from two reports:

"Estimates of the rate of induction of cancers and genetic effects caused by low radiation doses are seriously affected by the kind of extrapolation used. On this point the scientific evidence is not yet conclusive. Most students of this field believe that the rate of induction is either equal to or less than that estimated by linear extrapolation."<sup>2</sup>

"The Committee's most difficult task has been to reach a consensus on how to estimate the carcinogenic risk of low-dose, low-LET radiation. It was recognized early that there is no truly adequate or generally acceptable scientific basis for such estimation. . . . The Committee recognizes that some experimental and human data, as well as theoretical considerations, suggest that, for exposure to low-LET radiation at low doses, most cancer risk estimates based on the linear hypothesis are too high and should not be regarded as more than upper limits of risk. . . . In animal experiments, it has been shown, often with considerable statistical precision, that the dose-effect curve for radiogenic cancer can have a variety of shapes (sometimes including even a negative initial slope). As a rule the dose-effect curve searchers more hesitant in using work on mice to draw conclusions for human biology.

More significantly, the study demonstrated that a threshold phenomenon was present—a certain level of exposure to the vinyl chloride was necessary before any effects whatsoever could be demonstrated. Al-

## What Radiation?

An ad hoc committee made up of the Environmental Protection Agency, the Health, Educational, and Welfare Department, and the Nuclear Regulatory Commission found that the average cumulative radiation dose to persons within a 50-mile radius of the Three Mile Island nuclear plant was 1.5 millirem—less than 5 percent of that received from one normal chest X ray.

According to the ad hoc committee's report, this amount is so insignificant that at most less than 1 case of cancer could be added to the 325,000 normally expected cancer deaths among the 2 million population of the area, and this calculation uses the worst-case estimates of these exposures.

Additionally, the "report claims that its figures overestimate risk, however, because no reduction was made to account for shielding of people indoors . . . and the fact that the dose to internal body organs would be less than the dose to thermoluminescent dosimeters monitoring the area."

(The committee's preliminary report appeared in *Science News*, June 2.)

less, in most cases the linear hypothesis emerges by default as the simple model whose use appears to be least objectionable in the absence of clear evidence as to the shape of the dose-effect curve."<sup>1</sup>

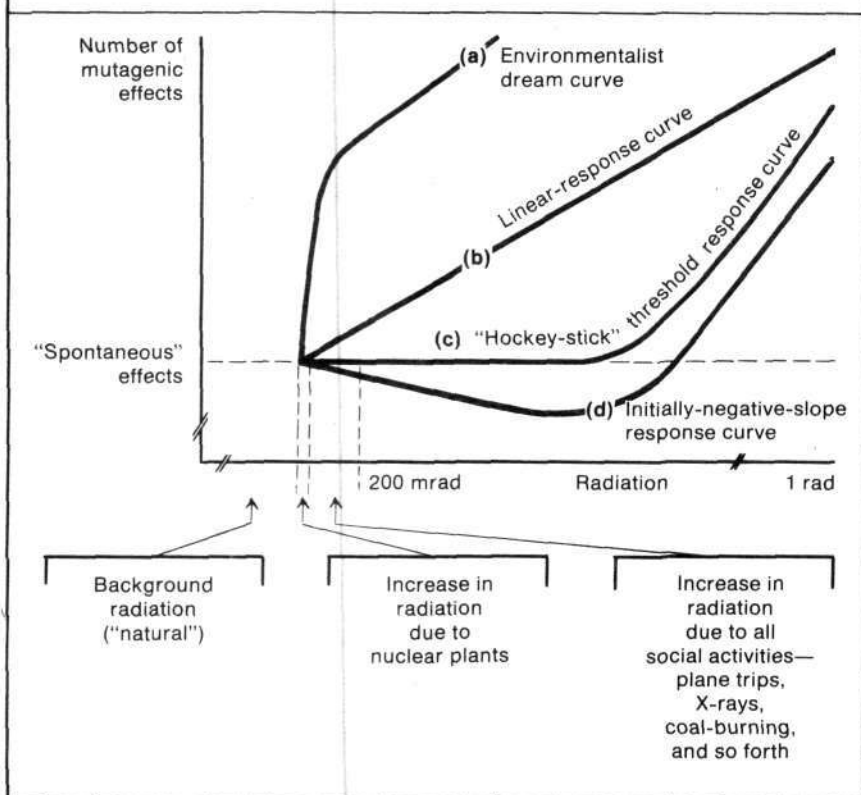
So the straight-line curve used to predict that low doses of radiation will cause cancer is simply accepted by "default . . . in the absence of clear evidence." What are some of the other hypothetical curves to extrapolate known radiation results to unknown areas where no carcinogenic or other risks have ever been shown? Keep in mind that the known data represent radiation doses of over 10 rads (usually over 100 rads) while for nuclear power we are talking about potential doses of from 10 to 100 millirads (1 millirad = 0.001 rad; 1,000 millirads = 1 rad).

Figure 1 depicts various possible relationships between the number of mutagenic events and increasing radiation exposure. As indicated earlier, the linear response curve (b) postulating a direct proportionality between radiation and cancer is the "default" curve. But the extrapolation from known 10-rad doses to unknown millirad doses takes one into a totally hypothetical area, removed from the known area by several orders of magnitude.

The third curve shown (c), known as the "hockey-stick" curve, depicts the normal biological response to environmental insults, as demonstrated in innumerable experiments with other substances. Here we note that a substantial increase in radiation is required before any rise in mutagenic effects is noted. This reflects the fact that biological insults must go beyond a certain "threshold level" before the body exhausts its capacity to handle them efficiently. The snowball example discussed earlier fits this curve. Indeed, most biological events reflect this threshold response curve.

The negative-slope curve shown in Figure 1 (d) is a provocative hypothesis, for if this type of response occurs it would indicate incremental doses of radiation above the "natural" amounts might actually be good for people. This is the curve applicable to

**Figure 1**  
**HYPOTHETICAL RELATIONSHIPS BETWEEN**  
**LOW-LEVEL RADIATION AND MUTAGENIC EFFECTS**



such dietary elements as zinc and calcium. Calcium is also necessary for good health, but overdoses will cause cancer in bulls. In fact, certain experiments have shown enhanced lifespans for animals treated with low-level radiation.

As already pointed out (see Table 2), the incremental increase of radiation due to nuclear plants is so small as to be virtually undetectable by any methods—if there is any effect at all. This is due to two interrelated facts: First, the less than 1 millirem increase per person per year due to nuclear power is less than one-half of 1 percent of normal exposures; and second, the biological findings concerned with thresholds and physiological repair make it virtually certain that any damage from low doses of radiation or any other low-level insults is "repaired." Therefore, the phenomenon of high-intensity-induced disease does not relate to low-level effects at all.

The extrapolation of large-dose effects to low-dose potential effects is a sop to the hysteria of the antinuclear antitechnology forces and results from the state of ignorance that exists in the biomedical sciences today. As a first approximation it is legitimate to look to epidemiological findings to give direction to various investigative efforts; but this should never be mistaken for science. Any scientific efforts concerned with the relationship of radiation and biological events must demand a causal and not correlative explanation of effects.

For example, naturally occurring radiation within our body results in more than 500,000 radioactive disintegrations per minute (a rate that justifies the slogan "nuclear power is safer than sex"). Yet, cancer is a disease of old age. Obviously, if there is a direct correlation between radiation and cancer, the causal relationship is not very straightforward; otherwise, under a continuous assault like this,



cancers would appear early and universally.

Similarly, were mutations to directly reflect radioactive insults, the cumulative effects over the eons should have resulted in widespread genetic disorders and infertility in the population, but this is just not the case.

This implies that although the physics of ionizing radiation is somewhat understood, the effects in the biological realm of these energies must be of a qualitatively different character, and thus must be approached as a scientific problem whose solution will yield fundamental insights into the unique nature of energy transformations and biological processes.

#### Paranoia Versus Reality

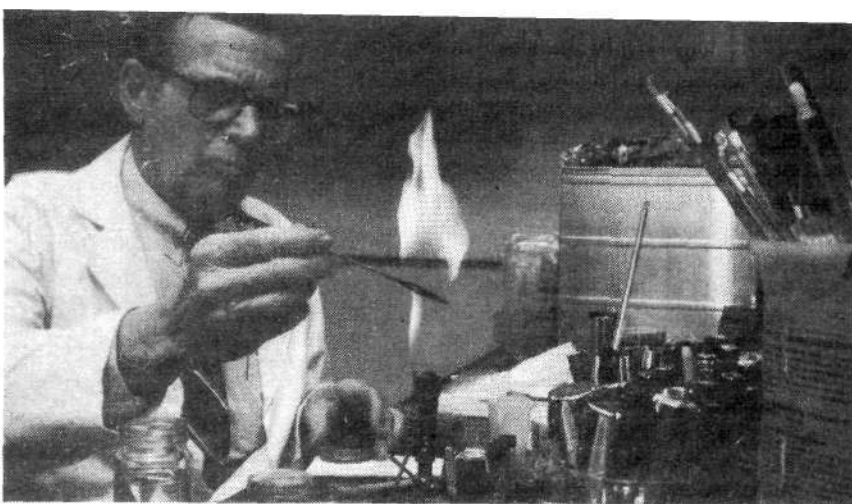
The environmentalist dream curve is just a mathematical representation of their hysteria. Califano's "10 will die from Three Mile Island" is based on mathematical juggling with no basis in reality. Even if a correlation were shown, which is not the case, the argument that radiation causes cancer would still be based on reductionist reasoning: I saw food appear in my doggie bowl every evening after I heard the noise of clanking cans. Therefore, when I am hungry I rattle tin cans to make the food appear.

Further research into energy transformations such as that of Dr. Sodi Pallares (featured in this issue of *Fusion*) will lead to a better understanding of radiation and other crucial questions. Only in the paranoid world of the environmentalists does energy represent danger; in our real world energy provides the key to the understanding of life processes and, ultimately, the negentropic invariant underlying all orders of the universe.

*Richard Pollak is on the biological science staff of the FEF.*

#### Notes

1. Committee on the Biological Effects of Ionizing Radiation of the Division of Medical Sciences in the National Research Council, "The Effects on Populations of Exposure to Low Levels of Ionizing Radiations," May 1979.
2. "Risks Associated with Nuclear Power (National Academy of Science, April 1979).
3. Herbert Inhaber, "Risk with energy from conventional and nonconventional sources," *Science* 203: 718 (1979).
4. Richard Pollak, "There is no cancer epidemic," *Fusion* 1 August (1978).



The hysteria about nuclear waste could wipe out 90 percent of U.S. cancer research. Above, a lab at the Memorial Sloan-Kettering Cancer Center in New York City.

# 4

## Waste Disposal Dispute Threatens Cancer Research

A few days after the Three Mile Island incident, the governor of South Carolina announced that the state's disposal site for radioactive waste at Barnwell would no longer accept the liquid scintillation vials that contain the solution used in counting radioactivity in basic biological research—a decision that could shut down 90 percent of the nation's cancer research.

The governor's reasons for closing the Barnwell facility are directly related to the antinuclear propaganda after the TMI incident. In addition to the scintillation fluid, the governor banned the disposal of any low-level waste from the TMI plant.

The liquid scintillation fluid contains a minuscule amount of radiation, so low that by Environmental Protection Agency standards it could be poured down the drain. The fluid also contains a more toxic chemical, toluene. The toluene-containing fluid could readily be incinerated—except for the public hysteria generated by the environmentalists about contamination from low-level radiation.

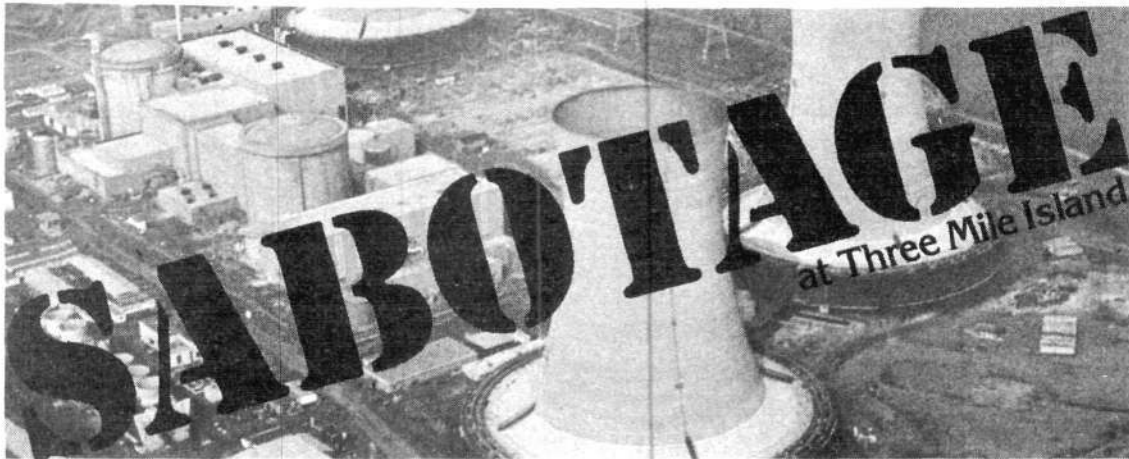
The vials of scintillation fluid are used routinely to measure metabolic activity by following the rate of metabolism of some specific molecule tagged with a tracer element such as

carbon-14 or tritium. This biochemical technology is vital to understanding the subtle metabolic changes associated with cancer, aging, and related frontier areas in medical research, and every major medical research facility uses hundreds of these vials of fluid daily.

About 90 percent of U.S. medical centers and universities rely on the Barnwell waste disposal site in South Carolina, because it is cheaper for them to transport the scintillation vials there than to Nevada or the state of Washington, the locations of the nation's other disposal facilities for low-level radiation waste. (Labs report that waste shipping costs to Nevada are 70 percent higher than to South Carolina.)

For a major cancer research center, such as Sloan Kettering in New York City, this situation threatens to make metabolic isotope studies impossible. "The impact will be tremendous," said a radiation disposal safety officer at Sloan Kettering. "The volume [of liquid scintillation fluid] is enormous, roughly 20,000 gallons a year. . . . We'll be up to our armpits in scintillation vials until the problem is solved. Research will become impractical in a month."

—Carol Cleary



### A Shocking Statement?

The sponsors of this advertisement believe it is far more shocking that not one of the eight government appointed commissions supposedly investigating the March 28 incident at the Three Mile Island nuclear generating plant has announced its intention to make the question of sabotage the focus of its inquiry.

Yet the facts surrounding this so-called "biggest nuclear accident in the history of the United States" overwhelmingly point to sabotage as the most probable cause of events.

#### FACT 1

Authoritative engineering studies compiled over decades have demonstrated that the odds are 1 million to 1 that the sequence of valve operations that triggered the initial emergency at TMI did not occur as a "natural phenomenon" or as a mechanical failure.

**Question:** Why has this point remained unpublicized by the responsible authorities?

#### FACT 2

In fact, it was not mechanical failure that initiated the TMI incident. The two initiating events that set off the TMI incident were (1) the loss of main feedwater flow to the steam generators followed by (2) the loss of feedwater flow in two separate emergency back-up systems. It is now known that both these events were caused by "human intervention".

**Question:** Was this human intervention intentional, as is most probable statistically, or was it "human or operator error," as claimed by the Nuclear Regulatory Commission?

#### FACT 3

Both back-up feedwater cooling systems reportedly had been shut down for two days at the time of the triggering events, a flagrant violation of federal safety standards. In addition, the shutdown of the feedwater cooling system that triggered the incident was accidentally initiated by someone performing maintenance on the feedwater filtering system.

**Question:** Why has no adequate explanation been given for these bizarre occurrences?

#### FACT 4

According to the version of events now being suggested by the Nuclear Regulatory Commission in congressional testimony, a valve was supposedly closed in each of these back-up feedwater systems during a separate required test of each system 42 hours earlier. The NRC then assumes that these valves must have "mistakenly" been left closed following these tests, even though very strict check-off and sign-off procedures were used during these tests. According to testimony, the proper procedures were followed and the valves were checked and signed off as open by at least two groups of operating personnel. Finally, it is then assumed that five shifts of key plant operators must have overlooked or ignored alarm lights, open switches, warning tags, and other safety devices and operating procedures designed to alert them to the shutdown of back-up systems prior to the initiating event.

**Question:** Is an explanation of simple "human error" credible?

#### FACT 5

Nuclear sabotage has been reported elsewhere. Approximately one month after the Three Mile Island incident, someone poured lye (caustic soda) on new fuel bundles at the Virginia Electric Power Company's Surry II nuclear power plant, with the intention of causing severe economic damage. On June 17 the *Newport News Daily Press* reported that a Surry employee admitted to the FBI that he and an accomplice were responsible for the sabotage to force new security measures at the plant.

**Question:** In light of this Surry II sabotage, why haven't the FBI and other investigating bodies taken up the question of sabotage at TMI?

#### FACT 6

The anti-nuclear "environmentalist" lobby in this country is committed to the elimination of nuclear power used for peaceful purposes, including the generation of electrical energy. The anti-nuclear groups are very well funded by foundations and other zero-growth financial institutions. It is

estimated that the funding level is to the tune of at least \$300 million a year, some of it from tax-exempt foundations like the Ford Foundation, the Rockefeller Brothers Fund, and the Stern Fund.

#### FACT 7

Significant sections of U.S. print and electronic media deliberately did their utmost to generate mass panic among the American people over the events at Three Mile Island. Much of the information presented was at best gross distortion and in many cases outright lies. Front-page media coverage included such headlines as: "Radiation Pierces Four Foot Thick Walls," "Baffled Scientists Struggle to Ward Off A-Plant Meltdown," "Bubble Will Cause H-Blast," and similar scientific absurdities. On April 6, the *Atlanta Constitution* documented instances where television reporters asked residents of Middletown, Pennsylvania to stay out of camera range while they put "For Sale" signs on the houses. Later these reporters told the story of an "abandoned city" on the evening news.

#### FACT 8

These press distortions were given a helping hand by NRC statements during the incident asserting that a core-meltdown and/or hydrogen gas bubble explosion could occur at Three Mile Island, with the possibility of mass deaths and widespread exposure of the population to dangerous levels of radiation. Yet, NRC officials and analysts knew at the time that none of this was true and that, in fact, a hydrogen explosion in the reactor vessel and a core meltdown were not possible! About three weeks ago, NRC spokesmen acknowledged that the original NRC statements should never have been released. Why were they issued?

#### FACT 9

A mass of evidence points to the existence of a top-down policy to sabotage the development of nuclear power throughout the United States. The strong possibility exists that government agencies are directly involved. Less than a week before the Three Mile Island events, the Federal Emergency Management Agency was established as a military type of command-and-control center with power to allocate "strategic resources" and facilitate production transfers to deal with so-called megadisasters. This Federal Emergency Management Agency is the same agency that is now being geared up to run the highly suspicious oil and gasoline shortages.

#### FACT 10

Beginning in 1976, the elite New York Council on Foreign Relations initiated its "Project for the 1980s," a series of studies asserting that "the controlled disintegration of the world economy" was a reasonable goal for the decade ahead. Depopulation and deindustrialization are explicit parts of this disintegration. Many of those who worked on the project are now ranking members of the Carter Administration; for example, Secretary of State Vance and Treasury Secretary Blumenthal. Another cothinker, Department of Energy Secretary James Schlesinger, promoted such zero-growth policies at the June 4 meeting of the International Association of Energy Economists in Washington, D.C., where he stated "neoclassical models of economics no longer work." The neo-Malthusian model is more relevant to the problems we face in energy. Three days later in a department press conference Schlesinger stated that after TMI the "nuclear option is barely viable."

**Question:** Is the highly suspicious TMI incident merely an element in a larger policy of energy and economic shutdown? There appears to be a tight interconnection between the institutions formulating the Malthusian policy, the government agencies that implement it, the foundations that disseminate the policy and fund the anti-nuclear groups.

### WHAT IS THE INDEPENDENT COMMISSION OF INQUIRY?

The Independent Commission of Inquiry is a group of private citizens committed to investigate these facts and answer these questions no matter where they may lead.

The Commission was initiated by the Fusion Energy Foundation during the Three Mile Island incident, when

FEF scientists realized that the American people were being subjected to a major misinformation campaign on the Harrisburg events.

Members of the Commission know the nuclear industry inside and out, as designers, producers, and consumers of nuclear power. The Commission includes scientists, business people, trade unionists, and community leaders.

The Commission has no power to subpoena witnesses or compel testimony. Nor does it have the organized might of U.S. corporations behind it. Indeed, most industry people are behaving as if the problems raised by Three Mile Island could be solved merely by keeping a "low profile."

What we do have is the intelligence and integrity of the vast majority of Americans, who must be educated and mobilized to ensure that any attempt to sabotage our vital energy supplies is exposed and the threat to our national security efficiently removed.

As a first step, the Independent Commission of Inquiry is committed to reprint this ad in major newspapers throughout the nation. We are asking anyone who can contribute to establishing the truth about Three Mile Island to come forward and tell his or her story to our investigators. Confidentiality will be respected.

The Commission will publish a full report on its inquiry by July 31 and will make this report available to all other agencies investigating Three Mile Island.

### Initiating Members of the Commission (partial listing)

<b>Emil Decembre</b> President, Building & Construction Council Beaver County, Pa.	<b>Henry Hill</b> President, Central Labor Council Cumberland County, N.J.
<b>Walter Forbes</b> Vice President & Consultant Business Corporation Trenton, N.J.	<b>Dr. Morris Levitt</b> Executive Director Fusion Energy Foundation New York, N.Y.
<b>Jon Gilbertson</b> Director of Nuclear Engineering Fusion Energy Foundation New York, N.Y.	<b>Jim Rebrin</b> Manager, Field Sales Dept. Acme Corporation Fort Worth, Texas (Formerly Nuclear Navy)
<b>Frank Hewes</b> Corporate Treasurer Allegheny Steel Casting Corporation Warren, Pa.	(Affiliations for identification purposes only)

### What You Can Do

We do not intend to stop there. The Independent Commission of Inquiry plans a major educational organizing effort to bring to light all the facts bearing on the decision the United States must make on the future of nuclear power. That decision will be either a nuclear shutdown, or a policy that is actually in America's interest—the gearing up of nuclear exports and economic growth that will guarantee energy growth for future generations. Other leading nations—France, West Germany, Japan—not only have already committed themselves to such a policy of nuclear energy development but have chastised the United States for not having a similar commitment. We need your help to reprint this ad and to fund our future activities.

I want the true story of Three Mile Island and nuclear power to be made public. Here is my check in support of the Independent Commission of Inquiry.

\$1,000    \$500    \$100    \$50    \$10    Other \_\_\_\_\_

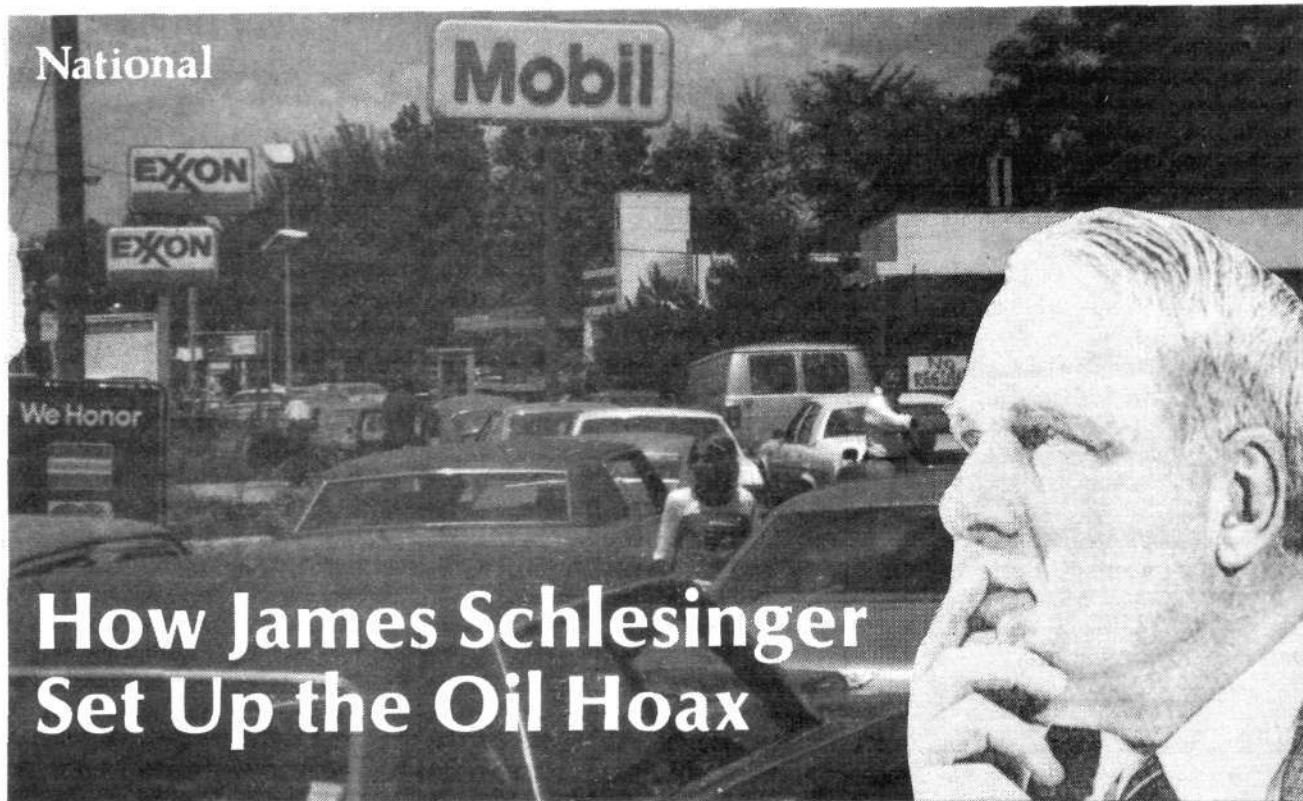
Checks or money orders should be made payable to the Fusion Energy Foundation and endorsed for the Independent Commission of Inquiry. Contributions to the Fusion Energy Foundation can be tax deductible. Send contributions and contributions to the Independent Commission of Inquiry on Three Mile Island, Box 1443, Radio City Station, New York, N.Y. 10019. Tel. (212) 265-3749.

Please contact me personally so that I can be of further assistance:

Name: \_\_\_\_\_

Address: \_\_\_\_\_

Phone: \_\_\_\_\_



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## How James Schlesinger Set Up the Oil Hoax

The escalating gasoline, diesel fuel, and related energy shortages in the United States and throughout the world are the direct consequence not of a lack of oil on the world markets but of criminal collusion between the "Seven Sisters" multinational oil cartel and, primarily, U.S. Energy Secretary James Schlesinger.

Statistics obtained directly from the U.S. Energy Department's official energy data agency, the Energy Information Administration, belie the repeated assertions from Schlesinger and the multinationals in recent months that there is an oil shortage. According to the EIA, world oil production is up some 5 percent over the first quarter of 1979 compared to both 1978 and 1977 production figures.

The key to the oil hoax is the "controlled disintegration" of the world economy projected by the New York Council on Foreign Relations, the U.S. branch of London's Royal Institute of International Affairs, in its *Project 1980s* futurology project. In that study, which included Secretary of State Cyrus Vance as a director, the Council called for the decline of overall advanced sector industrial output and

the reorientation of developed economies toward "services" and "leisure" under a regimen of energy shortage and austerity. It was this policy that was articulated by Exxon Chairman Clifton C. Garvin when he declared in early June that the world is "going to be on the ragged edge of price and supply for 20 years or more."

### There Is No Shortage

The present "shortage" was planned, in line with the Council on Foreign Relations' overall policy framework, at a closed-door session March 2 at Arden House, the Harriman family estate in New York. Knowledgeable sources have revealed that representatives of the major oil companies, including British Petroleum, Texaco, Conoco, and Exxon met with representatives of Schlesinger's office, and agreed to use the psychological climate of an oil shortage to push for drastically increased oil prices. They adopted this policy despite the fact, as they acknowledged, that there is *no oil shortage*.

This is the scenario being enacted today. The Seven Sisters, with the aid

of Schlesinger's policy efforts and a media scare campaign to convince the public that the gasoline shortages are real, have pushed the price of petroleum sky high. Rotterdam spot market prices are running in the range of \$25 per barrel, against an official OPEC price pegged at \$14.50 to \$17.

Schlesinger is pushing for an official world oil price of \$25 per barrel by 1985 in his latest National Energy Plan II statement to Congress, while the spot market may hit \$40 per barrel by the end of June. And U.S. oil majors are diversifying into other energy and nonenergy activities, such as coal and electronics. Exxon this week offered \$1.1 billion to purchase Reliance Electronics; earlier this month the oil giant bought a major Chilean copper mining installation from the Chilean government.

Meanwhile, shortages spreading to the transportation sector and threatening basic industries are giving a new spurt to the damaging inflation in the U.S., and further periling the U.S. economy.

How was the oil "shortage" created? As the Energy Information Ad-



ministration reports, *there is no energy shortage*. According to EIA figures, total world oil production for the first quarter of 1979, the period when Iran was withholding some 5 million barrels daily from world production, averaged more than 60.3 million barrels per day. The average for the same period of 1978 was 57.3 million. And for 1977, considered a more "typical" year by the industry, it was 57.7 million barrels per day. In short, total world production rose by more than 5 percent despite the temporary loss of Iranian output. In addition, Iran has produced between 3.5 million and 4.7 million barrels per day since March.

What the oil majors have done is to withhold supplies selectively, diverting other supplies in such a way as to create the appearance of shortages, thus enabling the companies to drastically increase prices.

The manipulations by Secretary Schlesinger and the oil multinationals to choke off U.S. gasoline supplies are one of the most incredible swindles in Schlesinger's career of "calculated cheating." Since the defeat of Schlesinger's energy austerity program in Congress, the energy secretary has employed a series of measures to cut back available oil supplies for U.S. industry and consumers.

First, there's the "strategic petroleum reserve" swindle, Schlesinger's ludicrous scheme to build up some 1 billion barrels in government petroleum stocks stored in abandoned salt mines in Louisiana and Texas, as a "reserve" against a possible future Arab oil cutback. In fact, the so-called strategic reserve has contributed heavily to the shortages of U.S. supplies.

Since last summer, the U.S. Energy Department has pumped a total of 85 million barrels of crude oil into the salt domes, an amount more than sufficient to relieve the energy shortage here. During the first quarter of 1979, when the Iranian shortfall was at its greatest, Schlesinger pumped some 15 million barrels into the domes. At the present moment, with gasoline and other shortages plaguing the country, oil is being poured into the DOE reserve at the rate of 200,000

to 300,000 barrels daily according to officials sources.

Why haven't the reserve stocks been drawn on to ease the present crunch—their very *raison d'être*? Because *no pumping equipment exists to recover the reserve stocks*. Schlesinger is pumping valuable oil into holes in the ground from which it cannot be recovered. This is *not* bureaucratic bungling, but deliberate sabotage of U.S. supplies, designed to drive up prices. As A.F. Grospiron, President of the Oil, Chemical and Atomic Workers Union, charged this week, "If it was expected by the Carter administration that product shortages would ensue because of the Iranian crisis, it should have been ordinary prudence to cease immediately diverting the crude oil into SPR stocks."

The American Petroleum Institute has calculated that total U.S. oil supply grew by 69 million barrels. Schlesinger claims, to the contrary, that stocks declined by 25 million barrels. The difference between the conflicting estimates—94 million barrels—is almost entirely accounted for by Schlesinger's strategic reserve diversions.

Other measures ostensibly designed to guard against the "emergency" are also in fact contributing to the shortage of supplies to the consumer. For instance, Schlesinger's

Economic Regulatory Administration (ERA), headed by David Bardin, is empowered to allocate gasoline supplies nationally and referees the amount of gasoline reaching the pumps across the country. Under ERA procedures, before a drop of gasoline reaches the consumer, 5 percent of the total gas supply is being stored by states in a "state set-aside" each month. Another 10 percent is reserved for military and other government customers.

This is the reality behind the announcements by Exxon, Texaco, and other majors that their oil deliveries to gas stations next month will be only 70 or 80 percent of last year's. It is not the case that supplies are down 20 to 30 percent; rather, more gas is being siphoned off into other useless and detrimental "reserves."

Bardin, who wields the powers that have created these gas supply dislocations and who probably has greater direct impact on the U.S. economy than any other single individual besides Schlesinger, has the strange credentials for his job of having been the attorney general of Israel.

#### Regulating Gas Prices Up

It is Schlesinger's regulations and not "supply and demand" that are responsible for the soaring of prices some 50 percent in the last five months. Behind the price hikes and Schlesinger's confident prediction in

## Schlesinger's 'Calculated Cheating'

Energy Secretary James Schlesinger's approach to pushing through his rejected energy austerity program via a rigged oil shortage is an example of what he described as "calculated cheating" in a 1967 Rand Corporation paper:

"Politics, so far as mobilizing support is concerned, represents the art of calculated cheating without being *really* caught. Slogans and catch phrases, even when unbacked by the commitment of resources, remain effective instruments of political gain. One needs a steady flow of attention-grabbing clues, and it is of lesser moment whether the indicated castles in Spain even materialize."

Other Schlesinger calculations include his asking Saudi Arabia in 1977 to issue fake statistics about Saudi production; he complained that the Saudis were producing too much oil and urged them to revise their reserve statistics downward. Schlesinger is also associated with fraudulent predictions of a developing Soviet oil production collapse.

## THE STRATEGIC RESERVE



... FIRST WE THOUGHT WE COULD STORE THE OIL AT THE BOTTOM OF THE OCEAN. BUT WE HAVEN'T DEVELOPED THE TECHNOLOGY TO GET IT THERE. THEN THERE'S THE MOON, BUT AGAIN...



BUT THE SALT DOMES ARE PERFECT... EASY TO GET TO... CHEAP... WELL PROTECTED...



MR. SECRETARY, WHAT TECHNOLOGY WILL WE USE TO GET THE OIL BACK OUT?



WHO SAID ANYTHING ABOUT GETTING IT OUT?

CURTIS

March that U.S. gas prices would reach \$1 per gallon is a little known regulatory power administered by Bardin's ERA called *cost banking*. Cost banking is the basis on which one dealer in California is currently charging \$1.36 per gallon legally in a government-regulated market. Under the until-now unused provisions of the 1975 Energy Policy Conservation Act, a refiner or dealer can add on costs up to a limit defined by the amount below the ceiling that he may have charged in an earlier period. Thus, if as was common a dealer charged only 65 cents per gallon when the maximum allowed was 70 cents, he "banked" the difference as a credit he can then use when there is perception of tight supplies, so that people are willing to pay almost any price for fuel.

Other Schlesinger directives have further contributed to the chaos in supplies. A well-known example is his directive diverting supplies into home heating fuel, which has affected gasoline and diesel supplies severely. The energy secretary also helped guarantee that there would be a shortage by pressuring U.S. oil companies not to buy additional oil on the Rotterdam spot market. Using the fraudulent excuse that such purchases would raise Rotterdam prices even higher, Schlesinger caused an additional 200,000 to 300,000 barrels per day supply shortfall in the United States. Once the damage had been done, Schlesinger then reversed himself last week, and told U.S. companies to resume purchases on the Rotterdam market, now that prices above \$30 per barrel are being rumored.

### Oil Company Complicity

As their attendance at the March Arden House meeting suggests, the oil companies have been witting participants in the London-Schlesinger scenario. In March, for example, Exxon announced that it was applying oil supply allocations for its U.S. customers based not on how much oil they got from Iran (a relatively small factor in the U.S. market), but based on how much oil the U.S. consumes—a formula that doubled the impact on the United States.

The ostensible reason for this un-

sual arrangement was the fact that Exxon and the other U.S. majors are supplying the Anglo-Dutch majors, British Petroleum and Shell, to compensate for their losses from Iran cutbacks. (BP and Shell were the majority foreign holders in Iran.) Yet Exxon made these arrangements with the two Anglo-Dutch companies despite the fact that BP and Shell—who, as a matter of policy were involved in the destabilization of the Shah and encouraged the temporary shutdown of their own production—had heavy stockpiles and are making a killing on profits from their holdings in the North Seas, Alaska, and Nigeria.

This diversion of U.S. supplies, coupled with a series of unexplained but conveniently timed accidents, including one at Exxon's huge Baytown, Texas oil refinery, have given credence to the lie that the oil shortage is real.

—William Engdahl

## Europe to U.S.: End the Oil Hoax

The Europeans have not bought Schlesinger's energy shortage, and when French Foreign Minister Jean François-Poncet and Industry Minister André Giraud visited Washington the first week in June, they presented President Carter with a comprehensive energy program to end any further oil hoax.

The Europeans were infuriated by the "emergency ruling" of the DOE's Economic Regulatory Administration to grant a \$5 per barrel subsidy to U.S. oil companies to purchase oil on the London-controlled spot market. The ruling was revealed to the Europeans May 31 by European Community Commissioner Guido Brunner. Under the so-called entitlement program, the U.S. government subsidizes purchase of foreign oil from a fund paid for by refiners who use lower-priced domestic oil.

Particularly galling to the Europeans was the fact that Energy Secretary Schlesinger had previously coerced them into adopting a formula for international oil consumption cutbacks.

Now the subsidy program could be used against energy-short Europe for Rotterdam purchases. As the French daily *Le Matin* put it, it is a measure to "dry up Europe."

#### The French Proposal

The French proposal, which has the backing of West Germany and Japan, is the following:

to eliminate the oil speculation on the Rotterdam spot market, by forcing oil cargoes to publish the price of the purchase;

to eliminate the U.S. subsidy of \$5 per barrel to oil companies to purchase oil on the spot market;

to get a world pricing agreement that will stabilize the oil flow and relations with OPEC;

to elaborate a world energy plan for the future that will address the problems faced by the developing sector in light of the oil price burden on their economies and that will spur nuclear energy development in the developed and underdeveloped sector.

The French and Germans have announced that if the United States refuses to go along with at least the first two items, they are ready to form a European consortium dealing directly with the oil producers in state-to-state deals.

#### The Kennedy Subsidy Hoax

According to information from highly placed Washington sources, the entitlement subsidies were worked out in closed-door meetings May 25 between Senators Edward Kennedy (D-Mass) and Claiborne Pell (D-RI) and John O'Leary, the number two man in the Department of Energy.

The move is a complete repudiation of the assurances given by Secretary Schlesinger to the Europeans only days before at the Paris meeting of the International Energy Agency. In one day, it drove the prices of oil on the Rotterdam spot market up by more than \$6 per barrel as Europeans scrambled to get oil at any price before the U.S. majors grabbed it.

The Europeans were especially irritated by the fact that the move was timed to disrupt the world oil markets on the eve of the Tokyo economic summit and the Vienna meeting of OPEC June 26.

## National Council of Churches: Nuclear Power Is a Sin

*"When faith in the Creator is replaced by faith in human ability to solve all problems by technical means, humanity has fallen into the sin of idolatry. . . . The current energy situation can be seen as the result of the idolatrous and unjust ways in which humans have used, abused, or neglected to use the limited sources of energy the Creator has made available for the well-being of the continuing creation."*

*Energy and Ethics: The Ethical Implications of Energy Production and Use,*  
A study document issued by  
the National Council of Churches in Christ,  
March 1979.

At its May 11 meeting the Governing Board of the National Council of Churches in Christ adopted an anti-nuclear policy statement that separates the church from the traditionally American values of growth and progress.

For those who have followed the Council's activities in the last decade, the zero-growth, cultist, antidevelopment spirit of the policy statement comes as no surprise. The Council member churches, spearheaded by avowed feudalist Dame Margaret Mead, have funded and participated in most of the terrorist-radical groups in the United States including, most recently, the FALN "Puerto Rican independence" group that carried out several bombings in New York City. In Africa, the Council has funded the FNLA, a so-called liberation group that fought against the ruling MPLA group in Angola and that was documented as practicing cannibalism.

The antinuclear policy statement culminates a campaign that started in fall 1974 when the Council appointed Margaret Mead and Rene Dubos, another antiscience advocate of primitive society, to chair "a study of the implications of using plutonium as fuel in the nuclear cycle." The Mead-Dubos team felt that the nuclear industry had already had enough of a public say, and so they excluded

"known supporters" of plutonium from their committee of inquiry.

The policy statement adopted in May reads in part: "We support a national energy policy which will not need to utilize nuclear fission. . . . We support a continued ban on the commercial processing and use of plutonium as a fuel in the United States, and stringent efforts to reach worldwide agreement banning such use of plutonium. Commercial use of plutonium can result in proliferation of nuclear weapons. The potential misuse could result in pressure to curtail civil liberties in order to prevent such a threat."

The Governing Board also came out in full support of sharing what they define as a poverty of energy resources, the promotion of appropriate technologies for the Third World instead of "capital-intensive energy technologies," and a monitoring of the energy use of households and public buildings in order "to act to conserve energy by eliminating unnecessary use."

#### Ethics?

The particular proposals adopted are familiar enough from the much publicized ravings of the zero-growth environmentalists. What is shocking is that the Council's Governing Board justifies its antinuclear position on the basis of what it calls "Christian ethics"



# The Plutonium Economy



The NCC's 11th commandment:  
Thou shalt not go nuclear.

and that these newly defined Malthusian ethics provide a religious cover for the kind of terrorism against technology that Council members (the Episcopal Church, to name one example) have supported.

These rewritten ethics, published in the study document quoted at the beginning of this article and in other writings by Council staff members, state that man's capacity for reason and the realization of reason in the form of advanced technology is a sin and an evil that must be eliminated so that man can return to a more "natural" state.

The study document tells Christians that the "perversion of dominion into domination is a sin and is one of the underlying causes of the energy crisis." In the policy statement this is translated to mean that any centralized control over energy resources and nature is sinful; thus fission (and fusion, which the Council never even mentioned as an alternative) are inherently sinful, because each local neighborhood can't have its own backyard reactor to control.

(One cannot help but wonder why the concept of a centralized monotheistic god is tolerated by the Council. Wouldn't it be more appropriate to have local neighborhood gods who could be more in touch

with the needs and customs of each community?)

Further, the study document defines man's purpose as being "responsible for the wise conservation of the Creator's gift of limited energy." There is not even a hint in this preordained, static world that man's mind can create new solutions to improve nature and invent new resources. In fact, such improvement is exactly what is defined as "sin."

We quote at length from the study document:

"The concept of idolatry is particularly helpful in understanding modern abuses of energy and technology. Idolatry is the perversion of our relationship to God, placing distorted trust for our salvation in other sources of power. While these sources may be properly used in obedience to God's will, such distortion transforms them into false idols. In ancient Israel, the powers of creativity were often perverted into idols of nature gods and fertility goddesses. . . . Today, human intelligence and labor and their products as embodied in science and technology are often elevated into similar counterfeit deities which must be served even at the sacrifice of individual and corporate life and well-being. . . . Technological systems tend to become instruments of economic and political domination.

"Current worldwide inequities of wealth and power reflect a situation of injustice in human society. This sinful condition was continuously condemned by the prophets of God, who called upon the rich and powerful to divest themselves of their unjustly accumulated wealth so that the poor and powerless could receive their share of the earth's resources."

Fortunately, our founding fathers rejected precisely this Malthusian interpretation of Christianity and built this nation on principles of increasing man's control over nature through advances in technology. What the Governing Board of the National Council of Churches needs is another grass roots American Revolution to bury Malthusianism and cultism along with their 20th century champion, the recently deceased Margaret Mead.

—Marjorie Hecht

## Washington

Beyond Malthus

# Schlesinger Campaigns for Zero Growth

At the first annual meeting of the International Association of Energy Economists in Washington, D.C. June 4, Energy Secretary James Schlesinger laid out a straightforward autarchic program for top-down energy and economic austerity, spurning economic growth and praising Malthus by name.

Although *Fusion* has often quoted from Schlesinger's 1962 book, *The Political Economy of National Security*, where the energy secretary lays out his Malthusian Dark Ages philosophy (see, for example, the editorial in *Fusion's* June issue), Schlesinger has enjoyed an undeserved reputation in industry as a pronuclear, protechnology spokesman.

Here's what Schlesinger said June 4:

"Energy has become the quintessential economic problem. Its solution will determine the survivability of the political institutions in the Western democracies. . . . The worldwide capacity expansion of oil production is not occurring and we now face a limited resource base. . . .

"Oil is a unique commodity and has been the source of growth in the world economy since 1945. . . . Economics has never had a good theory for depleting resources, and alternate energy sources are subject to constraints. . . .

"Constraining demand is the only way to hold down prices with a stable supply. The only way to deal with shortages is to constrain demand and not rant about the consequences. . . . The market can make small adjustments over long periods of time. The energy problem needs substantial

adjustments over a relatively brief period of time.

*"The neoclassical economic models no longer work. A neo-Malthusian model is more relevant to the problems we face in the short run. ... [emphasis added]*

"Oil has been the preferred fuel for growth, but the only rescue we have is diligent public policy. We face a massive shift in the requirements of society. We had hoped when we introduced the National Energy Plan in 1977 that we had seven or eight years to make the adjustments. We have not been able to achieve a national consensus on the energy problem or stability in the Middle East.

"We have to shift and abandon the marketplace as an idol. We will have to compress the time it normally takes through the market to introduce substitute fuels like syncrude [liquefied coal], gasified coal, etc. The government will have to pay for the R&D and subsidies to bring substitute fuels on line before the market place would bring them into play. ...

"The transition will be exceedingly difficult. ...



## Schlesinger: Nuclear Option 'Barely Viable'

*At a Department of Energy press conference June 7 Energy Secretary James Schlesinger reiterated his go-slow policy on fusion and the breeder and acknowledged that nuclear power's days are numbered. Here's what Schlesinger said June 7:*

**Question:** Jack O'Leary [DOE Deputy Secretary] said this morning that nuclear energy now no longer is a viable option. I wonder how you feel about the fusion and the breeder?

**Schlesinger:** We have indicated in the past that nuclear is a barely viable option. Whether Three Mile Island means the industry will stay away from more nuclear is not clear. But if nuclear is still alive, it is barely viable. We will have severe problems in the 1980s—without the extensive use of coal, we will not make it. In the recent International Energy Agency meeting, all participating countries agreed that the nations would have to make use of nuclear power in the 1980s.

On fusion, we continue to support the program to the tune of about \$500 million a year. We hope to demonstrate scientific feasibility by 1982 or 1983. This may indeed be our inexhaustible source of energy, but it will be 2020 or 2030 at the earliest when fusion could contribute to our energy supply.

On the breeder, there is agreement that we must have this backup and continue to support the program, but there is no urgency because we have not yet exhausted the potential of our uranium supplies.

## Congress Pushes for Antinuclear Legislation

Congress has followed the lead of the antinuclear lobby and proposed a variety of legislation and regulations that would kill civilian nuclear power in the United States.

The message to the nuclear industry and the nation from Congress, as well as from federal officials, is that nuclear power is possible only within a network of emergency controls and military measures. The model for this military-type control is the Federal Emergency Management Agency (FEMA). Created by President Carter last year, FEMA went into effect four days earlier than planned and just one day before the incident at the Three Mile Island nuclear plant. FEMA took charge of conveying decisions from the White House on down, arranging for a potential evacuation and managing the information flow.

Some of the antinuclear proposals in Congress are:

- The House Subcommittee on Energy and Environment of the Interior Committee voted May 9 to amend the Nuclear Regulatory Commission's fiscal year 1980 authorization to forbid the commission from spending money to issue construction permits for nuclear power plants in the first half of the fiscal year. The key antinuclear man on the Subcommittee is Rep. Morris Udall (D-Ariz). They also forbade the NRC to issue operating licenses for completed nuclear plants unless the plants had approved emergency evacuation plans.

- The Senate Nuclear Regulatory Subcommittee of the Environment and Public Works Committee amended the NRC authorization bill May 10 to mandate the shutdown of operating nuclear power plants if the

plants have not submitted emergency response plans approved by the NRC within six months. This was pushed by Sen. Gary Hart (D-Colo.).

- HR bill 3581, submitted by Rep. Mary Oakar (D-Ohio), would allow no new licenses to be granted until the Office of Technology Assessment, a notoriously antigrowth and anti-technology advisory group to Congress, did a study on the safety of nuclear power.

- Rep. James Jeffords (R-Vt) sponsored HR 3698 calling for the suspension of the granting of construction permits until a study is done by a National Nuclear Review Commission.

- Sen. Lowell Weicker (R-Ct) has introduced Senate Joint Resolution 55 requesting that a presidential commission be established to assess the future of nuclear power.

- The Senate Committee on Governmental Affairs Subcommittee on Energy, Nuclear Proliferation, and Federal Service has stated that it will try to link the siting of nuclear power plants to "emergency response planning." Ohio Democrat John Glenn's subcommittee staff insists that the NRC has no emergency procedures for "residual risks of catastrophic accidents," which the NRC "assumes they have eliminated through the engineering."

—Marsha Freeman

## Senate Energy Ctte. Cuts Breeder Funds

The Senate Energy Committee voted May 15 to discontinue funding for the Clinch River Breeder Reactor Project. The 10 to 8 vote was the result of Senator Lowell Weicker's (R-Ct.) unexpected last-minute decision to change his previous record of support for the project. Last year, the Energy Committee voted for the breeder by a one-vote majority.

Senator Weicker explained his vote by claiming that if the fiscal year 1980 budget legislation went to President Carter including full funding for Clinch River, it would only be vetoed this year, as it was last year.

The fate of Clinch River, the nation's only breeder project, will be up in the air until the legislation for the DOE budget goes to the full Senate floor. Well-placed Capitol Hill observers doubt that the full Senate will sustain the Energy Committee's recommendation to kill the program.

In the House, the Science and Technology Committee has voted full funding to continue construction on the embattled breeder, at the recommendation of its Research and Production subcommittee, chaired by Congressman Mike McCormack (D-Wa). If both houses of Congress again pass a funding appropriation and authorization, President Carter will again face the choice of accepting the project or vetoing the budget for the second year in a row.

### Congressional Line-up



## Who's Killing Nuclear Power?

**Sen. Edward Kennedy (D-Mass).** As the posters say at the airports, more people have died in his car than in nuclear power plants. The effusive letter Teddy sent to the "No Nukes" demo in Washington May 6 got a bigger hand than Jerry Brown, who was there in person.

**Rep. Morris Udall (D-Ariz).** Mr. Environmentalist has offered a plan to turn land west of the Mississippi into a game preserve. Declared Three Mile Island "the beginning of the end for nuclear power." Caribou count, U-don't.

**Sen. Gary Hart (D-Colo).** This former McGovern campaign manager has become "the Senator from Aspen Institute." Hart labeled Three Mile Island "a crisis in crisis management," and demanded further militarization of the U.S. economy to deal with the threat of "megadisasters."

**Rep. Dick Ottinger (D-NY).** From his Westchester millionaire's country estate, "Just Plain Dick" delivers lectures on Solar Power for the Pee-pul. "We need more oil crises, to show the people there really is an energy shortage," says Ottinger.

**Rep. Ted Weiss (D-NY).** Attacked the nuclear industry in a *New York Times* op ed piece June 6, whining that if nuclear power is so safe, how come the industry can't convince the insurance companies to insure nuclear plants without the Price-Anderson "government subsidy."



## Schlesinger-Style Military Men Replacing Scientists

High-level sources in the Department of Energy report that ex-military people with no experience in long-range energy research planning are being brought in to fill the vacancies created by the latest wave of DOE resignations. In an analogy to the 1960s situation in the Department of Defense under Robert McNamara, one DOE scientist characterized the new appointees as "whiz kids who know little about science, technology, or energy development."

According to department insiders, the new staff members have had experience in the Department of Defense, the Institute for Defense Analysis, and various military think-tanks. The main worry of many DOE scientists is that these new appointees are not qualified to head civilian energy development programs because they think only in the short term and have no commitment to the long-term goals needed for the frontier areas in science such as fusion.

These are exactly the type of people, however, required to administer Schlesinger's "Malthusian" energy policy.

## Dale Myers Resigns As Under Secretary

Dale Myers resigned from his post as undersecretary of the Department of Energy June 1.

Myers, 57, whose responsibility revolved around contract management and technology commercialization, was one of the most experienced DOE industrial managers. He joined the DOE in Oct. 1977 from Rockwell International, where he was corporate vice president and president of North American aircraft operations.

Between 1970 and 1974, Myers served as associated administrator for manned space flight at the National Aeronautics and Space Administration.



Dale Myers

DOE

According to Washington sources, a study done for the department by Coopers and Lybrand this year recommended that the responsibilities of the under secretary be downgraded with a concomitant increase in responsibility for Deputy Secretary John O'Leary, number 2 man in the DOE.

### Wave of Resignations

Myers is part of a wave of resignations in the DOE that result from a new civil service regulation on conflict of interest that takes effect July 1. The regulation will make it nearly impossible for scientists and administrators who retire or leave government positions to enter industry and work in their field of expertise.

This is the third wave of resignations to hit the department since its establishment two years ago. The first came shortly after Schlesinger set up the DOE, and it included most notably Dr. Robert Hirsch, director of the fusion program.

By the end of last year when it became increasingly difficult to keep important high-technology and research programs alive, there were more resignations, including Robert Thorne, a deputy secretary; G.W. Cunningham, director of nuclear programs; Stanley Ahrends, head of the breeder program; and Stephen Dean, head of the magnetic confinement program in the fusion office.

Included in the latest wave of resignations was William Jackson, a leader in the development of MHD and in U.S.-Soviet energy cooperation.

## Deutch Confirmation Looks Assured

John Deutch, assistant secretary of energy technology, was appointed acting under secretary of the Department of Energy May 25, the third highest position in the department. Deutch replaces Dale Myers, who resigned June 1.

President Carter has nominated Deutch for the post, which must be confirmed by the Senate.

Insiders report that although the Deutch confirmation hearings in the Senate would be an opportunity to slam the Malthusian energy policies of Deutch and Energy Secretary Schlesinger, such a fight seems unlikely. The Senate Energy Committee, which will hold the Deutch hearings, is chaired by Henry Jackson (D-Wash), a friend of the Deutch family.

Deutch, who worked with Schlesinger at the Rand Corporation, a leading think-tank for resource control and nonproliferation scenarios, has toed Schlesinger's line on energy and research policy since he came to the DOE. Deutch was promoted from assistant secretary of energy research to acting assistant secretary of energy technology after the resignation of Robert Thorne Jan. 1, 1979.

Last August, Deutch played a leading role in squelching the breakthrough of the Princeton PLT tokamak. The results were not a "breakthrough," he said, just "significant."

DOE sources report that Deutch's replacement as assistant secretary for energy technology is likely to continue the Deutch tradition of discouraging new technology. The new appointee is expected to be George Fumich, a lawyer who specializes in coal research.

The energy technology position has supervision over fusion, nuclear power, and magnetohydrodynamics, as well as coal, and the appointment of a "coal man" indicates that Schlesinger intends to push ahead with coal synthetics at the expense of more advanced technologies, sources said.

—Marsha Freeman

## U.S., Japan Sign Energy Deal

After a full year of negotiations, the United States and Japan signed a Cooperative Agreement on Energy Research and Development May 2.

The agreement, signed by Energy Secretary James Schlesinger and Japanese Foreign Minister Sunao Sonoda, reads in part: "The government of the United States of America and the government of Japan . . . recognizing that the energy problem is one of the most important questions to be resolved for world prosperity in this century and in the 21st century, determined to play a constructive role in resolving this problem through close cooperation . . . have agreed as follows: . . . Cooperation may be undertaken in the following areas: fusion, coal conversion . . ." and other secondary areas.

The final agreement, ending a year of semantic manipulations and making fusion cooperation the first priority, is a tactical victory for the Japanese. A year ago former Japanese Prime Minister Takeo Fukuda had offered to spend up to \$1 billion in joint research on energy with the United States, with fusion as the top priority. Fukuda told a special session of the Japanese parliament in Sept. 1978: ". . . we should set ourselves the target of commercializing nuclear fusion by the early years of the 21st century. I intend to institute comprehensive policies including the expansion of our research investment and to seek dramatic advances in research and development."

Although the U.S. fusion community responded to the spectacular Japanese offer with appropriate excitement at the prospect of an infusion of funds and initiative into the faltering U.S. fusion budget, Secretary Schlesinger insisted that the Japanese had to invest part of the \$1 billion dollars in the U.S. coal synthetics program or fusion cooperation was off. Coal synthetics, developed by the Nazis, is not only a primitive energy



DOE

A Japanese boost for the U.S. fusion program: Sonoda and Schlesinger sign cooperative energy agreement.

source but a wasteful one, since it requires twice as much coal to produce electrical power using synthetics as the coal consumed in a coal-burning power plant.

For months the Department of Energy tried to intimidate the Japanese, telling them that the terms of the proposed energy agreements were dependent upon "doing something" about the Japanese balance of trade. In addition, DOE press releases about the energy cooperation negotiations placed cooperation on coal synthetics first, a condition clearly unacceptable to the Japanese government.

By the winter of 1978, the Japanese government had decided that cooperation that included some money spent on the U.S. SRC-II coal synthetics project, in addition to fusion, was better than no agreement at all; and negotiations went into their final stage.

According to the DOE, both governments exchanged documents regarding the planned cooperation on the SRC-II coal process and will soon execute documents relating to the Doublet III magnetic fusion project at General Atomic in San Diego.

The extent of the fusion cooperation remains to be worked out. Japan's initial proposal included not only joint work on the Doublet ex-

periment, but also the establishment of a joint plasma physics institute, the sharing of information from the U.S. Tokamak Fusion Test Reactor at Princeton and from Japanese JT-60 machines, and joint work in fusion materials testing.

Four universities have bid for the U.S. side of a joint Institute for Plasma Physics: the Massachusetts Institute of Technology, New York University, the University of California, and the University of Maryland. One informed source said that NYU's Courant Institute of Mathematical Sciences would be the most logical choice.

### Geopolitics

Secretary Schlesinger's remarks at the signing ceremony reflect quite straightforwardly his geopolitical view of the agreements: "This cooperation will help us develop the energy technologies needed to smooth the transition to the 21st century when the promise of renewable and fusion energy can be fully realized. . . . Our success in this joint endeavor will help us materially to reduce our current heavy dependency on imported oil." Of course, as the Japanese made clear in their earlier discussions of fusion, without a crash program now, there will be no realization of the fusion promise in time to ease the oil crisis.

—Marsha Freeman

# Swedish Union Leaders Fight for Nuclear Power

Twenty-three Swedish trade union leaders representing more than 75,000 workers issued a petition May 17 demanding an uncompromising nuclear power development program for Sweden and attacking the zero-growth policies of Social Democratic Party leader Olof Palme, former prime minister.

The petition, which demands that the labor movement's national political leadership "stop its orientation toward zero growth and low energy and put cheap nuclear energy before the diffuse, expensive ... energy forms," has caused an upheaval in Palme's own party, characterized in front-page newspaper reports as a full-scale "trade union revolt."

The protechnology leadership in the Swedish union movement had been working with the Association for Nuclear Energy (FKU) and the European Labor Party on a nuclear development program for months prior to the Harrisburg incident. During that time, the Social Democratic Party was maintaining a nominal position in favor of nuclear fission power in the face of a government policy hostile to industrial high-technology growth.

When Palme took the cue from the Three Mile Island incident to turn against nuclear power, Eric Lindstedt and Leif Norlin, two Metal Workers Union local leaders on the FKU board of directors, initiated the petition. With the backing of the European Labor Party in Sweden, the unionists circulated the petition among their fellow metal workers, who comprise the major base for Palme's Social Democratic Party.

Within 24 hours, the petition became lead news in the nation's press. Palme immediately held a press conference and began to pressure the

petition signers, and he attacked the European Labor Party as "CIA."

The Social Democratic paper *Aftonbladet* went so far as to say that the signators had withdrawn their names after the Palme attack. Horlin and Lindstedt, however, plan to take court action against the press for lying that they had backed down. Meanwhile, throughout the country, the labor movement has been polarized on the nuclear energy issue.

Excerpts from the petition appear below.

### Text of the Swedish Petition

... We see it as our task to work for progress in industry, technology, science and society. ... We see the development of nuclear energy as a decisive factor for creating this development. Nuclear power is the energy source which has the full capacity to meet the increasing demands for an abundance of cheap, clean, and secure energy for social and industrial

development. ... The Harrisburg accident does not influence our judgment that nuclear energy is a safe energy source. On the contrary, when the hysteria fomented now by the media has calmed down, one irrefutable fact [will be] clear: no one was injured by the much-spoken-about accident. ... The highly advanced nuclear technology in Sweden. ... and our great uranium resources make nuclear power even more important for our nation's development. ...

The 180-degree turn on the energy issue by the Social Democratic leadership ... is in obvious opposition to the traditional policy of growth, industrial progress, and nuclear energy which we have always fought for. A policy which so clearly opens the door for economic stagnation ... must be condemned as dangerous for the nation and the workers. ...

No other country in Europe has reacted so hysterically to the Harrisburg accident as Sweden has done. Countries like France and the whole East bloc have instead escalated their nuclear programs further during the last weeks. If Sweden continues its dangerous policy, we will be driven into forced isolation from the rest of the world. We will not be able to take part in the great effort of continental Europe to industrialize the developing countries in the 1980s and 1990s.

*Continued on page 28*



Sweden's Association for Nuclear Energy (FKU) put the nuclear power issue on the front pages of the nation's press. Here, the Falu-Kuriren reports on the organizing activities of the FKU. Pictured is John Hardwick, editor of the FKU magazine and member of the European Labor Party.



With stagnation and higher energy prices, we will be deprived of our export markets. This will lead to wage reductions, unemployment and lower standards of living.

We therefore urge the party leadership:

- to stop its orientation towards zero-growth and low-energy and put cheap nuclear energy before the diffuse, expensive, renewable energy forms;
- to openly distance themselves from all invitations to collaborate from the greatest enemy of progress in Sweden, the Center Party;
- to start a nationwide information campaign on the great possibilities of nuclear energy.

## Mexico Takes on The Oil Multis

Mexico is pursuing an aggressive plan to solve the world energy disorder, including taking on the oil multinationals for their role in the oil hoax.

Speaking to a group of textile industrialists May 31, Mexican Minister of Natural Resources and Industry Jose Andres de Oteyza firmly lined Mexico up behind France and its attempts to control and then eliminate the cancerous spot market operations conducted by the Seven Sisters oil companies and related interests in Rotterdam.

"We have been very careful in how we sell our energy," Oteyza said, "avoiding the evil practices of other countries, which have been taking advantage of the conjuncture to sell on what is called the 'spot market,' taking the largest slice possible out of the nations and consumers thus choked off. . . . The speculative practices [on the international market] are risky and damaging, even immoral."

Oteyza then threatened that multinational oil firms who buy Mexico's crude oil and sell back refined petrochemicals at prices inflated by the Rotterdam operations will find their crude contracts canceled. "Just as we

sell our oil to international companies under specified conditions . . . with periodic revision and within well-defined rules of the game, so they must supply us petrochemical products under the same conditions. And if this doesn't happen we will take appropriate countermeasures."

### International Campaign

In tandem with these acerbic attacks on the multis for oil speculation, Mexico picked up the pace of its international campaign to make energy "the common responsibility of mankind." The Mexican program, which President Lopez Portillo will present to the United Nations in late September, is keyed to state-to-state oil supply arrangements that bypass the oil majors and to a full-throttle program for developing new energy technologies and transferring advanced energy technology to the developing sector. On the urging of French President Giscard d'Estaing, the European Community has backed the Mexican proposal.

Mexico is organizing in preparation for the UN presentation throughout the developing sector as well as among the industrialized nations. The director of Mexico's oil industry, Jorge Diaz Serrano, completed a swing through Brazil, Argentina, and Venezuela in May, briefing each government fully on the purposes and progress of the Mexican initiative.

Lopez Portillo also met with Cuban Premier Fidel Castro for two days of talks May 17-18, and Castro warmly endorsed the Mexican energy proposal. Castro pledged to make the energy plan a top agenda item in the late summer meeting of the heads of the nonaligned nations in Havana, just prior to the September UN General Assembly session.

Lopez Portillo told Castro: "We wish to commit our possibilities, our potential, to give meaning and content to a new economic order. Although recognized among nations, [the new world order] is still a formal and empty framework that must be satisfied and filled out with specific commitments, starting with those we can assume regarding energy resources."

## India

### The Battle Against Appropriate Technology

*Elements in India's Janata government, notably V. Shankar, the private secretary to Prime Minister Desai, have been working to reverse India's energy development and subject the nation to the appropriate technologies, zero-growth program prescribed by the International Monetary Fund. As part of this battle, the Indian government recently declined a Soviet offer for collaboration on a new nuclear plant complex, and efforts are underway to unseat Homi Sethna, the prodevelopment chairman of the Indian Atomic Energy Commission.*

*We are pleased to print excerpts from an article that represents the thinking of the protechnology faction in India. This critique of the Indian advocates of solar energy, titled "Solar Energy Agents on Rampage Again," appeared in the May 20 issue of New Wave, a weekly. New Wave often reprints Fusion articles.*

The advocates of solar energy as the most viable energy form for India have revived their campaign. Unlike in the past when they claimed that the future of the country rests only "on the diffuse rays of the sun," they now modestly claim that solar energy has to be the major source (not the sole source) of energy. Of course "the funds for solar energy research may have to come from nuclear research budgets."

One of the major reasons why solar energy may work in countries like the United States (where it is planned to be used only for domestic purposes) and not in developing countries like India is the impossibility of using solar energy for industrial uses. Industry needs large quantities of high-density energy . . . the energy needs are such that solar energy is just too weak. . . .

According to a recent conference of engineers in Delhi, the future plans [for India] include the detractorization of the fields.

Bioconversion, [which] means using biological means to convert sun rays into a usable form of energy . . . may entail growing crops which either supply alcohol or other organic fuel-chemicals. We wonder how much fertile land will be necessary to fill India's energy needs. And where will the food be grown in the meantime? . . .

Photovoltaic cells are at such a stage in development that the electric charge which they produce and can retain [is] miniscule and even a flashlight will have trouble blinking on them. . . .

#### **Downright Criminal**

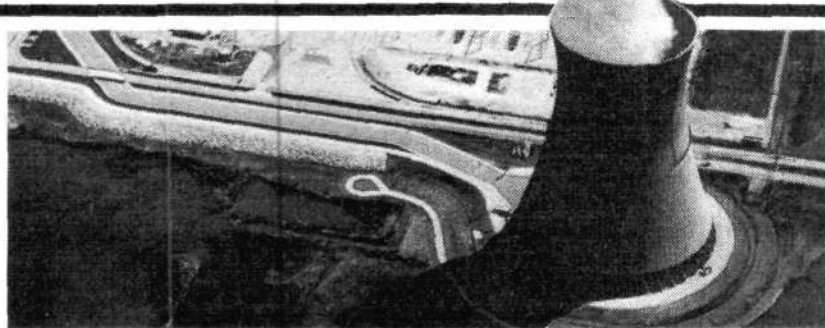
All this is not meant to make fun of enthusiasts of solar energy. After all, with proper development, in the next 50 years solar energy may become feasible, may be even desirable for domestic purposes. . . . But with its limited research budget, if India were to go for exotic energy sources like solar energy [it] would be downright criminal.

We have to go in for nuclear energy as this is the only viable high-density energy source for our country. . . .

All this high-pressure publicity for solar energy by the Western countries and their agents in the "Third World" is meant to hoodwink the poor people into believing that an attempt is being made to seek a solution! . . .

And the "Appropriate Technology" mantra coupled with "Solar Energy" [as] the Appropriate Energy of the Janata development policy is playing directly into their hands. It may surprise many people that despite the so-called high investments in solar energy research in the United States the only people interested in it are the oil lobbies, who are willing to waste money to prevent U.S. nuclear research from progressing. Not a single industrial giant like Dupont, General Dynamics, and Ford have come forward with any interest in solar energy. . . .

Dr. [Raja] Ramanna, Scientific Advisor to the Defense Ministry, said (at a seminar in March): "It would only be fooling the people if they were told that solar energy could replace the conventional sources of energy in the foreseeable future."



## **ENERGY AND THE SCIENCE OF ECONOMICS**

*A conference sponsored by the Fusion Energy Foundation  
and the Executive Intelligence Review.*

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Tuesday, July 31

10 am-4 pm

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### **CONFERENCE PROGRAM**

The Application of the LaRouche-Riemannian Model  
to Current and Future Energy Policies

The Future of Nuclear Energy

Special Report on the Independent Commission  
of Inquiry of Three Mile Island

Economic Impact Reports:

Industry, Agriculture, Transportation

### **SPEAKERS**

Lyndon H. LaRouche, Jr.

Contributing editor, Executive Intelligence Review

Chairman, U.S. Labor Party

Jon Gilbertson

Nuclear safety expert, Fusion Energy Foundation

Member, Independent Commission of Inquiry on Three Mile Island

Calvin Larson

Agricultural engineer, Fusion Energy Foundation

### **REGISTRATION\***

\$50 per person (including lunch)

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### **INFORMATION**

Mitchell Hirsch or Carol Leebove

Fusion Energy Foundation

Suite 3 East

19 West Jackson Boulevard

Chicago, Ill. 60604

Tel: (312) 663-3692

Dr. Stephen O. Dean:

# Some Thoughts on Leaving The Dept. of Energy

*Dr. Stephen O. Dean, who resigned in mid-March as the director of magnetic confinement systems in the DOE Office of Fusion, wrote this review of the magnetic confinement program shortly before he left the DOE.*

*Aside from many years of exceptional professional service, marked by the overall maturing of the fusion program, Dean has been an outstanding fighter for fusion power. Last summer Dean performed a major public service in accurately terming the Princeton tokamak results one of the most important breakthroughs in the history of the fusion program. Dean is equally accurate here in describing the present DOE policy as attempting to study and delay the fusion program to death.*

*We agree with his call for an immediate aggressive engineering development program. It is necessary to emphasize, however, that ultimate success in the fusion effort will result as a by-product of a multifaceted research effort especially focused on the fundamental question of the negative energy content in plasmas and associated self-ordering and energy-concentrating processes.*

*In short, what is required is the scale of funding adequate to pursue both long-term basic theory and experimental research as well as the most rapid engineering development of scientifically established approaches.*

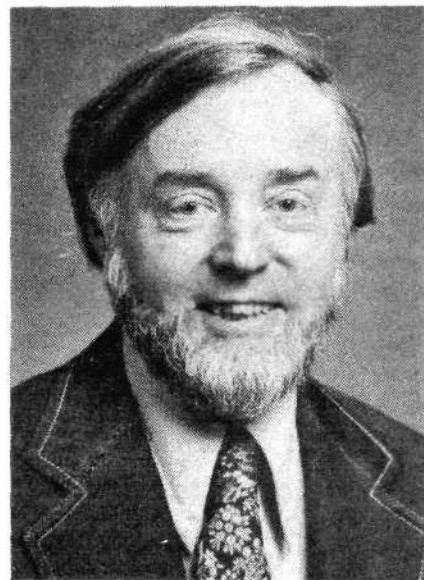
*An indication of how dismal the situation has become under Energy Secretary Schlesinger is that Dean and others can find solace in reports such as that of the Foster Committee, whose chief virtue is that it merely retards the demise of the fusion program.*

Here are some thoughts and opinions on the past, present, and future of the magnetic fusion program.

Looking back, the advances that have taken place in the program over the past six years, compared to the previous twenty years, are truly remarkable. It is tempting to think that this has come about solely due to the natural evolution of plasma physics understanding. I think that this is only partly true. An equal and perhaps even dominant element has been the attitude and determination of the people who have made the key decisions over the past six years. This includes not only Headquarters personnel, but also the scientists and laboratory managers, and others in the Office of Management and Budget and Congress. There was a willingness to focus the program toward concrete goals and to make bold decisions. The line managers have made the decisions; they have consulted with outside advisors but they have not allowed those less knowledgeable to set the course of the program or to decide the relative merits of various fusion approaches. The results speak for themselves.

### TFTR—Certain Success

In closed confinement, after 27 years of searching, the tokamak has emerged as the first, and thus far only, magnetic confinement device with sufficiently good confinement to achieve ignition. The success of TFTR [The Tokamak Fusion Test Reactor at Princeton] is assured. In the linear systems area, by 1972 most of the world had given up hope for mirrors. We decided to make one last try. Program redirections, leading to the successful 2XIIIB experiments at Lawrence Livermore Laboratory and the



*Dr. Stephen Dean, former director of magnetic confinement systems at the DOE Fusion Office.*

evolution of new ideas for enhancing power balance in mirrors have resulted in new life and promise in the mirror program.

### 'Alternate Concepts'

The "alternate concepts" program, about which there is a great deal of publicity these days, is, to be truthful, in an extremely elementary and exploratory state relative to tokamaks and mirrors. The recent review which identified Elmo Bumpy Torus as a promising closed system ready for acceleration is correct; but the popular perception that EBT may be a candidate for an engineering test reactor by 1984 is totally false. The EBT has been investigated by a very few people. There are great uncertainties in both the theoretical and experimental bases for extrapolation and these need to be vigorously studied. But, even if a major worldwide effort were devoted to pursuing this concept, EBT could at best be at the stage tokamaks are at today by the early 1980s.

The department policy statement that TFTR will demonstrate "scientific feasibility" is a most unfortunate resurrection of an imprecise way of thinking about fusion. TFTR will demonstrate a form of energy breakeven and will study fusion physics in the tokamak geometry. It will not dem-



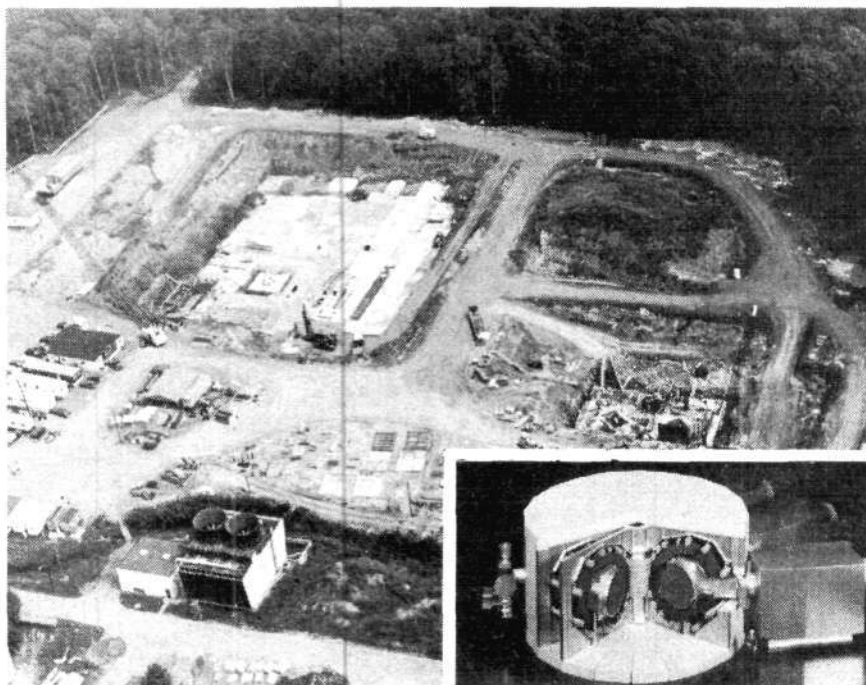
onstrate "scientific feasibility" for all fusion, because the physics is different for different magnetic geometries. It is my very strong personal opinion that the PLT experiments of last summer, taken together with earlier results in other tokamaks, demonstrate the scientific feasibility of the tokamak approach. By this I mean that there is now no reasonable doubt that plasmas can be contained in a tokamak for a long enough time at high enough temperature to initiate a sustained, controlled release of fusion energy. How the burn will be controlled and maintained for a long time are, in my view, engineering feasibility issues; whether fusion will be practical is an economic feasibility issue.

### The Engineering Test Facility

The Engineering Test Facility (ETF) is a facility the fusion program as a whole requires to test engineering associated with handling large amounts of fusion energy. The information learned from an ETF on materials, components, safety, remote handling, and so on, will, for the most part, be useful to any concept. Consequently, the primary criterion for selecting an ETF should be that there is a high degree of confidence that it will produce large amounts of net energy. Only the tokamak concept can provide such confidence, for an early 1980s machine start.

I think that a tokamak ETF should be started now. This does not and should not preclude the construction of experimental reactors for other concepts when they are ready. Fusion will never be practical unless more than one variety of experimental reactor is built. In spite of widespread belief to the contrary, I believe the country can afford several experimental reactors.

It has been said that one reason for delaying five years to begin an ETF is so that we can be smart enough to build a less expensive machine; that is, we need not over-design as much if our uncertainty in the physics is less. But I think that the proper comparison on cost savings should be against the cost of delaying an ETF for five years. The fusion program will spend about \$2 billion of R&D money during that five-year period, and it is



An overhead view of construction for the Tokamak Test Fusion Reactor at Princeton. Inset is scale model of the TFTR.

PPPL

impossible that the cost savings on an ETF could approach such a number. Therefore, even the simplest cost benefit analysis tells us to start now.

It is true that we do not know how to design all the components of the ETF at this time, but it is also true that the nature of a tokamak ETF is sufficiently well defined that a project-oriented research and development program, tightly coupled to the construction of that project, would very likely be successful in a much earlier time and at much less cost than is now projected in the agency plan. It has also been said that we should wait on ETF in order to pick the confinement geometry which is likely to be the geometry of the first generation of commercial reactors. We have no idea what the detailed geometry of the first generation of commercial reactors will be and we will not know in 1984 either. The detailed magnetic geometry of the commercial reactor will evolve, just as automobile and airplane performance have evolved. What we need as soon as possible is a device that makes as much net fusion energy as possible.

Going on to other matters, the re-

cent review and subsequent agency policy has had a beneficial effect on the fusion program in the sense that a year ago, through lack of information, the upper management of the Department of Energy was on the verge of cutting back the fusion program drastically. Through the review process, an understanding of the fusion program and of its achievements and promise has emerged. The review process has had a negative effect, however, on the technical momentum of the program and on the attitudes and morale of many key fusion program personnel. Some of our best people now seem to be scarred from the battle and unwilling to put forth bold plans. They are stunned that the agency policy favors untested concepts rather than those that have been demonstrated to work. We are not pursuing our most promising programs aggressively the way we have in the past. We are in danger of losing our focus and it has been our past willingness to focus that has led to success.

The growing international momentum is going to be a supportive ele-

*Continued on page 86*



# Economics Becomes a Science

## *A Riemannian Model of Economic Development*

by Steven Bardwell and Uwe Parpart

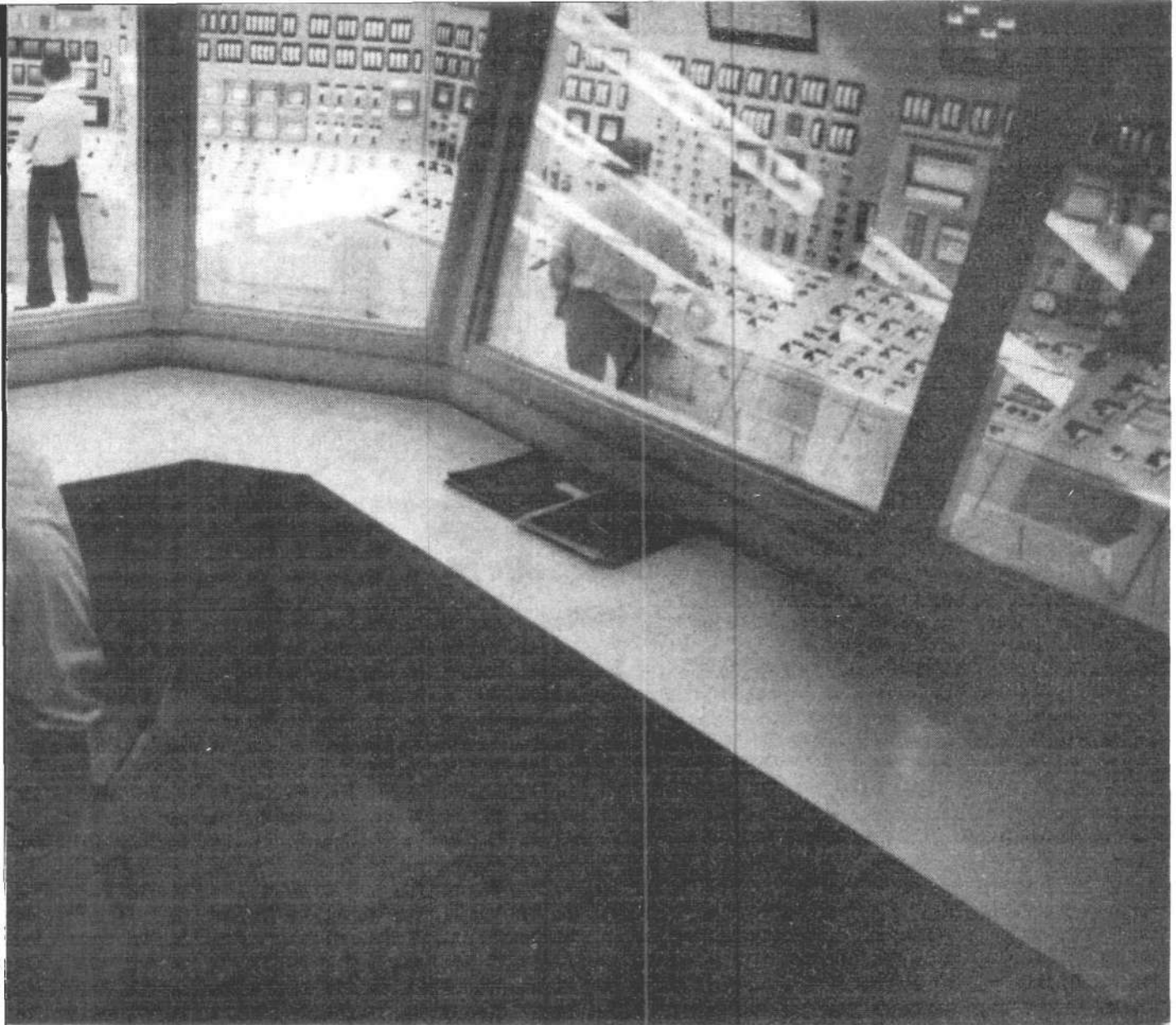
WHEN WE TRACE the course of the human economy over historically significant time spans and focus on what might be called the "long waves" of economic development, we can readily adduce its essential character as the process of the material realization of the advances of human reason, expressed as scientific breakthroughs.

Economic progress measured in the form of advances in the material-cultural standard of living of the population arises uniquely from the "negentropic action" of the introduction of new technologies (representing scientific progress) upon the productivity of the population; that is, its enhanced capability for the production of tangible wealth. Conversely, failure to introduce and rapidly capitalize new extraction and manufacturing technologies inevitably leads to economic downturn and "entropic" disintegration.

In general form, these facts were well known to the great economists of the "American System"—Alexander Hamilton, Friedrich List, and Henry Carey; they counterposed these facts to the insidious myths of "no growther"

Thomas Malthus, and made them the express basis of their economic policy decisions and dirigist intervention into the economic process. A detailed economic analysis based on the same principles and explicitly founded on the concept of the negentropic action of scientific and technological innovation as the central fact of economic development has been developed in numerous writings since the 1950s by political economist Lyndon H. Larouche, Jr.<sup>1</sup> The quantitative economic model presented below, the "LaRouche model," is based on that analysis.

Counter to this American System economics runs not only "zero growth" Malthusianism but also the "free-enterprise," "free-trade" mythmaking of Adam Smith, Jeremy Bentham, and their contemporary adherents Frederick von Hayek, Milton Friedman, and Lord Keynes. Unfortunately, the sham feuds for the credulous between the von Hayeks and Friedmans on one side and the Keynesians on the other over government intervention, deficit spending, and what have you, have thoroughly clouded the issues and succeeded in obscuring the fun-



damental disagreements that both these "British factions" have with the American System.

The notion of gross national product, GNP, happily employed by both Keynesians and Friedmanites, provides a convenient way of refocusing the issue. Keynes would have us believe that digging a ditch and then closing it up again, employing as many people as possible in the most labor-intensive fashion, produces real economic growth because it surely contributes to GNP and allegedly relieves the unemployment problem along with it. And Milton Friedman, upon inspection of GNP, would detect remarkable economic growth in the state of New Jersey as a result of the operation of several new gambling casinos in Atlantic City—and he would find nothing wrong with that.

#### **The GNP Fiction**

Both Keynes and Friedman, however, would disagree with a vigorous government-sponsored research and development program in fusion energy development; Friedman, because it is government sponsored, Keynes because

it is high-technology R&D and upon realization will lead to increased capital intensity of the economy. For whatever reasons, Keynes and Friedman thus agree on stifling technological progress and are led to a position of promoting or defending "economic growth" via gambling and ditch digging; and both find in GNP a convenient scientific category to cover such inane policies.

Alexander Hamilton would not have had such problems; he would have simply declared absurd a measure of economic growth that is incapable of discriminating between productive tangible-wealth-producing economic activity and such patently nonproductive or counterproductive activity as gambling or digging ditches and closing them up again.

Not surprisingly, the presently fashionable notion of a *decoupling* of economic growth and energy consumption is based precisely on extensive and largely uncritical use of this wholly unscientific GNP category. Thus, in August 1977, the Energy Subcommittee of the congressional Joint Economic Committee, headed by Senator Edward Ken-





The American System developed by Alexander Hamilton (l.), Friedrich List, and Henry Carey is what built America as an industrial and technological leader. If the present-day followers of Adam Smith (r.) have their way, the nation will regress to a lower level of technology and culture. The drawing above depicts the Boston Tea Party.

nedy, released a report claiming to prove that the United States could decrease energy consumption by 40 percent and still continue a course of growth and prosperity. The report attempted to show that energy and GNP are *decoupled* or, at least, decouplable in the future, both here and internationally.<sup>2</sup>

#### Decoupling Debunked

In a certain crass empirical way, the report's authors, Marc H. Ross of the University of Michigan and Robert H. Williams of the Center for Environmental Studies at Princeton University, correctly locate a basic fact of the U.S. economy. For the past 10 years, as they point out, the U.S. economy has been restructuring itself so that the content of total goods and services has become more elastic to energy supply and has grown much more in low energy-intensive areas (services and consumer goods) than in high energy-intensive areas (basic industry).

There is no doubt—and this is the substance of the Ross and Williams decoupling thesis—that as the economy shifts toward gambling revenues and similar kinds of services, the GNP becomes more insensitive to energy input in either quantity or price. The essential point, however, is that Ross and Williams take the deindustrialization of the past 10 years as evidence that the United States can make a viable transition to what they call a *postindustrial* society where there would be more labor-intensive services at the expense of more energy-intensive and capital-intensive basic industry.

Now, if this were a realistic scenario for the develop-

ment of an economy and if even this sort of evolution could be measured by a statistic such as GNP, then certainly the United States could cut its energy consumption by 40 percent without a decrease in the GNP. The point is, however, that the real significance in the trend Ross and Williams observe is totally different from what they hope to prove. In fact, it simply describes the process of the continuing deterioration and ultimate destruction of the long-term productive potential of the U.S. economy.

#### Some Conventional Theories

It is worthwhile to examine the best of the conventional economic theories that dispute the decoupling thesis promoted by the Kennedy subcommittee. Perhaps most useful of these is a study by Bent Elbek of the Niels Bohr Institute in Denmark.<sup>3</sup> This study attempts to examine the question of energy and economic development by the very useful tack of examining the "insides" of the category GNP. Table 1, in which Elbek dissects the actual ingredients in the GNP of several different types of countries, shows very strikingly that the seemingly homogeneous category of GNP in fact hides qualitatively different structures of economy.

The interesting thing about GNP, as Elbek shows, is not nearly so much its absolute size, but rather its internal divisions between agriculture, industry, services, and so forth. These divisions explain many of the problems and dynamics of economic development and the role that energy consumption plays in that development. However, the conclusion Elbek reaches for an advanced country like

the United States describes an asymptotic society where services, industry, and so forth have all reached levels extrapolated from the current trends evident in Table 1.

The end result of the Elbek model is a state of economic "perfect rest" where development and growth cease. In other words, despite his critique of quantitative views of the GNP, he has simply produced another version of the Ross and Williams postindustrial society.

Both the theory of economics Elbek presumes and, more immediately, his methodology and world outlook must be rejected.

### Self-Development

The fact is that human society must develop and progress, and economic growth is not an anomaly characteristic only of the present several centuries.

Let's look at an analogy from highly nonlinear physical systems: Physical systems rarely have an accessible equilibrium state (plasmas are a good example); hence, they continually evolve to states of higher and higher order.

In fact, it is impossible for a system that exists through energy input and flow, such as a hot plasma or a human society, not to evolve. If it ceases to concentrate and organize this energy, the system experiences an "energy crisis" and collapses very rapidly toward an entropic final state.

On the other hand, open-ended but structured evolution is possible and, indeed, necessary for existence, since new resources and new modes of energy capture and utilization become possible as this process of evolution creates new laws.

Man's history demonstrates this lesson with great force: All so-called natural resources became such only when man developed the technology to use them; such resources became finite only at that point. As soon as man created a new, higher technology, the former resources became irrelevant and their finitude unimportant. Without the continual development of new technologies and the accompanying new "laws" of economics, human societies die out or regress toward barbarism.

The model of the economy we present is called Riemannian because Bernhard Riemann's work in mathematical physics attempted to embody in the analysis of physical systems the same kind of negentropic tendency toward the evolution of more highly organized and differentiated states otherwise found in the evolution of human society.

Riemann's commitment to Plato's method of "hypothesizing the higher hypothesis," a method described in Plato's dialogue *Phaedo* (to take one example), was set out in his 1854 habilitation paper, titled "On the Hypotheses Upon Which Geometry Is Based." In addition, Riemann gives a striking application of his Platonic method in his analysis of shock waves. His 1859 work on shock waves specifically identifies physical circumstances in which a new kind of entity (a compression shock) comes into existence as a singularity for the gasdynamical system under consideration and in which this new, integral higher-order entity defines for itself a new phase space and lawfulness determining its own future mode of existence.<sup>4</sup>

The mathematical tools employed in Riemann's shock wave analysis (as well as those developed for the geometrical representation of multivalued complex functions) are peculiarly applicable to a LaRouche-type analysis of the economy. This is because the emphasis this type of analysis places on scientific innovation and the rate of propagation of new technologies through the economy sets up an orthogonal direction to the time axis, allowing for a shock-wave interpretation of the negentropic action of the introduction of major new technologies.

Epochs in the evolution of the economy (either global or regional) characterized by different principal technologies will define an ordered sequence of phase spaces given in terms of (in general) different sets of parameters and internal relations, but, in the transition from space  $n$  to space  $n + 1$ , connected by the singularities and specific "jump conditions" uniquely generated by space  $n$ . Negentropy in the economy—much as in a physical system—is then the transinvariant for this ordered sequence of

**Table 1**  
**TYPICAL COMPOSITION OF GNP**

Type of country	Per capita (1975 \$/yr)	Population (millions)	Agriculture (%)	Industry (%)	Transport (%)	Service (%)	Total (%)
Low income	300	2,371	40	30	5	25	100
Middle income	1,700	650	12	40	5	43	100
High income	4,800	884	3	41	6	50	100

This table, taken from Danish economist Bent Elbek's paper "World Energy Outlook and Options," shows the typical internal division of GNP for the three types of countries he studied. The interesting thing Elbek notes about GNP is not so much its absolute size, but the internal division between agriculture, industry, services, and so on.

Elbek's paper was presented at the International Scientific Forum on an Acceptable World Energy Future at the University of Miami, Florida, Nov. 27, 1978.

phase spaces (or manifolds in Riemann's sense) and the precise ontological analogue of Plato's "higher hypothesis" for a given ordered sequence of scientific hypotheses.

### The Deficiencies of Other Economic Models

All the national and world economic models used today suffer from two major interrelated deficiencies reflected both in the models and in the data bases:

First, no distinction is made between *productive* and *nonproductive* economic activity and realization of economic output, where by productive we mean effecting a useful material alteration of nature resulting in tangible wealth. (See below for detailed categorization.) Consequently there is no concept of economic *surplus* in the sense of an economic product representing "free energy" for the expansion of the productive base of the economy through investment in added productively employed labor and capital goods. In addition, the concept of economic growth itself becomes ambiguous, even maligned as a cause of inflation.

### The BEA on Its Economic Model

*Ever wonder how the government comes up with economic forecasts of what Americans can expect in the way of inflation and other key trends? The Bureau of Economic Analysis offers this description of the accuracy of the econometric model they use to call the shots on the economy.*

The whole inquiry—both its prediction and forecasting aspects—is aimed at the question: How reliable is the model as a forecasting instrument? The article does not provide an unambiguous answer to the question. However, both the quantitative error statistics and the analysis of turning point predictions show a substantial tendency toward deterioration as the prediction of forecast horizon lengthens. Since a large part of the impact of many kinds of government economic policy actions occurs several quarters after such actions, further improvements in econometric modeling are desirable.

An econometric model is a set of equations comprised of behavioral relationships plus "identities," or definitional relationships. The behavioral relationships are specified (as far as possible) on the basis of economic theory and are estimated by fitting regressions to actual data. A basic assumption is that the relationships are "stochastic." That is, even if all of the important causal determinants are included as explanatory variables in an equation and the form of the equation is properly specified, there remains a random or unexplained error term (often called "disturbance") which represents the net effect of the myriad other forces that are acting on the dependent variable.

Second, an inadequate or no account is given of qualitative changes in the technology base of the economy, even though in the long run, such changes and their action on the productivity of labor are the only source of noninflationary growth. Appreciation of this fact itself, of course, presupposes the distinction between productive and nonproductive.

Another reason frequently advanced for not including technology changes in the usual models is that continuous models cannot accommodate them. This is true. Therefore, the Riemannian model proposed here is specifically geared toward the occurrence of discontinuities in one or more of the model's parameters. In fact, it is in order to emphasize this feature that the model is called Riemannian: The 19th-century German mathematical physicist was the first to propose that the analysis of global phase-spatial relationships proceed from the standpoint of the determination of the "shape" (or geometry) of the phase space or manifold by means of the distribution of the singularities of the parameters spanning the space. In his discovery and description of the phenomenon of shock waves Riemann gave a specific example of the evolution of a physical manifold toward a point of discontinuity and the subsequent qualitative reordering of the manifold as a result of the propagation of the singularity retaining its integrity as a new type of physical entity.<sup>4</sup> Technological change will be seen to have shock-wave character in this general sense for our economic model.

### Conventional Models

We shall briefly examine three conventional-type economic models to illustrate the two points of criticism just made and to show how the indicated defects lead to gross predictive and policy failures. In presenting this short critique we want it to be understood that we do not overlook the fact that precisely to the extent that some of the examined models have about the same predictive power as the charts of an astrologer, their main purpose, in fact, may be the same as that of such charlatans in the service of the king: to provide the credulous with some semblance of objective justification for policies that are pursued for entirely different reasons.

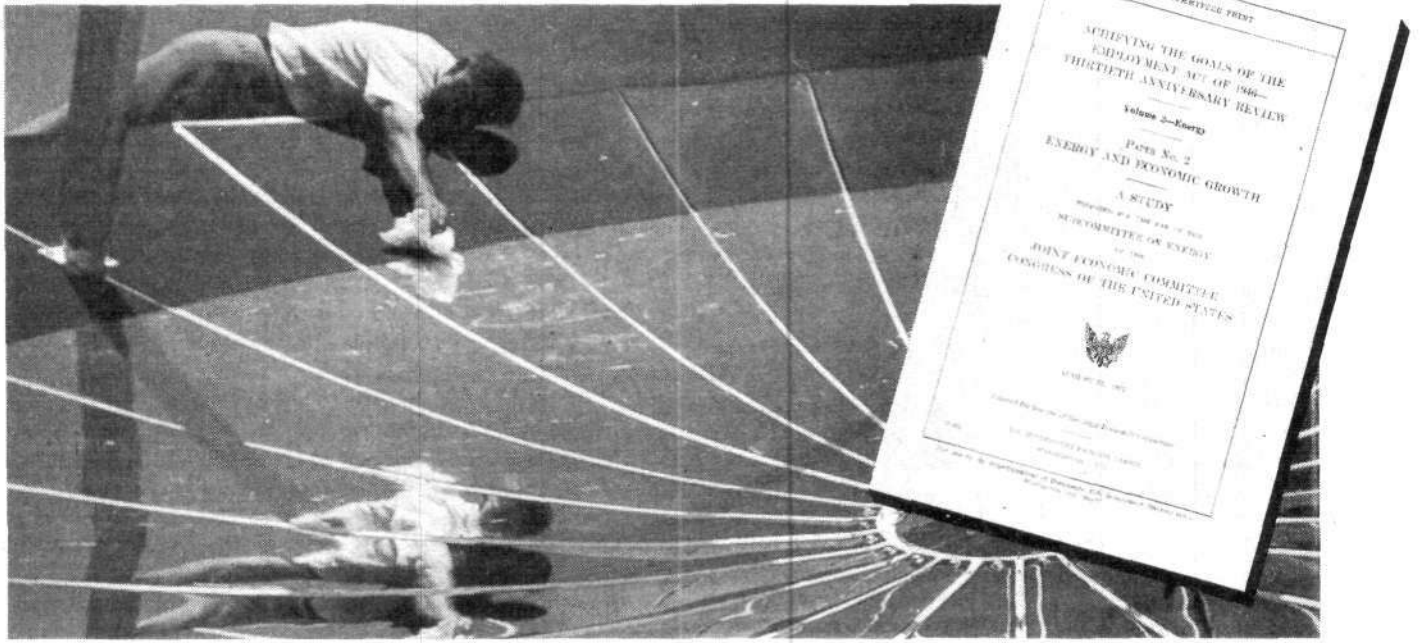
#### Naive Forecasting

First, there is the so-called *naive* forecasting method, which hardly deserves the name model. It proceeds by establishing certain historical trends for a given variable or set of variables and then more or less uncritically projects that same trend (positive or negative growth rate) into the near or distant future. Such simple inductive procedures are open to so many different and obvious objections that it is hardly worthwhile to bring our two points above to bear on them.

#### Econometric Models

Significantly, however, economic models of the second category to be considered, the *econometric models* forecasting *national income account statistics* (such as the U.S. Department of Commerce Bureau of Economic Analysis, or BEA, quarterly model), are subject to the same inductive fallacy—in fact, doubly so. They attempt to forecast the





Senator Kennedy's energy subcommittee of the Joint Economic Committee is promoting the idea that energy and economic growth have nothing to do with each other. Such "decoupling" of energy and growth is based on the premise that low-energy, labor-intensive work (such as the solar reflector cleaner above) as well as gambling and prostitution will play an increasing role in the American economy as basic industry shuts down.

values of variables such as personal income, government spending, gross national product, and so forth on the basis of some combination of

- (1) historical or lagged values of the variable in question;
- (2) other variables related to it by a set of linear equations; and
- (3) exogenous variables determined by factors not covered by the model at hand.

The first of these forecasting methods, of course, is just our above naive extrapolation; but basically so is the second. The linear equations establishing the relationships between the different variables of the model normally reflect and are justified by the model builders through reference to historically observed *statistical correlations* between the variables rather than through purporting to express actual *causal relations* in the economy comparable, say, to the laws of classical physics. Thus, the theory expressed by the model's equations has the epistemological status of a simple inductive generalization no different from naive extrapolation.

Most professional economists today will probably contend that economics admits of no other kind of "lawfulness" and theorizing, and that our criticism of the standard econometric models is therefore vacuous. We are not impressed by that point. Aside from their epistemological inadequacy, the forecasting performance of existing models is notoriously unreliable, whereas the causal analysis of the economy we are proposing will recommend itself mainly by its predictive accuracy.

There is no reason to drive a wedge between physical and economic theory. In physics, when someone claims he knows that under normal conditions water boils at 100 degrees Celsius, because he has made a long series of boiling experiments all with similar outcome, we do not accept that as a valid reason. Instead, we ask for a more reliable explanation that must contain some reference to a cause/effect relationship between the heating of water and the onset of cavitation (boiling).

Similarly, in economics, a statement that historically a change in such and such variables has generally produced such and such overall growth rate should be regarded as at best incomplete, leading to an answer of the more basic question of *why* the variables examined showed the observed behavior.

In today's economy there actually is one crucial phenomenon that just begs for the proper kind of causal analysis—the phenomenon of inflation. The very fact that inflation has so stubbornly resisted the econometricians' best predictive efforts demonstrates the incompleteness of their models caused by an inadequate choice of parameters and relations between these parameters. Einstein never tired of making the same point regarding the quantum-mechanical uncertainty relations; they must be taken as a signal of incompleteness *with respect to the chosen parameters* and phase-space relationships, but not as a sign of the ultimate causal incompleteness of physics.

We shall show here how it is precisely the distinction between the productive and nonproductive realization of the total economic product that allows for a choice of

parameters or variables that span the kind of phase space in which causal determination of economic behavior is possible. This identification of the causal parameters then becomes the basis for national policy intervention into the economic process as well as of reliable forecasting.

*Input-Output Models*

A third type of model to be considered briefly is the Leontief-type *input-output* model. In outward appearance at least these very differentiated models that map the flow of goods and services between the different sectors of the economy are concerned with establishing substantive producer-consumer relationships and not just with statistical correlations between selected variables.

Typically, these input-output or interindustry models display in matrix form the percentages of the total product of a given industry (or sector of the economy) consumed by the totality of other industries (or sectors) or going to "final demand" (see Figure 1). Such matrices can then be used to estimate required industry-by-industry inputs to obtain desired outputs both in the overall and with respect to certain specific output categories.

There is no question that the data displayed in input-output matrices can play a valuable role in economic policymaking; however, when applied to the problem of determining or forecasting economic growth in any time-frame except the immediate short run, input-output analysis suffers from the same fundamental flaw as the econometric models. All different output categories of the total economic product are treated on a par with each other, and no distinction is made between their productive and nonproductive consumption. However, it is only through the introduction of such a distinction that one can judge the future capacity for economic growth resulting from the consumption or realization of a certain type of product (mainly through the enhancement of the productivity of labor based on the rate of introduction and propagation of new technologies).

Simple production-consumption relations will not do, and input-output tables ultimately leave obscure the causes of economic expansion and contraction.

Perhaps the most serious indicator of insufficiency of conventional economic models is found, however, in their

		INDUSTRY PURCHASING						
		1	2	3	4	5	6	7
		agriculture and fisheries	food and kindred products	textile mill products	apparel	lumber and wood products	paper and allied products	printing and publishing
INDUSTRY PRODUCING	agriculture and fisheries	1	10.86	15.70	2.16	0.02	0.19	0.0
	food and kindred products	2	2.38	5.75	0.06	0.01	*	0.0
	textile mill products	3	0.06	*	1.30	3.88	*	0.29
	apparel	4	0.04	0.20		1.96		0.01
	lumber and wood products	5	0.15	0.10	0.02	*	1.09	0.39
	furniture and fixtures	6			0.01			0.01
	printing and publishing	7			0.08	0.02	*	0.0

Figure 1  
AN INPUT-OUTPUT MODEL

Input-output models like this one have some use in terms of showing which sectors use the economic products of other sectors, but they are totally useless in terms of forecasting economic growth because there is no distinction between productive and nonproductive consumption.

This model is part of a larger matrix that appears in Wassily Leontief's book *Input-Output Economics* and is meant to show the transactions of the U.S. economy during 1947. In both the vertical and horizontal columns, the entire economy is broken down into sectors. When read vertically, the numbers show what that sector consumes from the other sectors. When read horizontally, the numbers indicate shipments to other sectors. Each number in the body of the table represents billions of 1947 dollars. Asterisks stand for sums less than \$5 million.

Source: Wassily Leontief, *Input-Output Economics* (New York: Oxford University Press, 1966).

assumption of a simple continuity in the economic variables of interest. The related assumptions of a fixed set of economic relations and the imposition of a continuity condition on those variables are fundamental to all the present types of models: Econometrics demands a continuous manifold for the solution of its equations, and input-output analysis relies on the economy's being describable by the same-size matrix over time.

It has been well-known in physics since the time of Riemann and Boltzmann that these assumptions have drastic consequences for the system they describe: The assumptions of linearity (in the sense of fixed laws) and continuity, although both "local" statements about the system, have profound global consequences. In the case of physics, these two assumptions lead to the Second Law of Thermodynamics.<sup>5</sup> This is a very deep result, first rigorously shown by Boltzmann's famous H-Theorem: *a linear, continuous system is subject to an inexorable increase in entropy, the eventual running down and disintegration of order.*

The critical point for discussion is that the *same proof* holds for an economic model: the assumptions of linearity and continuity lead, by the same reasoning, to the necessary entropic consequence for an economic system unfortunate enough to satisfy these assumptions.

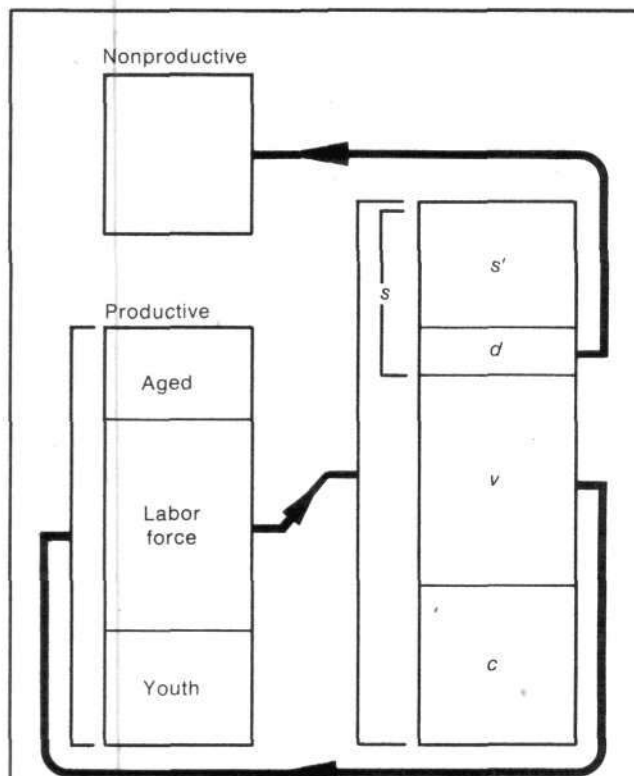
Obviously, however, neither history nor real economic systems satisfy either of these assumptions. Economic change, especially technological change, happens discontinuously, and, through this discontinuous process, the laws describing that economic development change qualitatively. The only presently existing mathematics sufficiently powerful to describe evolution of this sort is that outlined by Riemann and his school.

It is critical to note that the surprising indifference to growth rate of models like the Department of Commerce model—they predict equally healthy futures for the economy almost independent of growth rate—and alternatively, the gloomy necessity of zero growth deduced from system models like the *Limits to Growth* study of Meadows and Forrester,<sup>6</sup> both stem from Boltzmann's H-Theorem. These models, to take two examples, had zero growth and the impossibility of technological progress built in from the beginning in their most fundamental assumptions about the mathematics relevant to economics. Their "proof" of the possibility or necessity of zero growth is a purely circular consequence of their axioms.

### The Principal Categories of Reproduction Analysis

Since the mid-1950s economist Lyndon LaRouche has proposed a causal method of economic analysis that has served as the basis for the economic forecasting and planning model we have developed over the past several months with several collaborators. The latest popular presentation of LaRouche's method is contained in his October 1978 piece "The Theory of the European Monetary System."<sup>7</sup>

As opposed to the economic models just reviewed, LaRouche's analysis does not attempt to aggregate a whole



**Figure 2**  
**THE LAROCHE MODEL**  
**OF ECONOMIC REPRODUCTION**

*These bar diagrams show an entire society as well as the total product of that society divided into two categories: productive and nonproductive. Like a living organism, the economy is viewed as a reproductive system by which a given population produces and reproduces the material conditions of its existence. The principal quality to be measured is the enhanced reproductive capacity in societal transformations in successive epochs of the production-consumption cycle. The arrow pointing right indicates production, while the arrows pointing left show how that production is consumed.*

*As defined in the text,  $v$  is variable capital,  $c$  is constant capital,  $s$  is surplus product,  $d$  is nonproductive consumption, and  $s'$  is absolute surplus.*

economy from its component parts expressed as variables and their interrelations, but proceeds from the economy as a whole as the primary datum. In analogy to a living organism the economy is viewed as a reproductive system by which a given population produces and reproduces the material conditions of its existence, and in which the principal quality to be measured is the *negentropic* content (enhanced reproductive capacity) inherent in (or lacking from) societal transformations as represented by successive epochs of the production-consumption cycle.

The reproductive categories employed by LaRouche (displayed in their interrelations in Figure 2) are based on



the division of households into *productive* (income derived from labor employed for the production of tangible wealth) and *nonproductive* as follows:

- $v$  = *Variable capital* = portion of the total product (output) produced through a given production-consumption cycle representing the cost of reproducing the productive labor force at the same cultural-material level;
- $c$  = *Constant capital* = portion of total product representing the cost of replacement of plant, equipment, and raw materials at current level and quality of production;
- $s$  = *Surplus product* = portion of total product exceeding the quantity  $(c + v)$ ;
- $d$  = *Nonproductive consumption* = portion of total product representing the cost of reproduction of nonproductive labor in the private and public sectors at current level; and
- $s' = s - d$  = *Absolute surplus* = portion of total product available for reinvestment for expansion of  $v$ ,  $c$ , and  $d$ .

In the discussion of the data base of our model we will later relate these categories explicitly to categories familiar from Department of Commerce and similar government statistics.

For the time being we note that on the basis of the variables  $v$ ,  $c$ ,  $s$ ,  $d$ , and  $s'$  (aside from the time variable  $t$ , the only variables to be employed in our base model), certain ratios can be defined that represent important performance characteristics of the economy:

$$s'/(c + v) = \text{the rate of surplus production.}$$

This is a "free energy" ratio and represents the economy's capacity for expansion;

$$s/v = \text{the rate of surplus at current reproductive costs of labor.}$$

This is closely related to productivity as defined in government statistics and will be referred to here as productivity;

$$v/c = \text{a measure of the capital or labor intensity of the economy.}$$

For the present discussion, the behavior over time of the ratio  $s'/(c + v)$  is the most significant quantitative indicator. Rising values of this ratio represent the desired negentropic quality of the economy as a whole caused by investment in advancing technological capacity and necessary concomitant investments in improved specific skill and overall cultural levels of the labor force.

### The Model

The *base model*<sup>10</sup> of an arbitrary economy to be described at this point (a more sophisticated version will be introduced below) consists of a set of three ordinary differential equations governing the time rate of change of the just-introduced variables  $v$ ,  $c$ ,  $s'$ , and  $d$ . The equations relate these variables to three ratios of values of the variables assumed constant for the length of the reproductive cycle under consideration.

In essence, these values are politically determined and reflect the results of public- and private-sector policy choices operative in the economy. The required ratios are:

- $\alpha$  = the fraction of absolute surplus  $s'$  reinvested in  $v$ ;
- $\gamma = d/v$  = the ratio of nonproductively invested surplus to  $v$  in the current cycle;
- $\delta = (s' + d)/v$  = the ratio of surplus production to  $v$  (productivity) in the current cycle.

**Table 2**  
**AGGREGATED ECONOMIC DATA FOR THE U.S. ECONOMY**

Year	$c$	$v$	$d$	$s'$	$\alpha$	$\delta$	$\gamma$
1969	3.640	0.810	3.470	-0.020	0.499	4.259	4.2839
1970	3.630	0.800	3.900	0.639	0.046	5.675	4.8750
1971	4.240	0.830	4.270	0.170	0.705	5.349	5.1445
1972	4.290	0.950	4.800	0.800	0.162	5.894	5.0526
1973	4.960	1.080	4.980	1.100	0.036	5.629	4.6111
1974	6.020	1.120	5.370	0.349	-0.228	5.107	4.7946
1975	6.450	1.040	5.940	1.190	0.277	6.855	5.7115
1976	7.310	1.370	6.960	1.010	0.059	5.817	5.0802

The raw data (in actual dollars and uncorrected for inventory) taken from the data base for the aggregate U.S. economy are shown in columns marked  $c$ ,  $v$ , and  $d$ . From these columns invested surplus,  $s'$ , and the three ratios shown are calculated by the inverse model. These data are used to generate the starting values for  $s'$ ,  $v$ , and  $c$ , which are then used as input for the model.

With these variables we can write the following equations for  $v$ ,  $c$ , and  $s = (s' + d)$ :

$$dv/dt = \alpha s' \quad (1)$$

$$dc/dt = (1 - \alpha)s' \quad (2)$$

$$d(s' + d)/dt = d(\delta v)/dt = v(d\delta/dt) + \alpha\delta s'. \quad (3)$$

The first two equations simply express the fact that  $v$  and  $c$  change only as a result of the reinvestment of some surplus or profit (either positive or negative) in these categories. The third equation defines changes in surplus production as the sum of changes in productivity ( $s/v$ ) and in the absolute size of  $v$ . It is this third equation, in particular, that expresses the essential causal relation in the model. Surplus is created by the productive employment of labor; its size is proportional to  $v$ , with *productivity the crucial constant of proportionality*.

It is clear that, in most situations, using only these three equations would be a gross oversimplification of any economy. It is straightforward to write the more complex sets of equations required for a multisector economy, each of whose internal dynamics is governed by similar equations, but with different ratios. Below, we will show a simple example of such a system of coupled economic sectors.

An important capability that such a scheme of coupled sectors provides is the analysis of the interaction between the underdeveloped and developed sectors of the world economy. Without a doubt, the most striking feature of the world economy is its division into two sectors with grossly differing values for the ratios  $\alpha$  and  $\delta$ . The dynamics of the world economy depend on the interaction between these two subsystems.

Second, this multisector approach provides a natural scheme for examining the impact of the world economy on a subsumed (smaller) sector of that economy. Since the impact on a subsector of any pattern of world economic development will depend greatly on the level of industrialization, living standard, and productivity of that subsector, it is essential to have a way of measuring the effects of the world economy on any given subsector. The model provides a powerful way of studying the effect of different scenarios of world economic evolution on a single industry or state.

### Important Analytical Solutions

Although these equations are clearly intractable in their general form with any methods besides numerical ones, there are certain special cases in which they can be solved analytically. These analytical solutions reveal some important characteristics of the model equations and give significant insights into the underlying dynamic and structure of the numerically derived solutions.

#### Single-Sector Solution

In many cases, two important simplifications can be made to Equation (3), reducing it to the form:

$$ds'/dt = \alpha(\delta - \gamma)s'. \quad (3')$$

This equation will be a suitable replacement for (3) whenever the rate of change of  $\delta$  and  $\gamma$  are much less than the rate of change of  $v$ .

From this simplified form of the equations, several interesting conclusions can be derived. Most important is the dependence of  $s'$  on the various ratios. It is easy to integrate (3') for a general time dependence of  $\alpha$ ,  $\gamma$ , and  $\delta$ , with the result:

$$s' = s'_0 \exp \left[ \int_0^t \alpha(\delta - \gamma) dt' \right].$$

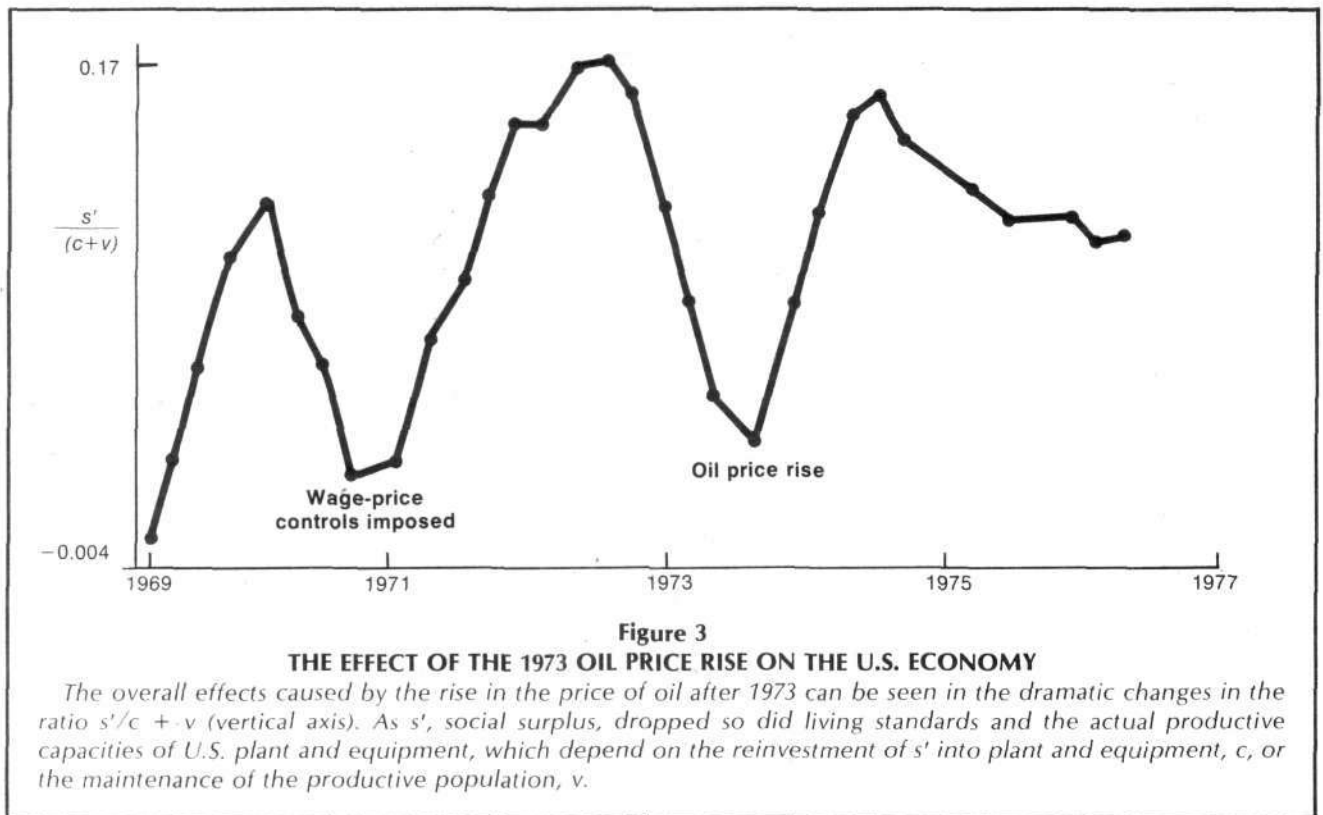
The growth of  $s'$  is found to be highly dependent on the composition of reinvested surplus  $\alpha$ ; it is possible to some extent to trade off  $\gamma$  and  $\delta$ , letting one decrease if the other does so, and still maintain the rate of growth. However, the influence of  $\alpha$  is essentially different. Any small change in the composition of reinvested capital greatly affects the rate of change of surplus. This is an important qualitative result, since it demonstrates in both a positive and negative sense the importance of the cost of replacement of  $c$ . A small cheapening (for example, a new mining technology) will greatly increase the growth of profit. The introduction of any method of cheapening  $c$  is disproportionately advantageous for this reason. By the same token, a small increase in the cost of  $c$  can dramatically decrease the rate of growth. This was the case, for example, with the rapid increase in the price of oil over the last five years.

We have just completed a case study of this situation and found that our qualitative prediction based on the analysis of the just exhibited analytical solution to the model equations is fully borne out by the quantitative results (see Figure 3). A more general point is this: the now quite common scare stories about "running out of everything"—oil, precious metals, timber, and so forth—even if they were true, are only indirectly relevant to economic growth. What matters is not the absolute availability of raw materials, but their availability at a given price.

Thus, it will not do to make provisions for the replacement of certain energy sources, for example, only when we are already at the borderline of marginal exploitation of the source. New sources must be brought on line early enough to be phased in well before depletion costs of current sources rise to a point at which the entire economy suffers and is reduced in its capability of developing new energy technologies at the required rate. From these considerations the fallacy of applauding higher energy prices (whatever the cause for such price increases) because they make the development of new sources profitable ought to be obvious.

#### Two-Sector Solution

Under the assumption of constant (historical) values for the ratios, we can obtain an interesting solution to the case of a two-sector world economic model. A realistic first approximation to the relation between the advanced



**Figure 3**  
**THE EFFECT OF THE 1973 OIL PRICE RISE ON THE U.S. ECONOMY**

The overall effects caused by the rise in the price of oil after 1973 can be seen in the dramatic changes in the ratio  $s'/c + v$  (vertical axis). As  $s'$ , social surplus, dropped so did living standards and the actual productive capacities of U.S. plant and equipment, which depend on the reinvestment of  $s'$  into plant and equipment,  $c$ , or the maintenance of the productive population,  $v$ .

and underdeveloped sectors (sectors 1 and 2, respectively) is the investment of a fraction  $\epsilon$  of surplus from the advanced sector into the underdeveloped sector. Under these assumptions, the coupling between the two sectors is only through the fraction  $\epsilon$ , and the equations take the form:

$$ds_1'/dt = \alpha_1(\delta_1 - \gamma_1)s_1'(1 - \epsilon),$$

$$dv_1'/dt = \alpha_1 s_1'(1 - \epsilon),$$

$$dc_1'/dt = (1 - \alpha_1)s_1'(1 - \epsilon)$$

$$ds_2'/dt = \alpha_2(\delta_2 - \gamma_2)(s_2' + \epsilon s_1'),$$

$$dv_2'/dt = \alpha_2(s_2' + \epsilon s_1'),$$

$$dc_2'/dt = (1 - \alpha_2)(s_2' + \epsilon s_1').$$

It is straightforward to derive from this an algebraic expression for the growth rate of the underdeveloped sector as a function of  $\epsilon$ . In Figure 4 this growth rate (normalized) is plotted as a function of the fraction of surplus invested from the advanced sector. There are two remarkable things shown by this very idealized model. First, the growth rate has a maximum; that is, there is an optimum fraction of surplus to be invested, and it is possible to invest too much in the underdeveloped sector. The consequent decrease in the underdeveloped sector's growth rate comes from the fact that a depletion of the

advanced sector's capability to grow will adversely affect the growth of the underdeveloped sector as well. However, it is striking that there is an optimum for this fraction.

Second, as Figures 5 and 6 show, this optimum decreases with time. That is, as the underdeveloped sector grows, the amount of advanced sector surplus reinvested for maximum growth decreases, as it should in any successful development effort.

#### General Utility of the Base Model

We have so far examined the use of our base model in two specialized areas of application: in what might be called impact studies evaluating the effect of significant short-term fluctuations of one variable while others are held relatively constant, and in two-sector studies focusing on the optimal allocation of surplus product. The general range of the model, however, is much broader and is indicated in the first flow chart (Figure 7). (The second chart, Figure 8, merely provides further details on model use and construction.)

The principal intended forecasting use of the model (now limited to the U.S. economy, but soon to be extended to other advanced-sector economies pending preparation of data base) proceeds along the following path. We start by inputting a time series of values for  $v$ ,  $c$ , and  $d$  and on that basis derive a set of historical values for the ratios of  $\alpha$ ,  $\gamma$ ,  $\delta$  and for  $s'$ . We can then reset these values at different levels reflecting arrays of possible private- and public-sector policy decisions affecting the ratios, and compute the outcomes for economic growth.



Figure 4

Time = 4 production cycles

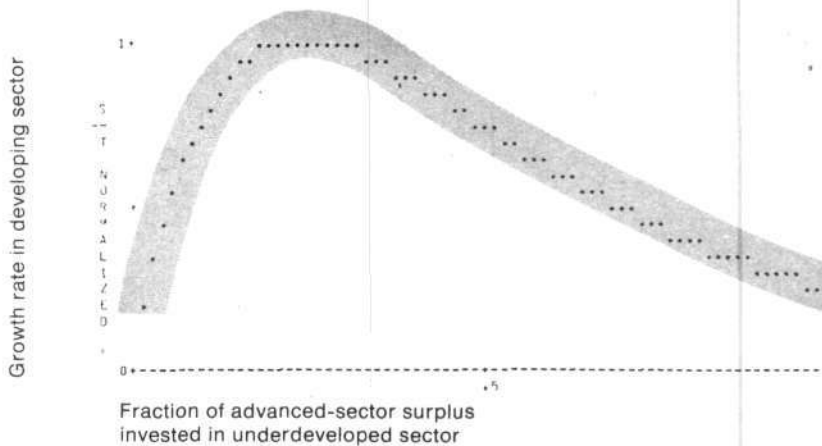


Figure 5

Time = 5 production cycles

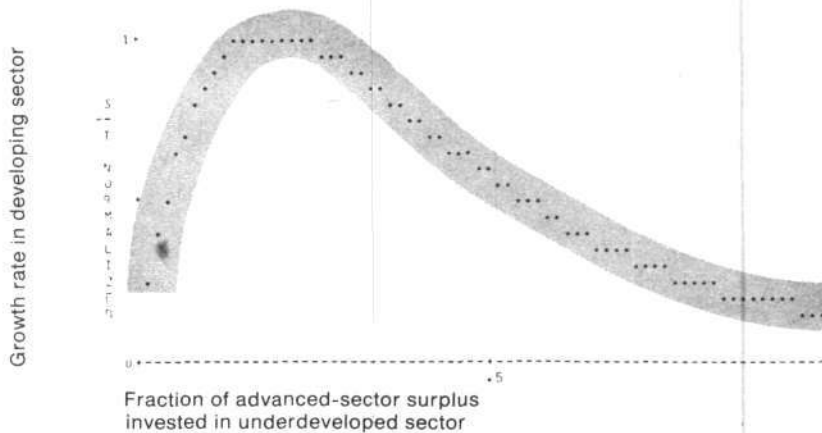
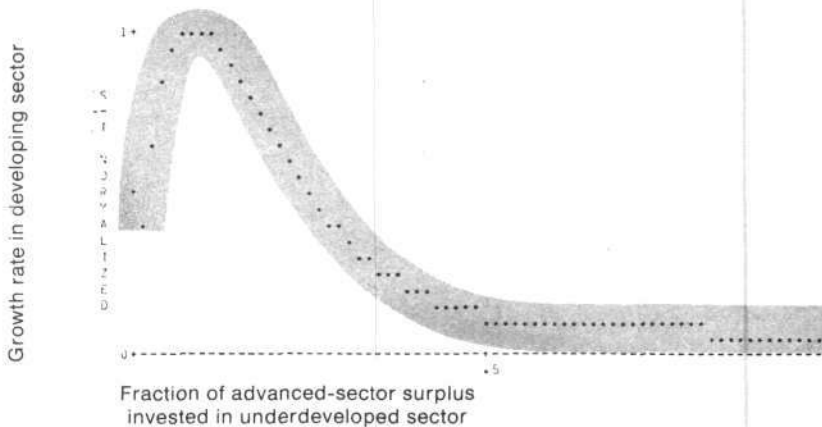


Figure 6

Time = 11 production cycles



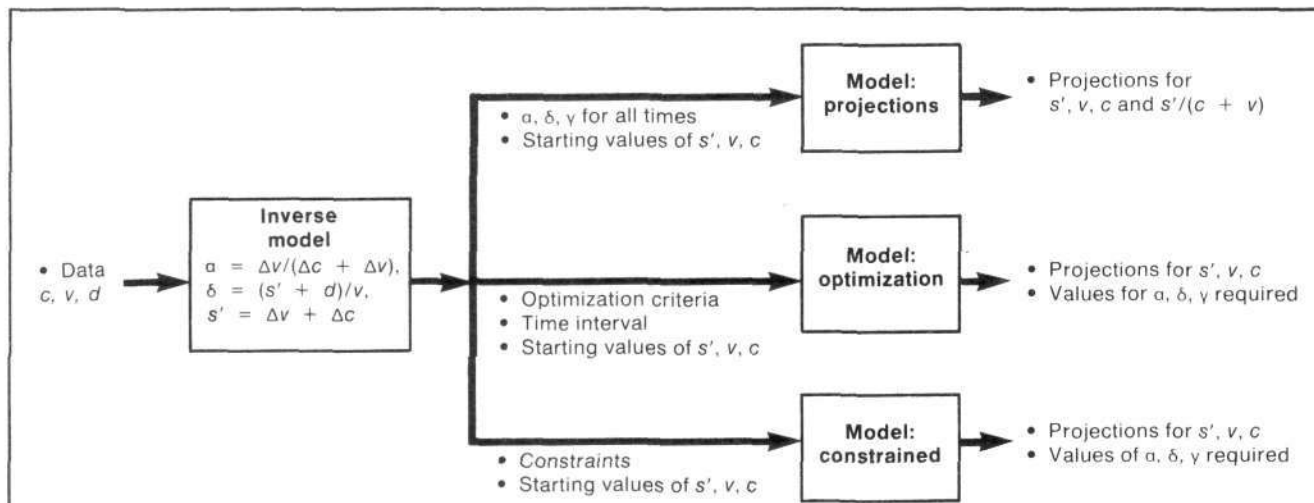
### Figures 4 to 6 THE OPTIMUM RATE OF INVESTMENT IN THE UNDERDEVELOPED SECTOR

These three graphs, produced by test runs with a computer code for the Riemannian economic model, examine the dependence of the growth rate of the underdeveloped sector as a function of the fraction of the advanced sector's surplus (profit) invested in the underdeveloped sector. This dependence is shown for three periods—four, five, and eleven-year production cycles—as the underdeveloped sector grows.

The values of the horizontal axis represent the percentage of advanced-sector surplus invested, from 0 to 100 percent, in the developing sector over the three time periods. The values of the vertical axis, from 0 to 100 percent, represent the growth rate produced in the developing sector.

Most striking is the fact that there is an optimum fraction for most rapid growth in the underdeveloped sector: In other words, it is possible to invest too little or too much in the underdeveloped sector. The second possibility arises because the growth rate in the underdeveloped sector depends heavily on the growth rate in the developed sector, since a fraction of the underdeveloped sector's reinvestment comes from the advanced sector. Hence, a fall in the developed sector's growth rate ultimately affects the underdeveloped sector as well.

Also note that this optimum falls over time; that is, a successful development policy is possible.



**Figure 7**  
**FLOW CHART FOR THE RIEMANNIAN ECONOMIC MODEL**

Each block in the flow chart shows one of the principal applications of the model. For historical analysis, the inverse model is used to change historical values of  $c$ ,  $v$ , and  $d$  into the ratios  $\alpha$ ,  $\delta$ , and  $\gamma$ . Running the model "backwards" in this way allows normalization and comparisons of past policy decisions with economic data.

There are three applications of the model for projection to the future. The model can be used to get projections (top block) of the economic impact of specific monetary and investment decisions. It is also possible to use the model for planning purposes by specifying optimizing criteria or constraints that determine investment decisions and hence the ratios  $\alpha$ ,  $\delta$ , and  $\gamma$ . These models are shown in the lower two blocks on the diagram.

As indicated above,  $\alpha$  reflects a variety of investment decisions with respect to  $v$ ,  $c$ , and  $d$ , but is being watched primarily for the impact of raw materials pricing; President Carter's recent oil price-decontrol decision is a case in point; we plan to publish results of an impact study now in progress.

Ratio  $\gamma$  principally reflects the impact of government spending in such areas as transfer payments and defense spending. Ratio  $\delta$  is generally, but usually not immediately, affected by investments in new technologies, government investment credit decisions for such purposes, and the like. In the short term the ratio reflects capacity utilization and other familiar factors that affect productivity. Input of different sequences of values for our ratios now yields different output sequences for  $v$ ,  $c$ ,  $s'$ , and  $s'/(c + v)$ .

We will publish not just the one sequence we judge the most likely, but several competing ones, in order to make transparent the impact of economic policy decisions, and in order, if you will, to tell people whom to blame for outcomes deemed undesirable. Our principal published indicator will be a value for "real GNP" equal to the predicted value of the sum  $v + c + s$ . The difference between the "real GNP" and the Department of Commerce GNP, signifying the difference between total unevaluated economic growth and productively realizable growth, will for the first time allow the drawing of accurate conclusions about the expected rate of inflation for constant employment figures.

As shown in the flow chart in Figure 7, our model is intended for and will be used for economic planning

purposes. Indeed, it is the principal merit of a causal model that switching from predictive to planning uses requires no changes in the model base. Optimization uses will allow for determining optimal growth rates on the basis of specified initial values, while "constrained"-model use allows, for example, the presetting of a certain growth rate and the evaluation of input requirements for the principal model variables.

#### The Data Base

In first approximation the preparation of the data base for our model poses relatively few difficulties; it involves a straightforward, essentially "algebraic," transformation of the U.S. Department of Commerce *Survey of Current Business* statistical categories into  $v$ ,  $c$ , and  $d$  as follows:

##### Variable Capital

Variable capital  $v$  is defined to be the portion of sales used for replacement of manufacturing and industry labor force (nondefense).

$$v = (\text{food} + \text{housing} + \text{energy}) \times (\text{goods-producing workers}) / (\text{total workers})$$

$$\times (\text{average manufacturing wages}) / (\text{average all wages})$$

$$= \text{TLFC} \times \text{Ratio 1} \times \text{Ratio 2}$$

where TLFC is the total labor force consumption, Ratio 1 is the ratio of goods-producing workers to total workers,

and Ratio 2 is the ratio of average manufacturing wages to the average of all wages.

$$\text{Food + housing} = \text{HGA} + \text{CS} + \text{AE} \\ - \text{NPAE} + \text{PRC} + \text{PHR},$$

where

- HGA = home goods and apparel
- CS = consumer staples
- AE = automotive equipment
- NPAE = nonpassenger car automotive equipment  
= TB × AE/PC, where
- TB = truck and bus factory sales
- PC = passenger-car factory sales
- PRC = private residential construction
- PHR = public housing and redevelopment.

$$\text{Energy} = \text{EPSR} \times \text{REC}/\text{TEC} + \text{GSRC},$$

where

- EPSR = electric power sales revenue
- REC = residential electrical consumption (in millions of kilowatt hours)
- TEC = total electrical consumption (in millions of kilowatt hours)
- GSRC = gas sales to residential customers.

$$\text{Ratio 1} = \text{GPW}/\text{TENA},$$

where

- GPW = goods-producing workers (in thousands)
- TENA = total employees, nonagricultural (in thousands).

$$\text{Ratio 2} = \text{AWEM}/\text{AWEP},$$

where

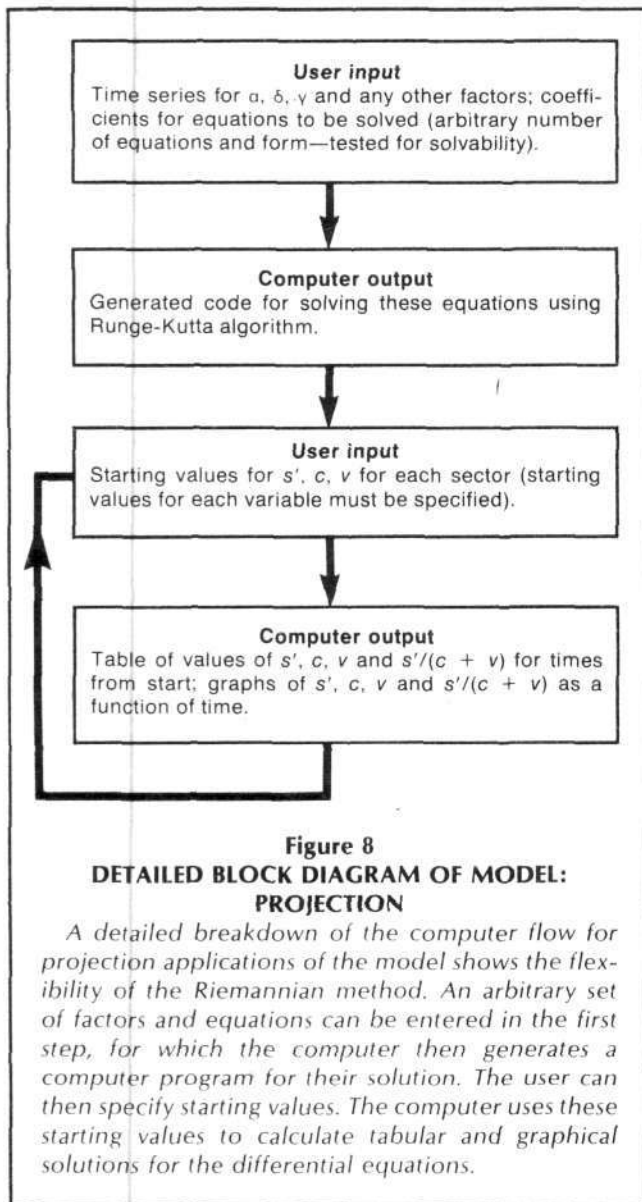
- AWEM = average weekly earnings, manufacturing employees
- AWEP = average weekly earnings, all private employees.

This gives the final formula:

$$v = [\text{HGA} + \text{CS} + \text{AE}(1 - \text{TB}/\text{PC}) + \text{PRC} + \text{PHR} \\ + (\text{EPSR} \times \text{REC}/\text{TEC} + \text{GSRC})] \\ \times [(\text{GPW} \times \text{AWEM})/(\text{TENA} \times \text{AWEP})].$$

#### Constant Capital

Constant capital  $c$  is defined to be the portion of sales used for replacement of plant, equipment, and raw materials at current level and quality of production. (All quantities are in millions of dollars unless otherwise noted).



**Figure 8**  
**DETAILED BLOCK DIAGRAM OF MODEL:**  
**PROJECTION**

A detailed breakdown of the computer flow for projection applications of the model shows the flexibility of the Riemannian method. An arbitrary set of factors and equations can be entered in the first step, for which the computer then generates a computer program for their solution. The user can then specify starting values. The computer uses these starting values to calculate tabular and graphical solutions for the differential equations.

$c$  = capital expenditures – transportation + energy

$$\text{Capital expenditures} = \text{MAS} + \text{CMAS} + \text{EDP} \\ - \text{DCG} - \text{PAE} + \text{PNRCI} + \text{PCI},$$

where

- MAS = materials and supplies
- CMAS = construction materials and supplies
- EDP = equipment and defense production excluding auto
- DCG = defense capital goods
- PAE = pollution-abatement expenditures
- PNRCI = private nonresidential construction
- PCI = public construction, industrial.

$$\text{Transportation} = \text{TTE} - \text{AE},$$



where

TTE = total transportation equipment  
AE = automotive equipment.

$$\text{Energy} = \text{GSI} + \text{EPSR} \times \text{FEI},$$

where

GSI = gas sales to industrial customers  
EPSR = electric power sales revenue  
FEI = fraction of electrical power to industry  
= EI/TEC, where  
EI = estimated industrial energy consumption and  
TEC = total electrical consumption (in millions of kilowatt hours).

Therefore,

$$\text{FEI} = [\text{GSIC}/(\text{GSCC} + \text{GSIC})] \times \text{ECI},$$

where

GSIC = gas sales to industrial customers  
GSCC = gas sales to commercial customers  
ECI = electrical consumption by commercial and industrial customers (in millions of kilowatt hours).

This gives the following formula:

$$c = \text{MAS} + \text{CMAS} + \text{EDP} - \text{DCG} - \text{PAE} + \text{PNRCI} \\ + \text{PCI} - \text{TTE} + \text{AE} + \text{GSI} \\ + (\text{EPSR} \times \text{GSIC} \times \text{ECI})/[\text{TEC} \times (\text{GSCC} + \text{GSIC})]$$

#### *Nonproductive Expenditures*

Nonproductive expenditures  $d$  are defined to be the portion of sales not used for replacement of manufacturing and industry labor force (nondefense) or for replacement of plant, equipment, and raw materials at current level and quality of production.

$d$  = consumer goods, energy, transportation, and construction not used productively.

$$\text{Consumer goods} = \text{TLFC} - v.$$

(See variable capital for description.)

$$\text{Energy} = \text{EPSR} + \text{GSR} - \text{GSI} - \text{EPSR} \times \text{FEI} - \text{EPSR} \\ \times \text{REC}/\text{TEC} - \text{GSRC},$$

where

EPSR = electric power sales revenue  
GSR = gas sales revenue  
GSI = gas sales to industry  
FEI = fraction of electrical output to industry (see  $c$ )  
REC = residential electrical consumption (in millions of kilowatt hours)

TEC = total electrical consumption (in millions of kilowatt hours)

GSRC = gas sales to residential customers.

$$\text{Transportation and capital goods} = \\ \text{DCG} + \text{PAE} + \text{NPAAE} + \text{NATE},$$

where

DCG = defense capital goods  
PAE = pollution-abatement equipment  
NPAAE = nonpassenger automotive equipment (see  $v$ )  
NATE = nonauto transport equipment.

$$\text{Construction} = \text{TNC} - \text{PRC} - \text{PNRCI} - \text{PHR} - \text{PCI},$$

where

TNC = total new construction  
PNRCI = private nonresidential industrial construction  
PHR = public housing and redevelopment  
PCI = public construction, industrial.

This gives the final formula:

$$d = \text{TLFC} - v + \text{EPSR} + \text{GSR} - \text{GSI} - \text{EPSR} \\ \times (\text{FEI} + \text{REC}/\text{TEC}) - \text{GSRC} \\ + \text{DCG} + \text{PAE} + \text{NPAAE} + \text{NATE} + \text{TNC} \\ - \text{PRC} - \text{PNRCI} - \text{PHR} - \text{PCI}.$$

This account also provides the reader familiar with Department of Commerce statistical categories with an explicit definition (at least in first-order approximation) of the categories  $v$ ,  $c$ , and  $d$  and, by implication, of the productive/nonproductive distinction.

For forecasting purposes our data base so defined is more or less sufficient since we are not principally interested in the absolute values of our variables. In the case of planning uses of the model, this no longer holds true. If one wants to plan the economy of an underdeveloped sector country, for example, one must have reference to absolute values providing reliable information on the infrastructure, capital base, standard of living, productivity of labor, and so on, in the economy. This necessitates far more extensive data transformations and corrections than indicated above.

We are now in the process of developing such a data base for the economy of India; results will be published shortly in preparation for an international conference on the economic development of the Indian subcontinent.

#### **Elaboration of the Model**

As successful and informative as the model in the above formulation remains, there is a fundamental feature of economic development that has remained an exogenous factor, namely, the interrelation between technological change, productivity, and growth of the economy. In the base model above, this relation must be supplied from the "outside" in the form of an empirically determined relation among the ratios  $\alpha$ ,  $\delta$ , and  $v$ .

As the LaRouche-Riemann economic model shows, there is an optimum fraction of the advanced sector's surplus (profit) that can be invested in order to get the most rapid growth in the underdeveloped sector. Here, scientists at India's Agricultural Research Institute experiment with the uses of radiation in plant breeding.



United Nations

To formulate a resolution of this insufficiency, some deeper introduction to the methodology of Riemannian mathematics is required. As noted above, the questions of the impact of technological change are geometric ones, not ones of a parameterization. That is, technological change introduces fundamental singularities into the actual economic process and precipitates, at these singularities, qualitative changes in the laws governing that economic development.

It is essential to realize that this jumplike behavior cannot be avoided. Any model that assumes, explicitly or otherwise, that economic variables must be continuous not only will fail to reproduce long-term economic behavior, but, more important, carries with it a set of axiomatic assumptions of the impossibility of technological change or realized scientific development. The historical fact is that such changes have taken place in a discontinuous manner, and, as we have seen, the assumption of continuity is equivalent to the assumption of a fixed mode of economic reproduction. Only by taking account of these discontinuous, qualitative changes can we deal with the central facts of human economic reproduction; namely, technological progress and increasing productivity by increasing cultural levels.

We have called the general approach of the model Riemannian because it uses the same mathematical tools that have been uniquely successful in Riemann's treatment of similar singular and nonlinear problems in physics. The crux of Riemann's method is his identification of the singularities in a process as the source of dynamics and internally determined geometry. Several points must be noted for further discussion<sup>9</sup>:

First, the set of variables required to specify the "state" of the economic system being modeled forms what Riemann called a *manifold*. This manifold is a multidimensional space whose properties are determined by the form of the differential equations that describe the economic system. That is, the space is not specifiable beforehand: its metric, "flows," and the like are a product of the *imposition* of the time-differential equations describing the evolution of the modeled economy.

Second, the equations specify a set of trajectories through the manifold. The solution to the equations defines, in effect, the geodesics for the manifold and hence the actual trajectory used by the system.

Third, as Riemann was at pains to point out, however, the interesting information for any manifold of this sort is given by the singularities it contains. As is the case in complex physical systems, these geodesics end or begin at singularities.<sup>10</sup> At some point along the trajectory describing (instantaneously) a successful economy, some derivative will become infinite, or some ratio will have a zero denominator. This singular point represents the onset of a new mode of "interaction"—the necessity for a qualitative change in the economy, (the development of a new technology, an energy crisis, or the like).

Fourth, the system of equations at this singular point cannot (usually) be made smooth again with any small change in parameters or any "adiabatic" change in the equations. The trajectories locally all share this singular point. A discontinuous change in the parameters or a qualitative change in the equations is necessary for the continued description of the system.

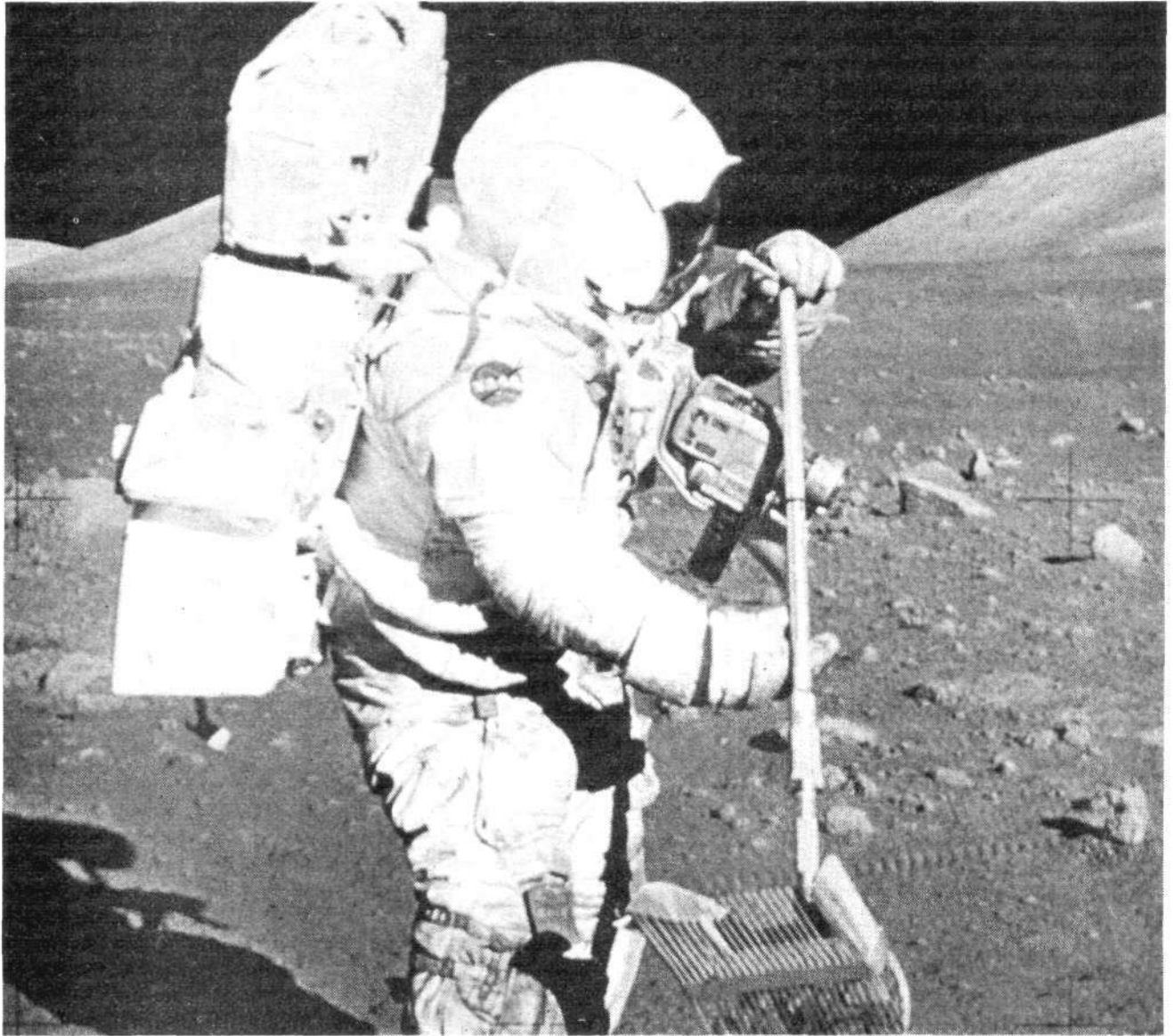
The parallel to Riemann's treatment of the formation of

shock waves (discontinuous fronts of pressure in a gas) out of normal acoustic waves is instructive.

In his 1859 paper, Riemann described a physical process in which the propagation of a wave changed the medium in which the wave propagated, in such a way that the higher-amplitude parts of the wave traveled faster than the low-amplitude parts. By virtue of this process, the peaks of the waves catch up with the trough in a finite amount of time, and the wave "breaks" mathematically, leading to singular derivatives for the amplitude as a function of position. Riemann's contribution was the recognition that this singular point was not a mathematical fiction—as most mathematicians had assumed from the

assumption that the physical variables had to be continuous!—but, rather, represented a qualitatively new feature in the system, a shock wave.

Economic systems exhibit shock-wavelike singularities at precisely the points of most rapid technological change or the points where such change is necessary. We can replicate this behavior mathematically by an argument very similar to Riemann's. The simple form of the economic model described above permits propagation of an economy in one "direction" only, namely, the time direction. However, it is clear that economic evolution occurs in two almost independent directions—in time and in "technological development." Both of these "coordi-



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*"Technological change introduces fundamental singularities into the actual economic process and precipitates, at these singularities, qualitative changes in the laws governing that economic development. . . . Only by taking account of these discontinuous, qualitative changes can we deal with the central facts of human economic reproduction—namely, technological progress and increasing productivity through increasing cultural levels."*



nates" are axes through which an economy can change, and, to a first approximation, economic evolution can occur in either "direction" almost independently. That is, an economy can exist by continuing in the same mode, at least for a length of time, without changing technology, and, in addition, a set of very rapid technological changes can occur in the space of only a few years, which could be replicated within a given level of technology only by many years of simple progress in the "time direction" alone.

Given this understanding of the geometric nature of technological development, by analogy with a hydrodynamic treatment of the previously simple propagation time given by  $d/dt$ , we write the propagator:

$$a/\partial t + u(a/\partial x).$$

That is, we allow differential (now partial differential) changes in two directions.

To give this so-called convective derivative meaning, we must specify the significance of  $x$  and  $u$ . The quantity  $x$  is relatively straightforward. It is clearly the level of scientific development of the economic system or sector under consideration. This is the "other direction" in which economic evolution can occur. Now,  $u$  must be the velocity or rate at which these scientific developments are translated into actual economic reproduction. Again, it is essential that these two facets of the propagation of an economy be distinguished;  $x$  is the distance covered by the economy in "scientific development," but this can occur only as the result of realization of such development in productive technology.

We now propose to recast our model equations (shown for a single sector) in the form:

$$[a/\partial t + u_1(a/\partial x_1)]s' = a(\delta - \gamma)s' + (\delta - \gamma)v$$

$$[a/\partial t + u_2(a/\partial x_2)]v = as'$$

$$[a/\partial t + u_3(a/\partial x_3)]c = (1 - a)c$$

where the  $u_i$  may or may not be the same. These equations have the striking property of supporting shock wave solutions! It is easily seen by looking at the first equation in the approximation that  $v$  is changing more rapidly than  $(\delta - \gamma)$ , in which case the first equation becomes:

$$[a/\partial t + u(a/\partial x')]s' = a(\delta - \gamma)s'$$

Now, notice the obvious historical fact that as  $s'$  increases, so does  $u$ . That is to say, the larger the rate of surplus production, the larger the rate at which new scientific developments are assimilated. That means, mathematically, as Riemann showed for the very similar equations governing shock waves, that the troughs of the wave are overrun by the crests and a shock wave singularity develops in a finite time. In our equation, this singularity is reflecting the breakdown of the form of the equations themselves, just as it did in the case of shock waves. The

formation of the shock wave represented the coalescence of the energy of the system in a new form, a coalescence that qualitatively changed the laws governing the future evolution of the medium of propagation.

In our Riemannian economic analysis, this velocity  $u$  is a close representation of the negentropic tendency of an economic system. Its realized tendency for technological change is quantified in  $u$ , not with the result that there is rapid expansion of the economy (this would be the result in a continuous system), but rather that it is a measure of the rapidity of onset of the shock wave-like singularity. Negentropy is not merely the tendency for internal elaboration and development, but much more essentially, the feature of the system that "forces" it to outgrow the present, fixed form of development.

### The Riemannian Transinvariant

In this context we can understand on a deeper level the apparent paradox of economic development. As an economy develops, there is always a "trade-off" that must be made between investment in plant, equipment, and new technologies, the component of the economy we have called  $c$ , and investment in the development of the labor force,  $v$ .

As an economy grows, this trade-off takes the peculiar form of larger and larger amounts of surplus being diverted to nonproductive but necessary expenditures—scientific research, education, and cultural activities, for example—that result in dramatically rising productivity,  $\delta$ . On the level of manpower deployment, this means that the economy does experience a rising ratio of  $d$  to  $v$ ; that is, a rising ratio of nonproductive, "service" employees relative to blue-collar, manufacturing operatives. However, the rise in productivity is sufficiently fast that the amount of surplus produced not only is rising but, in fact, is rising relative to  $(c + v)$  so that the critical ratio  $s'/(c + v)$  is also rising.

In other words, the formula  $s = \delta v$  is such that even though  $v$  is decreasing,  $\delta$  is rising faster.

What we see approaching here is a singularity of exactly the Riemannian type. What is indicated? Not some asymptotic state described by economist Bent Elbek, nor some "postindustrial" society where man's mastery over nature is complete. What we are foreseeing is that the historically specific mode of surplus generation implied by the equation  $s = \delta v$  has changed. It will no longer be the case that surplus is produced only by investment of labor power; new modes of production and new technologies—most emphatically, nuclear fusion—will usher in qualitatively new laws of man's interaction with the universe. In precisely the way Riemann described, this change occurs by a change in laws governing the dynamics of the economic system. Its mode of reproduction undergoes a discontinuous change into what Riemann described as a new manifold—a new world, with different laws.

The point of Riemannian economics (as well as Riemannian physics, for that matter) is that such a scenario is not futurology; it must be made the reality relative to which all other economic categories are measured. The invariant



Photo by Ulanowsky

Lyndon H. LaRouche, Jr., founder and chairman of the U.S. Labor Party, solved the crucial problem left unsolved by all his predecessors in the field—the problem of developing efficient deterministic models for the rate of economic growth of economies under the impetus of directed rates of technological progress.

or, more properly, the transinvariant that in the end alone allows us to ascribe reality or existence to any part of our understanding of economics is this geometric property of the succession of manifolds. To use another term, it is *negentropy*.

Economics deals more directly with the problem of development and progress than any other social science. For that very reason, we must measure its ontology against this transinvariant of negentropy. To understand any practical problem of economic planning today, we must start by understanding the fact that economic processes are real and efficient only to the extent that they cohere with the underlying negentropic tendency of the present manifold to be succeeded by another.

Steven Bardwell is the director of plasma physics research for the Fusion Energy Foundation and Uwe Parpart is the foundation's director of research.

#### Commercial Availability of Model

Readers interested in the commercial use of the economic model should write the authors at the Fusion Energy Foundation, 304 West 58 Street, fifth floor, New York, N.Y. 10019.

#### Notes

1. A comprehensive account of the development of LaRouche's economic theory can be found in his textbook *Dialectical Economics* (Lexington, Mass.: D.C. Heath, 1975); among LaRouche's more recent economic works is *The Theory of the European Monetary Fund* (New York: *Executive Intelligence Review* supplement, Oct. 1978).
2. Marc H. Ross and Robert H. Williams, "Energy and Economic Growth" (Washington, D.C.: Subcommittee on Energy, Joint Economic Committee, Aug. 31, 1977) Government document 91-592.
3. Bent Elbek, "World Energy Outlook and Options," paper delivered at the International Scientific Forum on an Acceptable World Energy Future, University of Miami, Nov. 27, 1978.
4. Riemann's 1859 paper on shock waves is discussed in Uwe Parpart's article "Riemann Declassified: His Method and Program for the Natural Sciences," *Fusion* (March-April 1979) pp. 24-37. Also see F. Klein, *Riemann's Theory of Algebraic Functions* (New York: Dover, 1963).
5. Morris Levitt, "Linearity and Entropy: Ludwig Boltzmann and the Second Law of Thermodynamics," *Fusion Energy Foundation Newsletter* Sept. 1976, pp. 3-17.
6. Donella H. Meadows et al., *Limits to Growth: Report for the Club of Rome's Project on the Predicament of Man* (New York: New American Library, 1974).
7. See *The Theory of the European Monetary Fund* (New York: *Executive Intelligence Review* supplement, Oct. 1978).
8. We use the term model only with great reluctance. It indicates a very tenuous relationship between analysis and reality, the kind that econometricians regard as necessary, but we find quite unacceptable. We claim for our model the same status normally claimed for physical theories.
9. Uwe Parpart, "The Concept of the Transfinite," *The Campaigner*, Jan.-Feb. 1976, pp. 6-68.
10. See Steven Bardwell, "Solving the Three-Body Problem," *Fusion*, June 1978, pp. 21-38.

# The Negato-Entropic Therapeutic Action of Insulin

*In Cardiac and Other Cases*

by Demetrio Sodi Pallares, M.D.

The following article by noted cardiologist Dr. Demetrio Sodi Pallares focuses on the important role of the hormone insulin in normal metabolism and, as an extension of this work, on how insulin can be used as a mode of intervention into a variety of abnormal metabolic or disease states.

The real significance of the article, however, is not any specific therapeutic protocol. If one views the network of metabolic chemical reactions as representing a "phase-space" geometry, then hormonal activity, in this case that of insulin, can be seen as potential inflection points for major shifts of that phase space.

Sodi Pallares is correct in pointing out that there seems to be an invariant pervading all of insulin's various effects on the metabolism, which is characterized by the way insulin increases the availability of free energy and the overall quantity of certain aspects of cellular organization, an invariant that he summarizes as "negato-entropy." But by locating this invariant, he has touched on a question of much deeper significance: What are the evolutionary implications of hormonal activity, in particular the implications for the evolution of new metabolisms, as well as other characteristics of species and ecologies?

To take one example, growth hormone, in conjunction with other factors, has a determining effect on the size of the adult individual; but just this fact poses the possibility that growth hormone has an enormous evolutionary significance. Considering that the Great Dane dog variety produces unusually large amounts of growth hormone, it is quite possible that the evolution of the modern horse from its tiny eohippus ancestor revolved around a similar type of metabolic change, in conjunction with secondary variations.

Even if, through more research, we could define the more basic role of insulin and other hormones in terms of their qualitative addition to the evolutionary capacity of the biosphere as a whole, we would still be left with the

underlying question of how, lawfully, did this mode of evolution itself arise? Although this line of inquiry may seem far afield from human medical questions, it actually has a direct relevance when you consider the human body as an energy system. The most crucial aspects of biology are directly related to apparent large-scale, rapid jumps in evolution, such as the relation of chromosome activity to the evolution of eucaryotes (cells with a distinct nucleus and chromosomes) from the much smaller procaryotes (simple cells without defined nuclei) or the evolution of the warm-blooded mammals with their sophisticated metabolisms from the primitive reptiles. These larger evolutionary jumps represent increases in negentropy, in the capacity for further qualitative advancement, thus necessitating a redefinition of the concept of energy from this standpoint.

From this larger perspective, one is better situated to determine what exactly are the critical processes involved in Sodi Pallares's clinical observations and to obtain a more rigorous notion of cellular energy content and organization. Since biology today is unfortunately only in its embryological stages of development as regards solving this problem, it should take as a guide here the known dynamics observed in plasma physics of the evolution of qualitatively different but connected states of plasmas.

Sodi Pallares's article is not only interesting in its own right but also as part of a continuing series of articles in Fusion on such related topics as biological superconductivity, electromagnetic radiation and the healing process, and higher-order DNA geometries and dynamics. Collectively, this series will demonstrate how biology represents a higher-order domain than physics that is lawfully connected to it through the common, but differently elaborated, invariant of negentropy.

—Ned Rosinsky, M.D.



INSULIN IS A HORMONE that plays a central role in the body's metabolism of the major nutrients, including glucose, protein, and fat. The hormone is secreted in the pancreas by groups of cells called the islets of Langerhans<sup>1</sup> and then is passed into the blood, which carries the insulin to the various tissues of the body where it exerts its effects on the cellular level.

In addition to these normal functions, as I will demonstrate in this article, insulin can be used with potassium and glucose to treat a wide range of disease states, including various heart disorders, stroke, skin burns, and other instances of cellular damage. My basic approach in formulating these therapies is to view insulin not as merely facilitating a large number of metabolic reactions but, rather, as exerting a determining effect through these reactions on the overall thermodynamic condition of the organism. Insulin increases the formation of free energy and the degree of organization on the cellular level, thereby strengthening the fundamental negato-entropic tendency in the living organism.

### The Effects of Insulin Deficiency

Most people associate insulin with the disease in which this hormone is abnormally low or completely lacking, the condition of *diabetes mellitus*. In order to explain the use of insulin in diseases other than diabetes, it is useful first to examine what happens in the insulin-deficient state.

The term diabetes mellitus was coined in classical times from the Greek expression for "pass through" (*diabetes*), referring to the excess water volume passing through the human body, and the Latin expression for "honey sweet" (*mellitus*), referring to the sweet taste of the urine of diabetics.

Insulin acts at a number of key positions within the complex network of metabolic chemical reactions (see Figure 1). The main feature of insulin deficiency is a lowered movement of glucose from the blood into the cells of many tissues, including the heart and skeletal muscles—glucose is normally an important energy source for these tissues. The inadequate glucose level within the cell prompts the release of glucose into the blood from the liver, which only adds to the already high blood-glucose level. This high blood glucose (*hyperglycemia*) overcomes the ability of the kidneys to conserve glucose. The excess glucose passes through the kidneys, resulting in glucose in the urine, a key symptom of diabetes. This condition, in turn, draws increased water through the kidneys, leading to an abnormally large urine volume, which causes dehydration and increased thirst (*polydipsia*). The decrease in cellular glucose causes a feeling of weakness and also stimulates the appetite, but increased food intake only exacerbates the high blood glucose, as most diabetics well know.

In the diabetic condition, energy supply, particularly what I shall call free energy (ATP—see Figure 2), is maintained for the most part by the emergency breakdown and utilization of proteins and fats, especially the body's own proteins and fats. This results in weight loss, muscular deterioration as muscles are cannibalized, and general

weakness and lethargy.<sup>2</sup> All of these effects can be demonstrated in animals by surgical removal of the pancreas or by selectively destroying the islets of Langerhans with the drug alloxan.

Insulin is a life-saving therapy for patients with severe diabetes mellitus. Since insulin was first discovered by Banting and Best in 1921, the hormone has been prescribed almost exclusively to patients with diabetes, with a few exceptions. For example, insulin is also given to patients with hyperkalemia (excess potassium in the blood plasma) caused by severe kidney failure. However, insulin is not commonly used now for the many other conditions described below in which I and other researchers have found it to be of tremendous value.

### Insulin Action at the Cellular Level

Insulin is secreted in response to a high concentration of glucose in the blood (which usually follows the digestion and absorption of a meal) as a rapid release of preformed insulin, accompanied by a slower response of further insulin synthesis in the pancreas.

A large protein molecule with a high molecular weight, insulin need not enter the cell to exert its many effects.<sup>3</sup> Each cell has specific insulin receptor sites located on the cell membrane that, when stimulated by insulin, transfer signals into the cell, affecting the cell's metabolism.<sup>3</sup> Some metabolic actions controlled by insulin require stronger signals than others: Kono and Barham calculate that al-

## Glossary

**Aerobic metabolism:** The set of chemical reactions within the body's cells that break down glucose in the presence of oxygen to produce energy that can be used for the various cell functions. Using oxygen, one molecule of glucose can produce 36 molecules of high-energy ATP.

**Anaerobic metabolism:** The set of chemical reactions within the body's cells that break down glucose without oxygen. This process is much less efficient than aerobic metabolism, producing only 2 molecules of ATP for each molecule of glucose.

**Anabolic:** The metabolic processes that "build up" proteins, fats, glycogen, and other molecules from the available food supply.

**Angina pectoris:** Chest pain caused by lack of oxygen or strain of the heart muscle.

**Arrhythmias:** Abnormal contraction patterns in the heart as measured by an EKG, experienced as "skipped beats," irregular pulse, and so on.

**Cardiogenic shock:** Low blood pressure caused by decreased pumping of the blood by the heart.

**Cardiomyopathy:** Disease of the heart muscle.

**Catabolic:** The metabolic processes that "break down" stored protein, fats, and glycogen to produce energy.

**Catecholamines:** A group of hormones including epinephrine (adrenaline) and norepinephrine (noradrenaline) that have a strong effect on the heart.

though a single adipose (fat) cell has approximately 160,000 insulin receptors on its surface, glucose uptake, for example, is maximally stimulated when only 4,000 sites are occupied by insulin molecules. Other metabolic effects of insulin require a higher percentage of occupied sites.<sup>4</sup>

Inactivation of insulin may result after initiation of its metabolic and thermodynamic impulses, providing the basis for an "on-off" control of many metabolic and thermodynamic processes.<sup>1</sup>

### Insulin and Energy

Insulin has a definite negato-entropic action (that is, opposing the tendency toward disorganization) since its activity favors cellular organization in several respects:

(1) *The effect on free energy:* Insulin favors the production of free energy in the cell; that is, the production of the high-energy molecule ATP, adenosine triphosphate. This is a general action on all tissues of the body.<sup>5</sup> The energy stored in ATP is used to fuel hundreds of chemical reactions in metabolism and, therefore, is commonly known as the energy currency of the cell.

(2) *The effect on potential energy:* Insulin favors the storage of energy by increasing the synthesis of glycogen (stored glucose) and triglycerides (fats).<sup>2,5</sup> For example, in the normal heart there is a large amount of glycogen and triglycerides stored in the sarcoplasm (cell contents) of the cardiac muscle fibers.<sup>6</sup> This potential energy can be converted to free energy and used when the work of the



Dr. Demetrio Sodi Pallares

**Cerebral anoxia:** Deficient oxygen supply to the brain. If prolonged, cerebral anoxia will cause brain damage and, eventually, death.

**Diabetes mellitus:** Medical condition in which the pancreas produces insufficient insulin, leading to a decreased rate of passage of sugar from the blood into the body's cells, which results in abnormal cellular metabolism and high blood sugar.

**GIK therapy:** Administration of solutions of glucose (G), insulin (I), and potassium (K) for various medical conditions.

**Glycogen:** The chief storage form of glucose in the body's cells.

**Glycolysis:** The breakdown of glucose to produce energy.

**Heart failure:** Decreased contraction of the heart, leading to a bloated, inefficient state of heart activity.

**Hormone:** Chemical substance secreted by the glands of the body that travels through the blood to regulate the overall metabolism. Hormones may speed up chemical reactions, slow them down, or allow them to occur, thus acting as thermodynamic control points.

**Hyperglycemia:** Abnormally high level of sugar (glucose) in the blood.

**Hyperkalemia:** Abnormally high amounts of potassium in the blood.

**Inotropic:** Increasing the force of contraction of the heart.

**Ischemic heart disease:** Various heart conditions that result from a decreased blood supply to the heart muscle, including heart attack and angina pectoris.

**Metabolism:** The entire array of thousands of chemical reactions in the cells, which serve two main functions: (1) the breakdown of fats, carbohydrates—including glucose—and proteins to produce free energy and molecular building blocks; and (2) the utilization of these molecular building blocks and free energy to produce the body's own protein, DNA, fats, and so on and to carry on the body's activities.

**Myocardial infarction:** Heart attack, the death of part of the heart muscle from lack of oxygen.

**Myocarditis:** Inflammation of the heart muscle.

**Oxidative phosphorylation:** The segment of metabolism in which ATP is directly produced, in the presence of oxygen.

**Polydipsia:** Abnormally great thirst, caused in diabetes, for example, by the large urine volume.

**Precordial pain:** Pain in the front of the chest over the heart, angina pectoris.

**Proteinogenesis:** Production of protein from molecular building blocks.

**Sarcoplasm:** The cell contents of a muscle cell, including the contractile proteins.

**Shock:** Decreased blood flow through the body's tissues, generally caused by a drop in blood pressure.

**Sodium pump:** A hypothetical medium in the cell's membrane that transports sodium ions (Na<sup>+</sup>) out of the cell.

**Systolic/diastolic:** The contraction (systolic) and relaxation (diastolic) phases of the heart's pumping cycle.

**Triglycerides:** Fats.

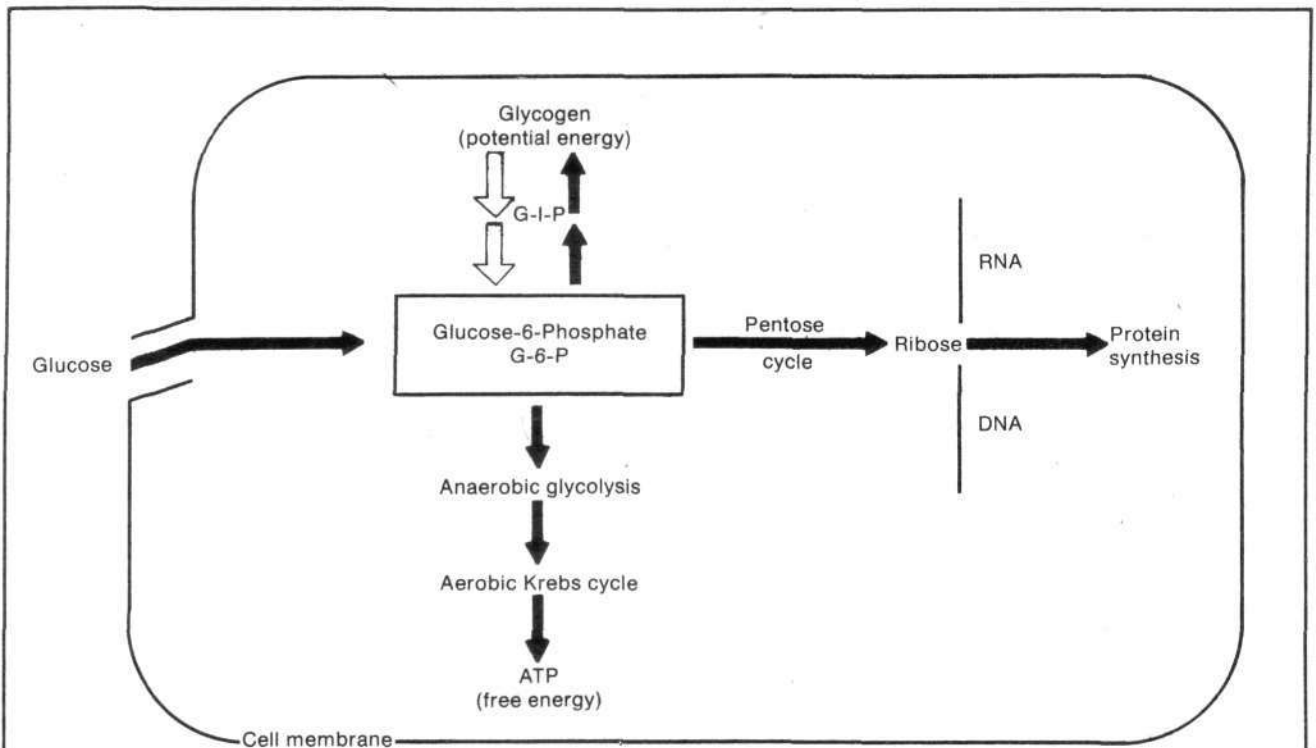
heart increases, as in exercise, or when more free energy is demanded for other reasons, as in fever. I believe that the so-called increased oxygen demand of the heart while exercising is more precisely a greater demand for free energy. Secondly, oxygen is necessary for the creation of ATP through a metabolic pathway that uses the energy from stored glycogen and fat nutrients.

(3) *The effect on proteinogenesis:* In addition to the above two energy considerations, insulin is also negatotropic in that it stimulates the synthesis of proteins (*proteinogenesis*),<sup>5</sup> which is both another form of potential energy and also necessary to maintain the normal structural organization of the cell.

The increase of potential energy in the tissues by insulin is accompanied by an increase of cellular potassium. Insulin favors the entrance of potassium into the cell

during both glycogen synthesis and proteinogenesis.<sup>1,6</sup> Lawrence Minkoff has assembled evidence indicating that potassium ( $K^+$ —chemical symbol for the positive potassium ion) is a “structure-maker” with respect to his notion of a pervasive structuring of the “liquid” portion, or cytoplasm, of the cell.<sup>7</sup> Minkoff’s hypothesis that the cytoplasm is structured is based mainly on his work with nuclear magnetic resonance tests, which indicate that the molecules of water in the cell are arranged regularly in a semicrystalline pattern akin to the crystal structure of ice but with a lesser degree of regularity. His evidence indicates that the cell’s cytoplasm is by no means a “random slosh” of water and dissolved ions and proteins.

In analogous fashion, Minkoff has found that sodium ( $Na^+$ ) is a “structure-breaker”; that is, increased concentrations of sodium ions in the cell decrease the cytoplasmic



**Figure 1**  
**INSULIN AND METABOLISM**

Shown are the major metabolic pathways, emphasizing the action of insulin. Solid arrows indicate metabolic pathways activated by the insulin hormone. This series of pathways, which involves hundreds of individual chemical changes, serves two primary functions: (1) the breakdown of nutrient carbohydrate (including sugar), fat, and protein to produce free energy stored in the form of ATP and molecular building blocks, both of which are used for (2) the building up of body protein, fat, and stored carbohydrate, and the use of energy for various life processes such as muscle contraction. Note that insulin acts on glucose entering the cell from the blood. Proteins and fatty acids also enter the cell and feed into the reaction pathways. Glucose has a central role in the metabolic scheme. After being brought into the cell, it can be stored as glycogen, burned to provide energy, or changed chemically to produce a variety of molecular species needed for the production of DNA, protein, and other body constituents. Similar pathways exist for incoming dietary fat and protein. Insulin acts in many of these pathways to affect the rates of chemical reactions.



structuring. Thus the increase of cellular potassium caused by insulin is another mode by which insulin is negat-entropic.

The association of insulin, glucose, and potassium constitutes the basis of a thermodynamic treatment for many cardiac and extracardiac conditions.

### Insulin and Maxwell's Demon

In 1966 I and my associates suggested a representation of "entropy" in cardiology, pointing out that one of the most important antientropic mechanisms of the cardiac muscle fibers is the *sodium pump*.<sup>8</sup> Although this "pump" has never been isolated or directly observed, it is generally presumed to consist of thousands of individual protein-molecule pumps located in the cell membrane, which extrude sodium from the cardiac cells or muscle fibers. Insulin is important here because it is a main activator of the sodium pump.<sup>1,6,8</sup>

A little later, in a paper devoted to Henri Laborit,<sup>9</sup> I compared the sodium pump with that personage of fiction "Maxwell's demon" (as described by the physicist James Clerk Maxwell), who spent his time separating fast-moving (hot) molecules from slow-moving (cold) molecules to avoid entropy (equality of temperature in which no change can occur). Whereas Maxwell's demon increases the difference in energy (temperature) across a wall using communication through the wall, the sodium pump maintains differences in sodium concentration across the cell membrane by moving sodium ions through hypothesized

pores in the membrane. (The normal concentration of sodium outside the cell is 20 or more times the concentration within the cell.)

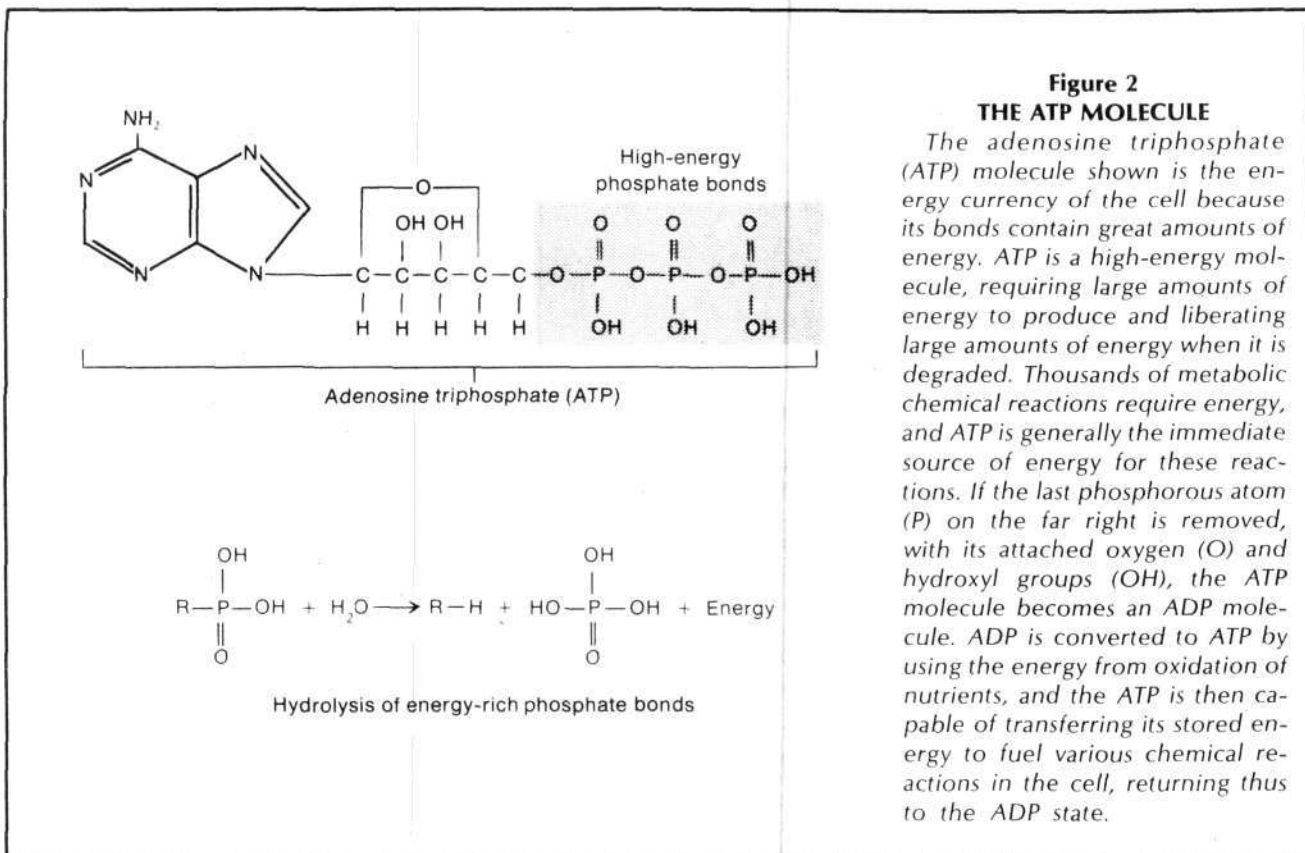
The analogy with Maxwell's demon is not quite that simple, however. Maxwell, of course, meant to say that without an external energy source the system could not escape entropy. In the case of the cell, the separation of ions, or the forcing out of sodium by the cell, is known to depend on ATP energy utilization within the cell. The point is that insulin determines how energy in the cell is used and, from that standpoint, exerts an overall negat-entropic effect.

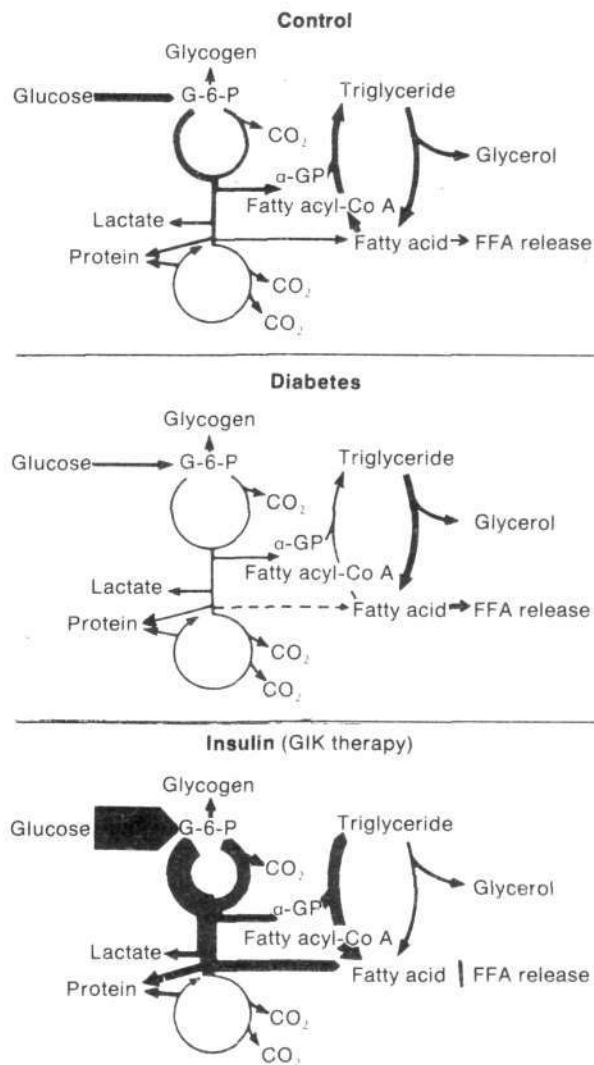
If sodium is not extruded by the pump, the ratio of intracellular sodium ( $\text{Na}_i^+$ ) to extracellular sodium ( $\text{Na}_e^+$ ) increases. When intracellular sodium reaches a high enough concentration, the cell becomes disorganized and dies. Entropy, then, can be represented by an increase in this ratio:

$$\text{Entropy} = \text{Na}_i^+ / \text{Na}_e^+$$

This is consistent with Minkoff's notion that an abnormal increase in the intracellular sodium acts as a structure-breaker.

In sum, insulin has two related negat-entropic effects with respect to ion balance: It enhances entrance of the structure-maker potassium into the cell, and it increases the action of the sodium pump to extrude the structure-breaker sodium from the cell.





**Figure 3**  
**GIK THERAPY**

As shown in the diagram, insulin increases the rate of glucose uptake by the cell, the storage of glucose as glycogen, the oxidation of glucose to produce ATP, the production of building blocks for DNA, and the rate of protein formation. The effects of insulin are demonstrated by contrasting the chemical reactions in a normal (a), diabetic (b), and insulin-therapy (c) metabolism. The heaviness of the arrows indicates the magnitude of a given reaction, while very slow reactions are indicated by dashed arrows. In the normal metabolism, moderate amounts of glucose are available for energy and storage. In the diabetic state, glucose availability is decreased, forcing the breakdown of triglyceride (fat) and protein stores. Under GIK therapy, with insulin greatly increased, large amounts of glucose and insulin increase the production of free energy and stored energy (glycogen and fat), and the formation of protein.

By increasing the production of ATP (that is, free energy, or  $\Delta G_{\uparrow}$ ), and increasing the storage of glycogen and triglycerides (that is, potential energy, or  $\Delta Pe_{\uparrow}$ ), insulin increases cellular organization so that entropy decreases, or  $\Delta S_{\downarrow}$ . If we consider a constant level of caloric intake in adult life, this can be represented mathematically as follows:

$$\Delta G + \Delta Pe + \Delta S = \text{constant.}$$

In other words, if both free energy and potential energy increase, particularly with an increase in cellular organization, then entropy must decrease. Insulin, therefore, has an important negato-entropic effect.

### Insulin and Metabolism

Insulin activates three major metabolic pathways (see Figure 3):

(1) The metabolic pathway complex that results in the storage of glycogen and triglycerides.<sup>1,2</sup>

(2) The pentose cycle, which is fundamental in the formation of proteins and nucleic acids (RNA and DNA).<sup>1,2</sup>

(3) Glycolysis, Krebs cycle, and oxidative phosphorylation—this involves breaking down high-energy nutrient molecules, such as glucose, and using the energy to produce ATP.<sup>1,2,5</sup>

In addition, as pointed out above, insulin stimulates the formation of protein. Thus, insulin activates practically all anabolic ("building up") phases of metabolism in the body.

### GIK Therapy

Based on our understanding of the thermodynamic importance of insulin in the normal organism, I and my associates have endeavored, with great success, to use insulin in conjunction with potassium and glucose (termed "GIK therapy" for G = glucose, I = insulin, and K = potassium) to treat a variety of disease states in which the energy aspects of metabolism have been disrupted. These include acute myocardial infarction, angina pectoris, cardiomyopathies, heart failure, shock, cerebral anoxia, as well as many other conditions.

#### Acute Myocardial Infarction

Acute myocardial infarction is the disease state known as "heart attack." It is the condition in which part of the heart muscle is irreversibly damaged from lack of oxygen, generally diminishing the overall pumping action of the heart. Myocardial infarction is generally thought to result from a blockage of one of the major arteries carrying oxygen and nutrients to the heart muscle.

In 1962, inspired by the work of Henri Laborit, my coworkers and I suggested the use of intravenous solutions of glucose, insulin, and potassium in the treatment of recent myocardial infarction.<sup>10</sup> In the same year I gave a lecture at the Lombarda Medical Academy to report on the beneficial effects of insulin during acute myocardial infarction.<sup>11</sup> My work showed that the main effects of insulin in acute myocardial infarction are:

(1) Insulin restores the differences in electrical charge across the cell membranes to the damaged cardiac fibers, which was lost during the establishment of the infarction.<sup>6</sup> (This electrical voltage is necessary for proper contraction of the heart muscle fibers.) Because of this effect, the GIK solution was termed a "polarizing solution."

(2) Insulin increases the amount of glycogen in the cells, which had been reduced by the infarction.<sup>6,11,12</sup>

(3) Insulin facilitates the entrance of glucose through the membrane of the infarcted cardiac fibers.<sup>12</sup>

(4) Insulin reduces the amount of intracellular sodium, which is a structure-breaker within cells.

(5) Insulin increases the ratio of intracellular potassium to extracellular potassium ( $K_i^+/K_e^+$ ).<sup>6,12</sup> By increasing intracellular potassium, the structure-maker, GIK solution reduces entropy.

Also in 1962, I and my coworkers demonstrated from experimental work with 175 dogs that GIK solution has other favorable effects on the damaged tissue of a recent myocardial infarction<sup>13</sup>:

(1) The pattern of injured tissue as measured by an electrocardiogram diminished rapidly.<sup>13</sup>

(2) The area of necrotic (dead) tissue reduced in size, an effect that is also indicated by the electrocardiogram.

(3) All types of arrhythmic (abnormal heart beat) complications diminished or disappeared completely.<sup>13</sup>

(4) The GIK solution corrected for excess intracellular water, a common finding after heart attack.

(5) The hearts of the control group of dogs that did not receive GIK solution showed an extensive infarction with intense black color, while in those treated with GIK solution the infarcted area was smaller and slightly violet (see photos on back cover), indicating the favorable effect of the GIK therapy.

In this experiment the histological studies (that is, microscopic examination of tissues) produced the results shown in the table.

Calva of our group made a fundamental discovery in 1966 demonstrating that GIK solution in a recent infarction activated oxidative phosphorylation (a form of ATP production) after it had been totally depressed by the infarction.<sup>14</sup>

Our investigations inspired numerous other teams all over the world to investigate insulin's action on the metabolic condition of recent cardiac infarction. Although more than 100 references exist on the subject, I will review only a few of the more fundamental studies.

In 1966, Gudbjarnason and coworkers (of the Richard J. Bing research group) studied the formation of protein in the infarcted area by measuring the incorporation of carbon-14 labeled glycine-2 into new protein.<sup>15</sup> Proteinogenesis is fundamental for the formation of a satisfactory scar in the healing process after an infarction. The authors demonstrated that GIK solution increases protein synthesis, ranging from an increase of 94 percent to 173 percent.<sup>15</sup> In other words, the GIK solution activated metabolism for the formation of a good healing process in acute myocardial infarction.

**Table 1**  
**GIK THERAPY AND MYOCARDIAL INFARCTION**  
**(Histological studies of 175 dog hearts)**

	<b>Control group</b>	<b>Group treated with GIK</b>
Myocardial fibers with necrosis	Large areas	Small areas
Leukocytic infiltration (a sign of tissue damage)	Diffuse	Moderate
Myocardial fibers with fat degeneration (a sign of tissue damage)	Heavy	Slight

In 1972, Maroko et al. (of the Braunwald group) proved that the GIK solution considerably reduces the size of the infarction as well as the histological (microscopic tissue) and mitochondrial damage.<sup>16</sup> In addition, the injured-tissue electrocardiogram pattern and the heart failure that often accompanies infarction were found to disappear rapidly. For this investigation Braunwald received a U.S. government grant to continue the study of GIK therapy.

In 1975, Richard J. Kones published *Glucose, Insulin, Potassium and the Heart*.<sup>17</sup> In this book, he exhaustively reviews the action of insulin on the heart, opening up new areas of potential therapeutic insulin use for cardiologists and internists.

Other investigators from many different countries have published similar studies, including work done in Japan, the United States, Argentina, Italy, West Germany, England, Sweden, the Soviet Union, India, Poland, Finland, Norway, Guatemala, Spain, Puerto Rico, South Africa, China, and Mexico. Within this international community of scientists we are recognized as the pioneers of GIK therapy.

#### *Angina Pectoris*

Angina pectoris is the condition in which the patient experiences chest pain that is connected to heart dysfunction from lack of oxygen, without irreversible damage to the heart muscle.

In contrast to the extensive investigations of many researchers in treating myocardial infarction with insulin in GIK solutions, there are almost no references to the treatment of precordial pain (pain in the left front chest) related to coronary disease (the condition of angina pectoris). Nevertheless, we have had considerable experience in treating patients with angina pectoris, using insulin, a low-sodium and high-potassium diet, and beta-blocker drugs if indicated. At this time, I am preparing a book titled *The Metabolic Treatment of Cardiac Conditions* in which I present my clinical results in the treatment of





(a)



(b)

**Figure 4**

**EFFECT OF GIK THERAPY ON MALNUTRITION**

The photograph in (a) is a three-year-old child with extreme malnutrition. Note the excavated abdomen, typical of severe emaciation. After 32 days of treatment with insulin, glucose, and potassium, the patient as shown in (b) recovered completely and reached a normal state of health.

precordial pain. In more than 95 percent of patients with angina, the pain totally disappeared or markedly improved. The results are so impressive that I have reached the following conclusion:

Angina pectoris is a metabolic-thermodynamic dysfunction of the subendocardial muscle of the left ventricle of the heart, which can be strongly influenced by metabolic-thermodynamic alterations of the entire organism.

The positive exercise test, which has often been considered diagnostic of coronary artery disease (a narrowing of the arteries that supply blood to the heart muscle), signifies only a poor metabolic-thermodynamic adaptation of the heart to the performed exercise. Other conditions besides coronary disease can result in a positive exercise test: myocarditis (inflammation of the heart muscle), cardiomyopathies (diseases of the heart muscle), anemia, diabetes, excessive catecholamine (the hormones adrenaline and noradrenaline) action, and iatrogenic (treatment-caused) effects produced by digitalis, diuretics, antiarrhythmic drugs, and the like.

Four important causative factors of angina are (1) poor insulin activity; (2) excessive catecholamine action on the heart, particularly adrenaline; (3) poor thyroid activity; and (4) diets rich in sodium and low in potassium. Coronary disease (disease of the arteries of the heart muscle) is frequently a conditioning factor, not the major cause, as was suggested by Hans Selye.<sup>19</sup> In support of this notion is the existence of many patients with angina and infarction in whom the coronary arteries are normal.<sup>20-23</sup>

*Cardiomyopathies*

With the exception of specific treatments in cases of known etiology, the only reasonable therapy for most cases of cardiomyopathy (heart-muscle disease) is to protect the heart metabolically with insulin and low-sodium, high-potassium diets. Sometimes thyroid extracts and corticoid hormones are also indicated. Diuretics, antiarrhythmic drugs, and possibly digitalis are entropic pharmaceuticals that, in my opinion, should be avoided.

Recently, Richard Kones invited me to write a chapter on cardiomyopathies for a book in preparation. In that chapter, I have presented the excellent results obtained in our metabolic-thermodynamic treatment of 15 cases of cardiomyopathies of different etiologies: emetine poisoning, toxemia of pregnancy, rattlesnake bite, acute pancreatitis, diabetes, catecholamine excess, and others.

The most impressive case was that of a three-year old child with a cardiomyopathy caused by severe malnutrition (grade IV), chronic gastroenteritis, intestinal parasites, and a resulting anemia. The patient was in very poor condition (Figure 4a), and he received GIK solutions for 32 days. He was also treated with antibiotics, calcium, vitamins, and two blood transfusions, but the overriding emphasis of the treatment was the GIK solution. After 32 days, the patient was in normal condition (Figure 4b), a remarkable recovery.

*Heart Failure*

When the contractions of the heart muscle are weak and insufficient to pump blood properly, the blood flow is retarded and the heart becomes bloated, which further

weakens the heart contractions, a condition termed heart failure. The classical accepted treatment for heart failure, digitalis and diuretics, is entropic, producing loss of potassium from the cardiac fibers and myocardial damage as side effects, although these drugs do have obvious beneficial effects in treating heart failure.

The metabolic-thermodynamic treatment we propose (GIK solutions and a low-sodium, high-potassium diet) is negato-entropic in essence and has produced impressive results. Several investigators in the United States and England have confirmed our results.

In 1926, Visscher and Miller demonstrated that insulin increases the contraction of myocardial fibers in normal as well as in diabetic patients.<sup>24</sup> In 1966, Oyf and Sinclair showed that insulin, alone or with glucose, augments the systolic (contraction) pressure of the left ventricle (the main pumping chamber of the heart) when the ventricular pressure is abnormally low.<sup>25</sup> In 1969, Gautam described a patient with severe cardiac failure and acidosis (low blood pH) in whom the classical treatment failed.<sup>26</sup> But when GIK therapy was used it increased the contracting power of the heart and cured the acidosis. In 1972, Majid and coworkers studied a group of patients with cardiac insufficiency (heart failure) and demonstrated insulin to

have excellent results in several hemodynamic parameters including cardiac output (the rate of blood pumped by the heart).<sup>27</sup> In the same year, Taylor and his group demonstrated the suppression of the secretion of insulin in cases of severe left ventricular failure, lending additional support to the use of GIK in that condition.<sup>28</sup> In 1974, Suarez and Suarez, Jr. used the same treatment in heart failure that was unresponsive to the accepted treatment of digitalis and diuretics.<sup>29</sup>

#### Shock

Shock is a decreased blood perfusion of the body tissues, usually caused by low blood pressure. I have experience only with cardiogenic shock (shock caused by dysfunction of the heart) but with probably the lowest mortality in the literature.<sup>30</sup>

According to the investigations of other researchers, however, GIK is useful in any type of shock. For example, Weisol and coworkers reported that, "Regardless of cause, the results of the clinical studies to be reported in this paper confirm the presence of severe myocardial dysfunction in the septic shock state [shock caused by massive infection]. The evidence suggests that myocardial response to an infusion of glucose/potassium/insulin significantly exceeds that produced by isoproterenol, the inotropic

## Commentary

# Glucose, Insulin, and the Ischemic Heart

by Richard J. Kones, M.D.

In the preceding article, Dr. Sodi Pallares discusses some aspects of the role glucose and insulin play in the cellular biochemistry of the heart. Sodi Pallares is one of the foremost cardiologists of our day—he is an Honorary Member of the American Heart Association, a Master Teacher of the American College of Cardiology, and a pioneer in the research field of electrocardiography.

I would like to comment on the significant implications of "The Negato-Entropic Therapeutic Action of Insulin"<sup>1</sup> for ischemic heart disease in particular. *Ischemic heart disease* is the clinical term covering all conditions in which the blood supply to the heart is decreased relatively. It includes the clinical entities known as *myocardial infarction* (heart attack), *angina pectoris* (chest pain from a

strained heart), and *cardiogenic shock* (low blood pressure caused by diminished blood output from the heart).

Overall, these conditions are said to prevail when there is an imbalance between the amount of oxygen available to the heart and the actual oxygen demand of the heart muscle. The oxygen supply is determined by the product of coronary blood flow to the heart muscle and arteriovenous oxygen extraction, while the oxygen demand is dependent upon preload (the volume of blood in the heart before contraction), afterload (the resistance encountered by the heart in pumping blood out), heart-wall tension, and other minor variables.<sup>2,3</sup> This deliberate oversimplification, however, reflects only a part of the pathophysiology: the heart is a complex motor functioning as a pump and depends

upon the oxidation of substrate nutrients supplied to it. It derives energy from this substrate largely for the performance of mechanical work.

#### Energy Efficiency

Normally, the heart receives all of its energy from the oxidation of substrate via the metabolic pathway called the Krebs cycle. Under conditions in which there is adequate substrate and oxygen availability, metabolism is said to be *aerobic*, producing approximately 36 moles of high-energy phosphate in the form of adenosine triphosphate (ATP, the "energy currency" of the cell) per mole of glucose oxidated (that is, 36 molecules of ATP for every molecule of glucose). Under *anaerobic* conditions, however, in which oxygen is lacking, the complete oxidation of one mole of glucose furnishes *only two moles of ATP*. Since the energy produced is thus decreased from 36:1 to 2:1, anaerobic metabolism of glucose is much less efficient.

Although some cold-blooded metabolic systems may support anaerobic cardiac function adequately (the turtle, for example), in the warm-blooded mammalian heart the drastic reduction in energy stores immediately convertible to mechanical en-



*This advanced visualization technology bounces sound waves off the heart, much like a sonar device used in the ocean, and provides valuable information about the heart's functioning that has been used to evaluate new therapies like GIK.*

[leading to increased cardiac contraction strength] agent usually employed in such circumstances."<sup>31</sup>

Burn and Williams, from the Royal Victoria Infirmary in England, reported the beneficial effects of GIK therapy in restoring blood pressure and low serum sodium.<sup>32</sup>

In 1970, Carey and coworkers studied the action of insulin in hypovolemic shock (shock due to loss of blood or body fluids).<sup>33</sup> Since in this condition glucose rises in the serum in relation to the severity of the shock, the authors recommended insulin in the same form that Allison has used in severe burns. (Burns are frequently followed by shock because of fluid loss through evaporation from a large exposed burn area.)

In 1970, during the Annual Clinical Congress of the American College of Surgeons, Spielman and Ozeran reported that dogs with irreversible shock survived longer when treated with insulin and glucose.<sup>34</sup>

In Mexico in 1974, Alvarez Cordero treated different types of shock (hypovolemic, septic, cardiogenic, and others) with GIK solution.<sup>35</sup> These patients showed marked improvement in clinical condition and a drop in direct bilirubin, pyruvic transaminase, and alkaline phosphatase (test evidence of various types of tissue damage).

Recently Noriega and coworkers in Mexico treated 92 patients in severe septic shock with GIK solutions.<sup>36</sup> The

ergy under anaerobic conditions does not permit effective heart contraction.<sup>4</sup> Even worse, under anaerobic conditions the heart, for various reasons, becomes much more dependent upon oxidation of glucose, in contrast to aerobic conditions in which it is virtually omnivorous, metabolizing free fatty acids, glucose, polypeptides (proteins), and so on.

As a result of more than two decades of work by many investigators at the National Heart, Blood and Lung Institute in Bethesda, Maryland, a new approach to this problem has emerged. In order to forestall myocardial cell death during ischemia a number of interventions have been proposed. Theoretically, either reducing myocardial oxygen and/or nutrient demand or increasing oxygen and/or nutrient availability to the heart may improve the energy balance of the ischemic heart cell and thereby reduce myocardial injury. To this end, a number of pharmacological agents and techniques have now been tested experimentally. Preliminary results suggest that myocardial ischemic injury may indeed be altered when these techniques are applied early in the course of the ischemic episode.<sup>5,6</sup> Although there has been

some criticism of the methods used to measure myocardial ischemic injury, the principle of reducing oxygen-nutrient demand or increasing oxygen-nutrient availability to reduce myocardial injury appears fundamentally sound and is currently accepted by the cardiology community.

#### **GIK Therapy**

Exercise was first prescribed by Celsus (30 B.C. to 50 A.D.) for patients with glucose in their urine in an at-

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*'A valuable conceptual advance has been made in the application of physical laws to the study of energetics in the heart.'*

---

tempt to clear the blood of "excess" glucose. His method was sound since we now know that exercise directly increases the utilization of glucose and free fatty acids in working muscle. Since that time, innumerable papers have appeared dealing with glucose therapy in heart disease, combined with insulin and/or potassium. In 1962, Sodi Pollares and coworkers published an important clinical study

in which the combination of glucose-insulin-potassium (GIK) was advocated for ischemic heart disease.<sup>7</sup>

Braunwald and Maroko<sup>8</sup> and Opie et al.<sup>9</sup> successfully reduced the quantity of myocardial cell death with GIK in experimental animal preparations. The animal hearts treated with GIK contained more ATP, high-energy creatine phosphate, and glycogen with a higher ratio of sodium to potassium ions ( $\text{Na}^+/\text{K}^+$ ) and a lower concentration of lactate to pyruvate—all indicators of healthier heart muscle. It appeared that GIK improved energy balance by providing more intracellular substrate (glucose) through facilitated transport (via insulin) into the myocardial cell. Even though the heart was still ischemic, the anaerobic burning of glucose for energy (glycolysis) was enhanced sufficiently to improve overall myocardial energy balance. Nonetheless, several clinical studies at that time failed to demonstrate conclusively that GIK had a beneficial effect in human patients with ischemic heart disease.

Considerable recent evidence, however, now suggests that GIK may in fact be beneficial to such patients. Using a specific intravenous infusion



mortality (11 cases) was a low 12 percent. With other therapies, the current average mortality for this condition is 40 percent. This investigation will be published next year.

#### *Cerebral Anoxia*

When the supply of oxygen to the brain is slowed or cut off, irreversible cell damage can occur. This condition is called cerebral anoxia.

In 1971, Ariza Herrera and coworkers investigated the protective action of GIK solutions on the electrical activity of the brain when submitted to anoxia.<sup>37</sup> In the control animal brains that did not receive the solution, anoxia resulted in the disappearance of the brain electrical tracing (the electroencephalogram, EEG) in 3 minutes and 27 seconds on the average. In the brains submitted to anoxia that were protected with the solution, the brain electrical tracing lasted 6 minutes and 2 seconds on the average. That is, the GIK brains lived twice as long after the oxygen supply was completely cut off.

This investigation explains our good results in treating cerebral-stroke patients with GIK solutions.<sup>38</sup> (Cerebral stroke is usually caused by decreased blood circulation to a portion of the brain.) We have also used the same treatment during surgery, for poison intoxications, bone fractures, episodes of acute pulmonary insufficiency, acute

hepatitis (liver inflammation), and many other conditions.<sup>6,39</sup>

It is therefore reasonable to ask, why is GIK solution useful in such a variety of conditions that are not obviously related? These conditions may not seem to be related, but all of them involve corresponding cellular damage that is similar from the standpoint of metabolic, thermodynamic, and electrolytic (sodium, potassium, and other dissolved ions) alterations. Similar damage effects are:

- (1) The cells retain sodium and lose potassium.
- (2)  $\text{Na}^+/\text{Na}_e^+$ , that is, entropy, increases.
- (3) Free energy (ATP) and potential energy (glycogen) decrease.
- (4) Proteinogenesis diminishes while proteinolysis (the breakdown of protein) is augmented.
- (5) Intracellular acidity increases (a result of inefficient nutrient metabolism).
- (6) Intracellular disorganization increases and comes to a limit when the cell dies.
- (7) As disorganization increases, the main functions of the cell are profoundly altered.

#### **A New Cell Model**

We have recently modified some of the aspects of our understanding of the action of the GIK therapy in accord-

rate and uniform concentrations of GIK, selecting patients within 15 hours after acute myocardial infarction, and studying such patients in a controlled Myocardial Infarction Research Unit with well-trained staff, Rackley and coworkers demonstrated that left ventricular function was significantly improved by GIK and that free fatty acid levels in the blood were suppressed, coinciding with a decrease in mortality.<sup>10</sup>

Interest in the effects of GIK solutions has now been rekindled. During the 51st Scientific Session of the American Heart Association last year, two papers were presented, the first confirming the positive inotropic effect (increase in the contracting strength of the heart) of GIK during pacing in man<sup>11</sup> and the second suggesting that GIK reduces in-hospital mortality in patients with acute myocardial infarctions.<sup>12</sup> Three papers were recently presented during the 28th Annual Scientific Session of the American College of Cardiology.<sup>13-15</sup> GIK solution supported the mechanical function of the left ventricle, the main pumping chamber of the heart, early in the course of acute myocardial infarction,<sup>13</sup> and glucose/insulin protected ischemic heart tissue in an

animal preparation by stimulating anaerobic glycolysis with preservation of ATP concentrations and ultrastructural microscopic integrity of the cells.<sup>14</sup>

#### **Catecholamine Effect**

As emphasized by Sodi Pallares, excess catecholamine (epinephrine and norepinephrine) release in the body during the course of ischemic heart disease is in fact frequently deleterious: Mortality in acute myocardial infarction is proportional to plasma and urine catecholamine levels.<sup>16-18</sup> High catecholamine levels also precipitate unwanted and potentially lethal arrhythmias (abnormal heart rhythms). A large body of experimental evidence suggests that components of GIK solutions favorably influence the electrophysiologic alterations induced by ischemia and catecholamines. Direct support for this hypothesis is provided by the recent demonstrations of reduced myocardial vulnerability to "ischemic" ventricular fibrillation (chaotic contraction pattern) during GIK infusion.<sup>15</sup> GIK may thus suppress ventricular arrhythmias via several mechanisms: reduction of free fatty acid levels, lengthened refractory period (period of rest between heart

beats), diminished automaticity of Purkinje heart-muscle fibers, increased late diastolic threshold, reduced vulnerability to ventricular fibrillation, and preservation of ischemic myocardial mass.

In the preceding article, Sodi Pallares shows that insulin promotes anabolism and incorporation of substrate—including glucose—into cellular structures. When administered without glucose, insulin is positively inotropic in the normal and ischemic heart and may be used therapeutically.<sup>19</sup> A comprehensive discussion of the effects of insulin is beyond the scope of this commentary, but the interested reader should see References 20 and 21 for further discussion and information.

A valuable conceptual advance has thus been made in the application of physical laws, especially thermodynamics, to the study of energetics in the heart. Microscopic events, that is, mechanisms of processes, are not described by such formulas. Rather, they describe macroscopic constraints. As in other systems, every pathologic or therapeutic change (or "state") observed is associated with alterations in available energy, unavailable energy, and "wasted" energy in the heart.



Juvenile Diabetes Foundation

Most people associate insulin with diabetes, the disease in which this hormone is abnormally low or absent.

ance with the following new information. Some of these new ideas were indicated in part above, in the references to Minkoff.

Gilbert N. Ling presented a new and elegant conception of cellular activity in 1965 of which the main characteristics are <sup>40</sup>:

(1) Cell water and, in general, the cell's cytoplasm are structured rather than amorphous.

(2) A major portion of cell cations (sodium and potassium) are closely associated with macromolecules such as proteins, rather than floating freely in the cytoplasm.

(3) Cation pumps (for example, the hypothesized sodium pump) may not exist, or if they do exist they are not the only factor causing ion flow across the membrane.

Reinforcing the concepts of Ling, Cope and Damadian studied the microenvironment of potassium (<sup>39</sup>K) in muscle and brain using nuclear magnetic resonance (NMR).<sup>41</sup> According to this research, the rates of diffusion of H<sup>+</sup> and K<sup>+</sup> indicated structured cell water.

Intracellular water is more structured than ordinary water with dissolved ions, but less structured than ice crystals.<sup>42-44</sup> In this scheme, the cell can be regarded as similar to an ion-exchange resin granule, whose association sites on proteins have a marked preference as a whole

There is nothing unique about energy balance in the heart; mechanical energy is directly related, quantitatively, to conversion of energy from other forms, and is intimately related to the molecular and supramolecular structures of the living system. An understanding of macroscopic events in biological systems frequently precedes the description of microscopic events and evolves through the processes of hypothesis, experimentation, and eventual proof. Additional data will permit the expansion of this age of molecular cardiology and undoubtedly suggest new therapies for old problems.

Dr. Kones, director of electrocardiology at Northern Westchester Hospital Center of Cornell Medical College in New York, has published four books and numerous papers in the field of cardiology. A chemical engineer as well as cardiologist and teacher, he is a member of the American College of Cardiology, the American College of Clinical Pharmacology, the American Physiological Society, the Institute of Electrical and Electronics Engineers, and the International Study Group for Research in Cardiac Metabolism, among others.

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for  $K^+$  over  $Na^+$ . During muscle or membrane electrical excitation, this preference is reduced by a configurational change (overall change in shape of the molecule without breaking any chemical bonds) in the proteins. But the normal configuration is reestablished by ATP, which restores the resting state of the proteins.

In summary, NMR data indicate structured water in cells and the association of  $Na^+$  and  $K^+$  with macromolecules; and this association may play a major role in maintaining ion-concentration differences across the cell membrane.

This new cytoplasmic model denies two fundamental assumptions used previously for many years: (1) Ion concentrations are maintained solely by a sodium pump, and (2) the cell is a membrane-bound bag containing amorphous liquid water in which proteins, sodium, potassium, and other ions and molecules are randomly dissolved.

From the perspective of this new model, free energy (ATP) is as necessary as in the old model. Insulin maintains its importance in fostering the production of ATP. Instead of solely activating a pump to maintain ion balance, insulin ensures the ATP that maintains the configuration of cell proteins so they can retain  $K^+$  within the cell, and thereby help to extrude  $Na^+$ .

Since insulin opposes all of the various entropic effects, it can be said that insulin represents negato-entropy as its essential characteristic.

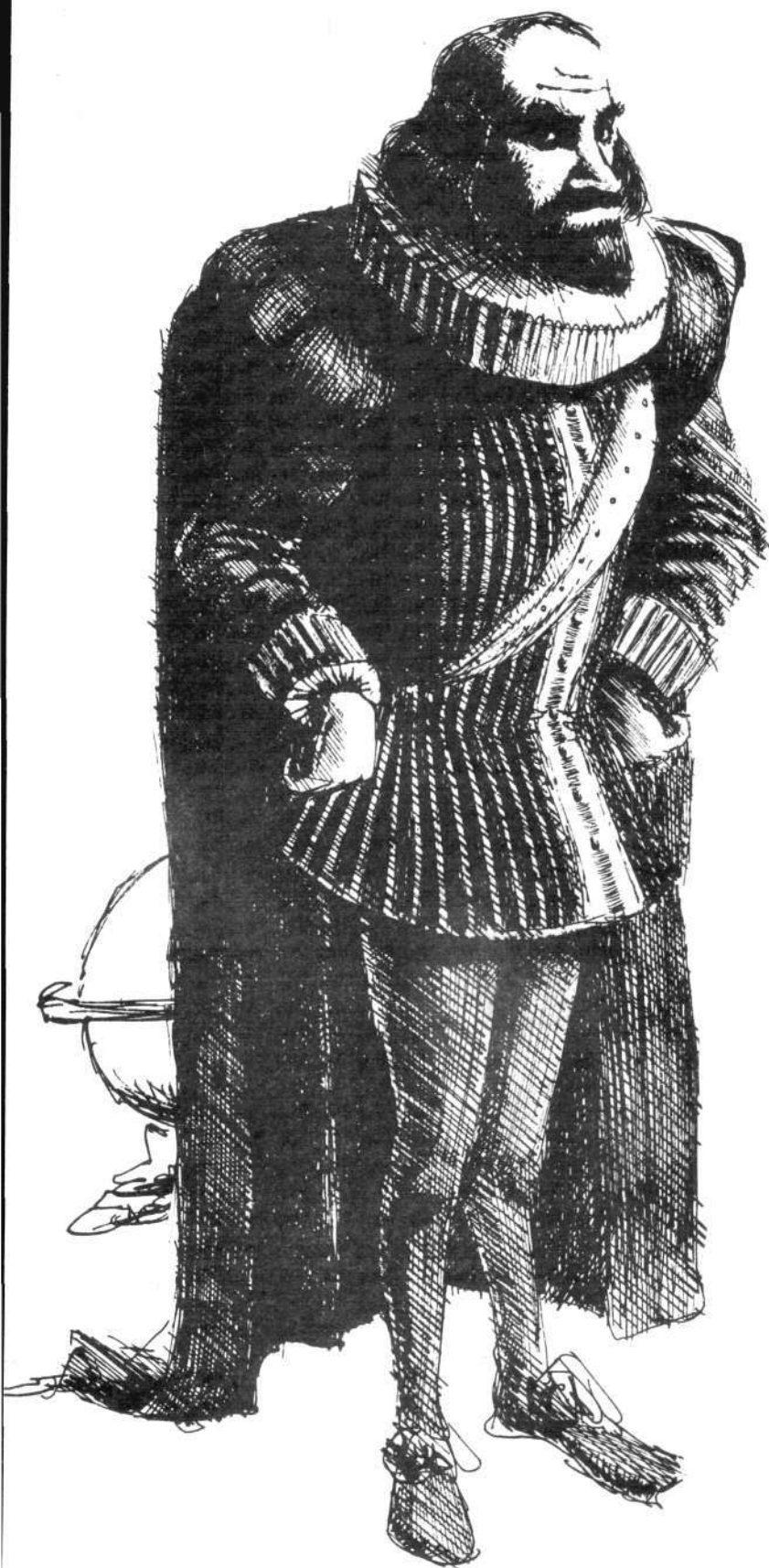
*Dr. Sodi Pallares, an internationally recognized authority on cardiology, is on the Advisory Board of the Fusion Energy Foundaton. He has served as president of the Mexican National Academy of Medicine and is presently chief of the Department of Electrocardiography of the Institute of Cardiology, Mexico, and chief professor of Cardiovascular Clinics for the National University of Mexico.*

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*An Open Letter  
to Academician Basov:*

## Francis Bacon Was No Scientist

We are pleased to continue the ongoing polemic of humanist science versus British empiricism and the British scientific establishment by reprinting this open letter from Carol White to Soviet Academician Nikolai Basov. White is responding to an article by P.B. Shelishch, "The Father of the Sociology of Science," in the February 1979 issue of the Soviet monthly science magazine *Priroda* (*Nature*), of which Basov is the editor-in-chief. The Shelishch article, summarized in an accompanying box, promotes Francis Bacon as the father of the sociology of science and praises Bacon's assertion of "the primacy of nature over human reason."

As White points out, the Shelishch article must be seen as another of the epistemological frauds that the British Intelligence establishment has promoted in order to block the successful development of an East-West Grand Design for scientific and economic progress and bring on a New Dark Ages. White and others have detailed the extent of British sabotage of real science in several articles that have appeared in *Fusion* over the past months.<sup>1</sup>

Basov, who heads the Soviet laser fusion program, is the chairman of the *Znanie* (Knowledge) Society of the Soviet Union, a member of the Soviet Academy of Sciences, and holds a Nobel Prize in physics for his work in developing lasers. Ironically, the Soviets have proposed international collaborative research programs for laser fusion, as well as magnetic confinement fusion, of exactly the sort that the Shelishch article seeks to sabotage.

The editors of *Fusion* have invited Academician Basov to write a reply to this open letter for the magazine.

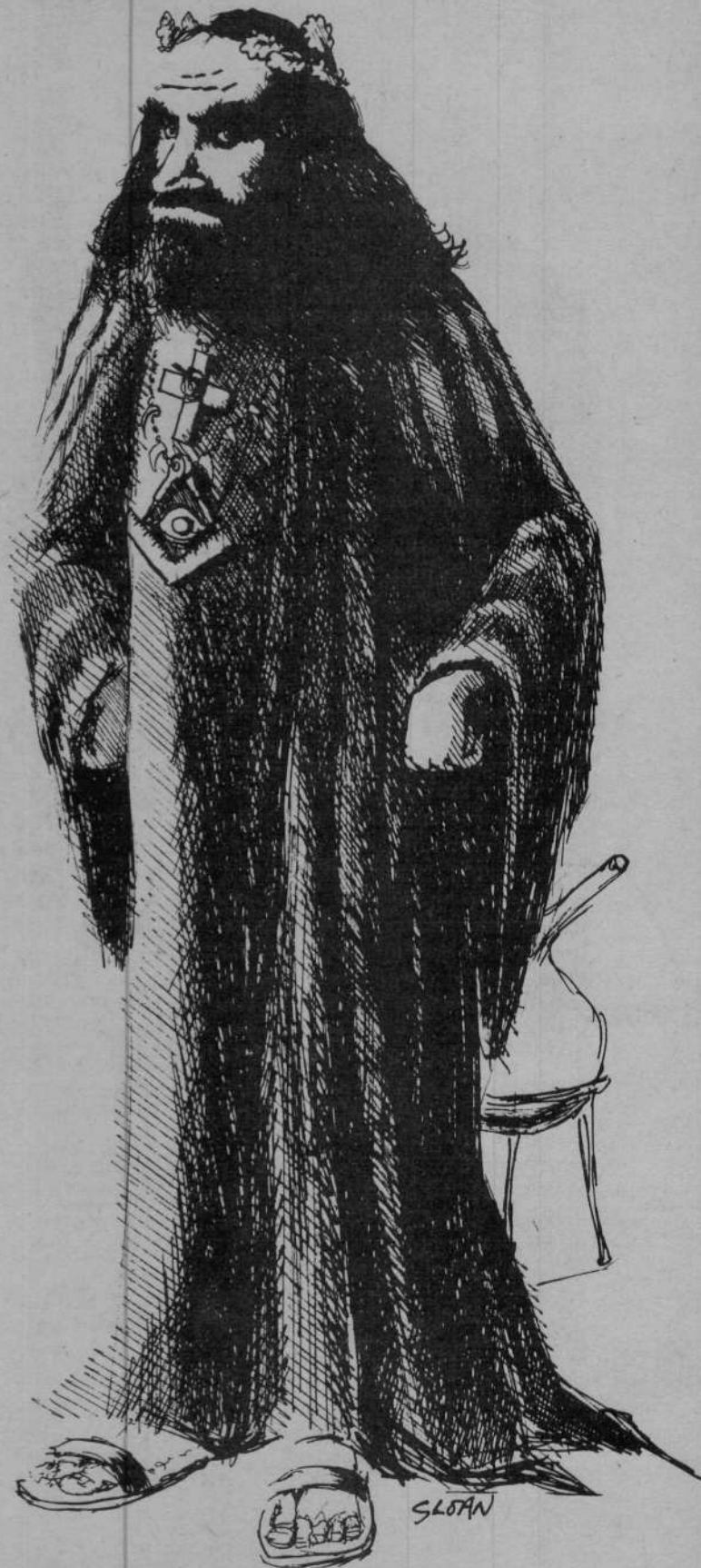
by Carol White

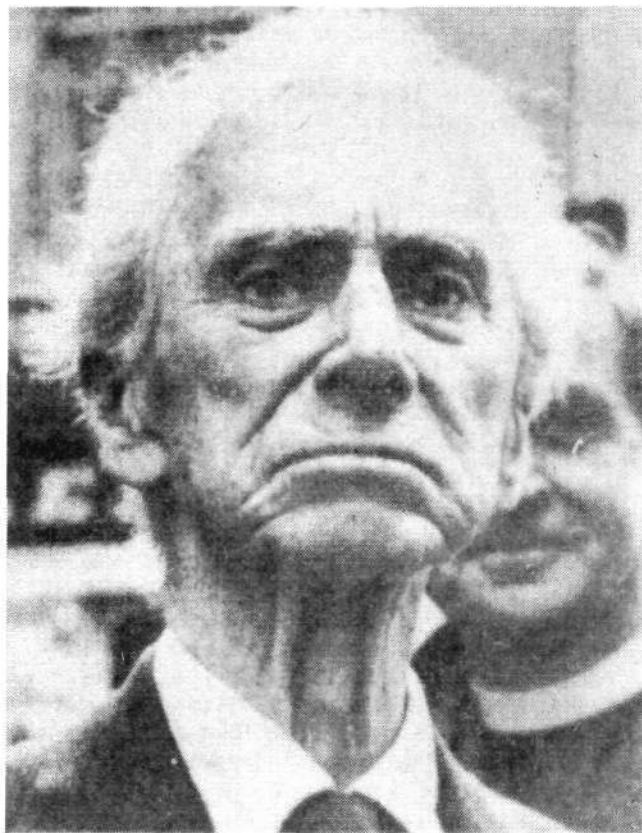
YOUR GENERALLY EXCELLENT monthly science publication *Priroda* having just come to my attention, it would be appropriate that I write pointing out the obvious similarities of that magazine and *Fusion* magazine, with the various collaborative proposals which that implies. Unfortunately, the occasion of my writing is to bring forcibly to your attention the consequences of allowing your magazine to publish such pernicious distortions of both the history and epistemology of science as the article, "The Father of the Sociology of Science," by P.B. Shelishch, featured in the February 1979 issue of *Priroda*.

I shall return to the question of why the article is wrong and why it is an urgent matter of public policy that such vicious distortions not receive circulation except perhaps as exemplary material for the sake of an included rebuttal. However, before turning to the article itself, it is important to establish the most critical aspect of the situation: the continued existence in the Soviet Union of British-controlled Bukharinite science networks that are allowed to operate freely under cover of such otherwise positive institutions as your own.

Who is P.B. Shelishch, candidate of philosophy and affiliate of the Institute of Socio-Economic Problems of the Academy of Sciences of the Soviet Union in Leningrad? What is the Institute of Socio-Economic Problems? Is it perhaps the spawning ground for the pernicious virus of operations research? Is it connected by patronage to Kim Philby and his evil operations within your country?

These are questions of urgent importance. The publication of this piece of filth in praise of Francis Bacon by





*Bertrand Russell, one of the most evil of the British scientists in the tradition of Francis Bacon, denied the existence of universals.*

Shelishch demonstrates the existence of precisely those networks of which the British boasted this past month [February 1979] when they warned that any escalation of the Chinese aggression against Vietnam into a Cuban missile crisis-style confrontation would within 15 days bring about major destabilizations in the East bloc, beginning with Poland.

#### **British Empiricism or the Grand Design?**

A cursory look at the article shows the author's advertised connections. The article is a factional polemic against the *Grand Design*, yes, the Neoplatonic tendency with which Soviet Premier Brezhnev is presently aligned, along with West German Chancellor Helmut Schmidt and French President Valéry Giscard d'Estaing—that tendency that alone offers an alternative to the British drive to precipitate us all into World War III. It is this tendency that the U.S. Labor Party chairman Lyndon H. LaRouche, Jr. has played a large part in bringing into being. President Giscard's remarks during his recent visit to Mexico are directly to this point. Do they not as well express the purposes of your own Znanie Society?

I quote here directly from President Giscard's rebuttal to one of Mexico's leading antihumanist intellectuals, Octavio Paz:

I believe that we are moving increasingly toward a perception of the history of the species and therefore, one can ask global questions of the kind you are asking me. Can humanist societies contribute to the world of tomorrow? . . . We know what we inherit as humanist at this time: it is . . . the accumulation of knowledge and behavior jointly inherited from the Renaissance founded in the Judeo-Christian tradition. What will that cultural contribution of humanist societies be? . . . I'll mention four concepts: First, a democratic concept . . . that is, the search for political and social structures in which the individual will on the one hand and the service of individual rights on the other are at the center of the political and social mechanism. . . .

The second fundamental concept is juridical. Humanist societies are societies of law . . . that is, they are not established on the basis of relations of force. . . . The third fundamental concept . . . is the concept of education. There is a kind of intimate symbiosis between the development of concern with education. Lastly, there is the scientific concept, which appears as a product of humanist societies . . . the ideal of the progress of humanity or of societies develops especially . . . and in certain respects largely as a result of the progress of knowledge and the domination knowledge exercises over a certain amount of material data. This is the potential contribution of humanist societies: to provide these two concepts to the common cultures of the species.

What then does Shelishch say? How has he revealed himself to be the enemy of what I feel free, Academician Basov, to call our humanist faction?

Philosophy candidate Shelishch identifies his sources quite openly. Lord Ernest Rutherford and Professor Benjamin Farrington belonged to the very same Bertrand Russell Amnesty International networks that are today orchestrating human rights campaigns around dissident Soviet scientists Anatoly Shcharansky and Zhores Medvedev. It was Rutherford who was directly involved in the unsuccessful seduction of Lev Landau and A.F. Joffee, who induced Wassily Leontief and Georg Gamrow to emigrate to the West from the Soviet Union and who attempted to capture Peter Kapitza. These are the same networks that ran Nikolai Bukharin's operation.

Shelishch's article and others of that ilk give credibility to positivist circles in Great Britain. They, like the so-called antiwar Pugwash conferences, create a credible environment in which dirtier operations can occur through which those in-place networks of which the British boast are maintained.

Only such an artfully created climate could give credibility to such otherwise rococo figures as the now-dead kook Guy Burgess and his triple-agent associate Kim Philby. Good Lord, the latter is even named after British *Empire builder* Rudyard Kipling's hero, Kim. Moreover, Kim Philby follows in the footsteps of his father St. John Philby, who was British advisor to Muslim fundamentalist



Ibn Saud. (St. John was such a determined supporter of Wahabi primitivism that while in Arabia he did not use a bed, table, or chair—although, of course he did maintain his membership in the Athenaeum Club of London.)

The public posture of Soviet support for Ayatollah Khomeini in Iran is no mere academic question. The degree to which Philby-coordinated British networks, operating from Philby's base as an advisor on Mideast affairs to the Soviet Foreign Ministry, were and are being permitted a free hand in the destabilization of Iran is a question of war or peace and must be dealt with summarily. No argument for keeping him in place weighs against the demonstrable evil of his activities.

### The Unnamed Target

Whom after all, is Shelishch addressing his polemic against? Since I do not use Francis Bacon's inductive method, I would venture to hypothesize that it is directly against the writings of Lyndon H. LaRouche and his associates, of whom I am one. The pedigree of Aristotle, as cited by Shelishch, that evil murderer of Alexander the Great, who was a city-builder and implementer of Plato's sweeping Grand Design policies, has been amply documented both in LaRouche's "The Secrets Known Only to the Inner Elites" and in Criton Zoakos's "Aristotle and the Craft of Intelligence."<sup>2</sup>

More specifically, my own series of articles on Francis Bacon in *Fusion* magazine, including "The Royal Society" and "The Royal Society Revisited," as well as LaRouche's "Sir Isaac Newton Was a Hoax," deal with precisely the area covered by Shelishch. In fact, Shelishch goes over my ground so carefully that he feels obliged to defend Bacon's use of Solomon's House in *New Atlantis* as an ideal scientific institute, despite Bacon's own description of his ideal institution as a center for industrial and scientific espionage, and for cult practices devoted to the worship of the controlling oligarchic families.

Why, then, does Shelishch not openly address his arguments against LaRouche and his associates to us? It can only be because Shelishch is associated with those same Bertrand Russell networks in the West that, through slander and direct threat, seek to suppress the growing influence and acceptance of LaRouche and the Labor Parties as a major force in world politics in opposition to the British oligarchy. Why else, indeed, not engage in an open dialogue with us?

I intend to document the historical connection of these Russell networks to their mother Francis Bacon as well as to sketch the humanist opposition to them in the Leibniz tendency both within and without the Soviet Union, including, in fact, Josef Stalin, who was trained in Leibniz's work during his seminary days. But first, it is useful to look more closely at the contribution of Benjamin Farrington alluded to in the Shelishch article.

In 1951, Farrington wrote a book titled *Francis Bacon: Philosopher of Industrial Science* (London: Lawrence and Wishart), in which he tells a tale that is incredible to anyone familiar with Bacon's actual history as a self-serving agent for the Cecil family and later for the Duke of

Buckingham, who was himself involved in some of the nastiest scandals of his day including not least pederasty and the sale of political favors. I quote Professor Farrington's opening paragraph:

The story of Francis Bacon (1561-1626) is that of a life devoted to a great idea. The idea gripped him as a boy, grew with the varied experience of his life, occupied him on his deathbed. The idea is a commonplace today, partly realized, partly tarnished, still often misunderstood; but in his day it was a novelty. It is simply that knowledge ought to bear fruit in works, that science ought to be applicable to industry, that men ought to organize themselves as a sacred duty to improve and transform the conditions of life.

With no obvious ironical intent, considering that Bacon lost his position as Lord Chancellor because of his dishonesty, Farrington describes Bacon as refusing

... to judge knowledge by a merely external standard. It was not enough that it be logically consistent. He asked instead what it had done, how had it affected the fortunes of mankind down the ages. From this historical standpoint he proposed a new criterion of the validity of science. "Science like religion must be judged by its fruits."

Thus, the terms of the debate are posed by Farrington and his cothinkers at the Institute of Socio-Economic Problems between Machian positivism or the variant form of empiricism concocted by William James and John Dewey—pragmatism. In these terms, the question of truth is not even considered. It becomes an operational construct, an epiphenomenon of practice or the reflection of that practice as logic.

Since truth is of no account, then it matters not what Bacon actually did in his life. Bacon's so-called scientific writings are to be taken at face value, without regard to their actual context as a deployment against such leading humanist scientists as Giordano Bruno, William Gilbert, Johannes Kepler, and Galileo Galilei.

### The Bukharin Angle

Nikolai Bukharin's intervention into the 1931 Second International Congress of the History of Science and Technology, held in London, is not immaterial to the point to be made here. As leader of the Soviet delegation, he promoted precisely the point of view reflected by Shelishch and his British mentor, Farrington—that of British materialism.

Associated with the publication of *Science at the Crossroads* by the Soviet delegation at that conference, was a paper by Professor Hessen, titled "The Social and Economic Roots of Newton's *Principia*," which elaborated the British fraud of Newton's "achievements." By raising a false polemic, Hessen claimed that Newton's *Principia* was the theoretical reflection of developments in navigation resulting from the social and economic forces that lead



*The British Royal Society (above) was set up to steal the scientific advances of Continental science and to discredit and even destroy those scientists working in the tradition of Leibniz and Descartes. A key target in the 19th century and even to this day is Bernhard Riemann (opposite).*

men to discover new oceanic trade routes, and so forth, rather than simply an emanation of Sir Isaac's genius.

Since Newton's work rests in fact on the actual accomplishments of Kepler and Galileo, and a happy suggestion of Robert Hooke, the point to be made by humanist researchers in the history of science is quite otherwise. As established in the previously cited articles, Isaac Newton was a plagiarist whose main purpose was to establish the credentials of the Royal Society as a counterforce to the Grand Design forces grouped around Gottfried Wilhelm Leibniz. Newton was involved in some nasty cultist side operations as well.

What was the point Bukharin sought to drive home? What is its application today? Or, to answer the question in its posing: In whose interest would it be, then, for the Soviet Union to cease funding basic research in favor of merely applied science as defined by narrow bureaucratic criteria?

Clearly, Bukharin's intervention at that 1931 conference was coherent with his role up until his imprisonment for

treason in 1938 as a major opponent to Soviet industrial development and cooperation with prodevelopment industrial forces in the West. Bukharin represented precisely those antiindustrial Bertrand Russell circles led by Britain's Prince Philip today, who boast that the antiscience environmentalist movement was spawned in Britain as a counter to the threat of the spread of industrial civilization throughout the globe.

Shelishch betrays himself in his juxtaposition of Newton to Descartes on exactly the point where Descartes and Leibniz are in full agreement—the same point President Giscard d'Estaing elaborated in Mexico.

Today, the same problem faces us as scientists, as it does as statesmen. We must constantly break through the barriers of any existing body of knowledge and practice to realize the next higher-order energy-dense regime if we are to guarantee the enhanced development of our species. This cannot be done without appropriate financial and other backing to scientists. But, as you yourself well know, Academician Basov, it can be done only through the determined and creative effort of those individuals who dedicate themselves wholly to the advancement of our species.

In the last analysis, it is precisely our species' ability to develop and be guided by unique, creative individuals that is crucial. What else is the lesson of Vladimir Ilich Lenin?

Francis Bacon should more properly be called the mother of the sociology of British science. Mother, because of his well-known homosexual proclivities, but also because—and for not unrelated reasons—the British oligarchy fondly addresses its intelligence chieftains as mothers.

Bacon was the avowed enemy of science, as even a cursory glance at his *Novum Organum* should establish without question. He overlooks all of the major breakthroughs—in astronomy, mechanics, and electromagnetic field theory (even going so far as to attack William Gilbert)—in favor of a gibberish listing of happenings in nature to be investigated. Nonetheless, it is appropriate to connect him with the disciplines of the philosophy of sociology and the history of science for the very reason that these relatively recent disciplines, spawned most notably by the work of Ernst Mach and Bertrand Russell, are precisely in the Baconian antiscience tradition.

Mach's own positivist tendency is not covert in its insistence that the universe is unknowable, that man can know only ephemeral appearance. The line of this deployment against science proceeds, of course, directly through the British Royal Society. Bertrand Russell's hysterical denial of the existence of universals is key in this regard. Pseudodisciplines such as the philosophy of science were, in fact, created solely as a means to undermine the actual practice of science.

Sir Isaac Newton's "hypothesis non fingo sum" was truly in the Baconian inductive tradition. As Morris Levitt, Carol Cleary, and John Schoonover pointed out in their series of articles on "Cults, Kooks, and the 'Rebirth' of British Science," the Royal Society and the British Association for

the Advancement of Science were founded in the 19th century to enable the backward British science establishment to steal the hypotheses developed by creative Continental scientists working in the Descartes-Leibniz tradition, and at the same time to subvert and destroy these scientists.<sup>1</sup> Exemplary were the deployments of British agent Voltaire against Euler.

And what, Academician Basov, is the true story behind J.B.S. Haldane's relationship to Lysenko and the Soviet genetics community?

The point to be emphasized is that the development of science is anathema to antiindustrial, profeudalist oligarchical tendencies.

#### Why Riemann's Work Is Unknown

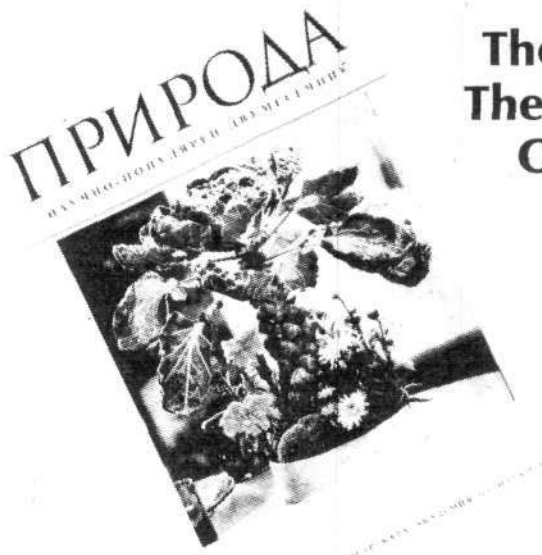
The Klaus Fuchs—Robert Oppenheimer story falls into the same pattern. By the revelation of so-called major security leaks around the atomic bomb, the British created a climate in which they were credibly able to suppress scientific development in the United States. Even today, it is a scandal in the scientific community that so-called top-secret material in the United States and Great Britain is declassified in the Soviet Union.

Most notably, Bernhard Riemann's work, which has been in the public domain since 1859, has until recently been classified as secret. And, of course, Riemann was and is officially debunked by the Royal Society, while his and his associates' work was coopted into the accounts of the so-called major accomplishments of Faraday and Maxwell. It is an open secret that Aldermaston Laboratories in Britain still devote a continuous effort to mastering the implications of Riemann's work.

The British attitude toward Riemann is exemplary. Riemann was a fully developed Neoplatonic thinker. His habilitation paper, "On the Hypotheses Which Lie at the Foundations of Geometry," taken conjointly with his treatment of higher-ordered manifolds in the theory of func-



Bernhard Riemann: A fully developed Neoplatonic thinker.



### Priroda: 'Bacon Is The Father of The Sociology Of Science'

This summary of P.B. Shelishch's article, "The Father of the Sociology of Science," which appeared in the Soviet monthly *Priroda* in February 1979, was prepared by Cliff Gaddy, Soviet affairs correspondent for the Executive Intelligence Review.

Shelishch begins the article with a 1936 quote from British physicist Ernest Rutherford that closes with the sentence: "... The success of scientists does not depend on the ideas of a single person but on the combined wisdom of many thousands of people reflecting on the same problem, and each contributes his mite to the great edifice of knowledge which gradually arises."





APN

Academician Nikolai Basov (r.) shown here with three associates in the quantum radiophysics laboratory at the Lebedev Institute of Physics, the Soviet Academy of Sciences in Moscow.

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This, says Shelishch, is the truly modern view of science, one that has become hegemonic in recent decades: "Understood and studied for centuries as a system of knowledge, science has begun ever more rapidly to show society another of its sides—that of a system of activity of many people and generations in the production of knowledge. . . ."

But is this actually so completely new, Shelishch asks?

"Perhaps the mass activity of people in the production of scientific knowledge was something that had been subjected to special analysis already earlier. Isn't it possible that it had been rather precisely understood as a counterbalance to the prevailing

ideology of scientific isolationism, the roots of which are contained in Plato's theory of knowledge as the 'remembering' of innate ideas, the theory which flourished so magnificently in the form of the divine revelation of truth to man during the epoch of feudalism?

"Even a cursory glance at history shows that the struggle between materialism and idealism over the issue of the nature and methods of knowledge demanded from the materialists a careful analysis of the social and historical prerequisites and conditions for the development of science."

It is in filling this need that Francis Bacon is so important, Shelishch says. Bacon is primarily known as "a mili-

tions, establishes the epistemology of science on a completely rigorous basis. It has been the contribution of Lyndon H. LaRouche, Jr. to understand and to elaborate the implications of Riemann's work and to subsume those discoveries as features of the universal developmental tendency to negentropy that makes coherent the inorganic and organic human realms of existence as multiply connected domains of successively higher-order geometries.<sup>4</sup>

Just as the British run terrorist, surrogate warfare operations under the cover of so-called Marxism, so too, since the 17th century, have they run covert operations under the guise of Neoplatonism. (Of course, this Delphic technique has a history going back to Aristotle's penetration of the Platonic Academy of Athens in the service of the Persian oligarchy.)

The alleged dichotomy between idealism and materialism has operated in substantially the same way that British networks today deploy the Heritage Foundation on the one hand and Naderites on the other to attack the American economy. This right-left charade is easily exposed on any of a number of issues, such as deregulation, that bring both networks into the Kennedy camp. The same thing occurs in Italy in the coherent deployments against the European Monetary System by the Napolitano wing of the Italian Communist Party, the Red Brigades, and the openly fascist Action groups.

#### The Scientific Method of Plato

The first complete treatise on scientific method we have is Plato's *Timaeus*. In the *Timaeus* dialogue, Plato establishes the notion of what LaRouche has aptly termed *negentropic phase space*, that is, the higher-order hypothesis that accounts for successful ordering of a succession of increasingly appropriate hypotheses about the nature of the universe and man's place within it.

Since we are here, and we are a product of the uni-

verse's capacity for self-evolution, then we can account for our existence within the domain of natural law. Therefore, the inorganic domain traditionally studied as physics and inorganic chemistry is necessarily multiply connected to the domains of life and emergent reason. Historically, the potential for the further evolution of life forms and man existed within the inorganic domain as such; man's ability willfully to direct the further evolution of his universe demonstrates that consubstantiality by the appropriateness of his ability to act according to the dictates of reason.

Taken together, then, the three, successively higher-order manifolds must themselves be governed by an overriding principle—the  $n$ ,  $n + 1$ , and  $n + 2$  domains, the inorganic, organic, and human, must be subsumed by an  $N$  negentropic principle.

As Plato points out, although reason emerges only as a predicate of human existence, all men do not behave reasonably. The same multiple-connectedness of the three domains is characterized by the qualities of mind typified by Plato as possessed by bronze, silver, and golden-souled individuals, respectively. In our terms, we can characterize the bronze soul as the irrationalist who denies coherence to the universe—a Mach or Russell, for example. To such a peasant, the gross, ephemeral *object* is the only reality.

In the second category is an H.A. Lorentz or an Albert Einstein. On a certain level such silver souls accept law, but only in the Kantian sense of *positive prescripts*. They are capable of second-rate, flawed scientific conceptions. They can apply the work of but never replicate a Riemann.

Perhaps you might think of such a person as a bureaucrat who schedules production to fulfill his quota and to make a good record, oblivious to problems that arise around fulfillment of a broader plan. His criterion is credible performance; his identity lies in his receipt of emoluments.

tant materialist, a fighter against scholasticism, a methodologist of science. But the contemporary sociological view of science compels us also to recognize in Bacon the father of the sociology of science."

But even Bacon wasn't the first such methodologist, Shelishch suggests:

"Isolated, but extremely profound thoughts on the social prerequisites of science, on the mass, historically successive activity of people as the source of its development can be found already in Aristotle. In fact, in his works we can easily detect, albeit in embryonic form, the idea of scientific progress, an idea usually ascribed to the Modern Age."

Nevertheless, Shelishch continues,

it wasn't until Bacon's time that we got the real objective basis for a sociology of science:

"The essence of Bacon's sociohistorical approach is clearly shown in his analysis of the causes of the unsatisfactory state of the science of his day. Bacon makes a special study of this question in his *Novum Organum* where he begins by pointing out that 'out of the 25 centuries spanned by science and the memory of man, scarcely six centuries can be distinguished as having been fruitful for science or useful for its development. . . . We can rightly name only three periods of science: the first was that of the Greeks, the second that of the Romans, and the third our own,

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*'Asserting the primacy of nature over human reason, Bacon believes that knowledge can progress only by a gradual and successive process of induction. . . .'*

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that is, the Western peoples of Europe, and to each of these three periods we can give no more than two centuries.' Thus, 'the primary cause of such negligible success for science must in all fairness be attributed to the limitation of the time with which it was blessed.'"

The true scientist, the golden soul, locates the congruity between his own identity, developments within his discipline, and humanist perspective based upon a commitment to progress for the species as a whole that presents certain particular tasks for science in any given period.

To such a person the phasal characteristics of any given epoch are secondary to the progression of succeeding phase spaces. Any given stage of scientific law merely indicates a stage in the process of man's growing understanding of the continuously evolving universe in such a way as to direct that process for man. To such a scientist, process itself is the primary datum, within which any given set of laws or facts is merely subsumed as predicates.

This, then, defines the notion of negentropic phase space, or the phase-space characteristics of a succession of phase spaces, or Plato's higher-order hypothesis of the hypotheses.

It is through the hegemonic position to the scientific method by a society's commitment to understand and master the universe as essentially lawful that even bronze souls begin the process of self-development to reason. Such a process is imbedded in a society committed to industrial development; that is why, fundamentally, the oligarchy is now committed to a Dark Ages perspective.

#### British Moles Against Science

Academician Shelishch's reference to something called Plato's ideal categories is typical of the British school of falsification. The point of fielding a British school of Neoplatonism was precisely to create a credible dichotomy between a so-called school of materialism and one of idealism, at the same time obfuscating the real humanist alternative. Both materialism and idealism are objectifications existing in an  $n$ , bronze-souled geometry. Neither category is Neoplatonic humanism. Either the material object is judged as a primary datum with ideas as merely its by-product, or ideas are disembodied to float as cult

objects in an irrationalist universe. The reality behind the gobbledygook is shown in the séances attended by leading British so-called scientists.<sup>5</sup>

While being taken in by the materialism versus idealism fraud, Karl Marx, for example, was quite clear about the relationship between the three domains, as is shown in his *Theses on Feuerbach* and his *1844 Manuscripts*. He addresses himself to precisely this point again in the section on the relationship between freedom and necessity in Volume III of *Capital*.

In the early 17th century, Francis Bacon's epistemological frauds went along with more practical dirty operations. He created the circumstances leading to the abortive Essex coup at the turn of the century, disentangling himself just in time to become state attorney prosecuting his erstwhile collaborators. The penetration operation he ran, through triple-agent Jesuits of the Kim Philby stripe, succeeded in throwing the Dudley-Dee-Walsingham secret intelligence networks into disarray and discrediting any attempts to arrange a republican succession following Queen Elizabeth's death in 1603. All of Bacon's nasty practices, not least among them pederasty, remain in force today among the aristocratic denizens of the Foreign Office, MI5, and MI6—who, after all, along with the monarchy are the rulers of present-day Britain and staff the boardrooms of the City of London.

The ability of Bacon to penetrate Tudor humanist networks, like the ability of a Haldane or Philby to be credible to the Soviet leadership as communists, reflects the weaknesses within those respective leaderships. It is precisely the environment that tolerates articles praising Bacon, that tolerates a Philby and allows him rein to promote the destabilization of Iran against the stated policy of President Brezhnev.

Materialism and anarchism are bedfellows. Materialist epistemology is coherent with the Benthamite notion that individuals are properly activated according to their greed

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Not only this, writes Bacon, but natural science had to compete for talent and resources with other fields, such as religion. Shelishch writes:

"Thus, for Bacon, science—which he takes to mean acquired knowledge—is the historical product of human activity, and the primary and essential factor of its development is favorable sociohistorical circumstances defining the volume of human labor in the sphere of cognition."

Bacon also investigated the "practical tasks of management of science," which included construction of buildings, setting up libraries, organizing encyclopedia-type projects, and—above all, at least according to the number of times Shelishch quotes

him on this point—*funding!* The best specialists have to be acquired, mainly by offering them good salaries. Bacon wrote that they should be assured of "the kind of remuneration and conditions that would satisfy any specialist."

Bacon also was an advocate of international cooperation in science, Shelishch says:

"Bacon's concern with this broad spectrum of practical problems of the real development of science (which are by no means exhausted by the above), problems which he himself was the first to pose and elaborate, stands in sharp contrast to the kinds of questions that occupied and excited his contemporaries and prede-



for objects. Under such a schema, anarchist rage is the justified response of the individual who is refused the object of his choice. Call it communism, and the British oligarch will feel quite at home in the psychological atmosphere of the party.

### The 'Beautiful' Boys

Martin Green, in his book *Children of the Sun: A Narrative of Decadence in England After 1918* (New York: Basic Books, 1976), captures the mentality of British ruling circles—their delight in evil for diversion. Green deliberately misfocuses his subject by featuring impotent misfits such as Howard Acton and Brian Howard to create the notion that the oligarchy is inconsequential.

That aside, however, the book is useful. In it, we learn, for example, far more about Guy Burgess, his homosexuality, drunkenness, and use of drugs than about Kim Philby; and nothing is said about Haldane or Russell.

The book deals with a collection of aristocratic aesthetes, British Foreign Office communists, Trotskyites, and drug pushers like Aldous Huxley, promoter of LSD and the counterculture; terrorist controller Stephen Spender; the fascist Mitford sisters—one of whom married the Duke of Devonshire to become a Kennedy-in-law, while the other, communist Jessica, became associated with Elizabeth Kübler-Ross in the Kennedy "Right to Die" movement—to name but a few. Needless to say, Green does not include the pedigrees.

The average Soviet citizen like the average American finds it hard to fathom the mentality of a class of people who would rather see the world destroyed than lose the positions of power their families have occupied for centuries. And what of their retainers, those hangers-on of aristocracy like Howard and Acton? If one reads between the lines—and even if you don't—the picture that emerges from Green's book is truly horrifying.

The homosexuality of this caste is a decisive feature.

cessors. And, at the same time, it is so much in tune with our own age and the development of science under conditions of the scientific-technological revolution. In fact, this modern side of Bacon is rather precisely reflected in the title of one of the books written about Bacon: *Francis Bacon, Philosopher of Industrial Science* by B. Farrington.

"We have sufficient reason to regard Bacon as the founder of the sociological study of science. The link between science and human practice, the status and role of science in society, the tasks and methods of government organization of science and education—this entire complex of questions is being studied on a broad

scale by modern sociology of science, and the ideas of Bacon, even though they have to a large extent become obvious and commonplace for progressive society of the 20th century, have by no means lost their significance."

### The 'Micro-Level'

Shelishch writes that Bacon's legacy is not limited to the above. He was also a pioneer in the study of the "micro-level" of science—its internal structure and organization. Shelishch praises Bacon's *New Atlantis* for its description of an ideal scientific institute (the "House of Solomon") in which there is a highly developed functional division of labor in science, something totally unknown to the

*the contemporary sociological view of science compels us also to recognize in Bacon the father of the sociology of science.'*

16th and 17th centuries, "but quite similar to that of today."

"Using modern terminology," says Shelishch, we can divide the scientists in Bacon's utopian research institute into "information specialists," "experimenters," "coordinators," "applied scientists," "organizers," and "theoreticians."

"The internal life of this scientific

1. 30,000 BC. Venus of Wittendorf, an Upper Paleolithic sculpture.



2. c. 440 BC, the head of an athlete.



3. 1524. Portuguese explorer Vasco da Gama



4. 1969. man lands on the moon.

### NEGENTROPY

Plato put forward the concept of the higher-order hypothesis that accounts for the succession of increasingly appropriate hypotheses about the nature of the universe and man's place within it. Here, a telescopic view, through symbols, of man's progress.

Green describes it as an adolescent cult worship of Adonis, the beautiful boy whose main concern while he maintains his youth is his own adorned body. More precisely, this is a postpuberty form of the most vicious *infantilism*, with a dominating mother-figure hovering in the wings.

### A Question of Style

Adornment is a question of style, and in these aristocratic circles, style becomes paramount. Reality is an intrusion upon fantasy. Excitement is provided by flouting accepted convention, by evil. This is the connection to the Satanic Isis worship only hinted at in Green's book. Boredom is oppressive. After every orgy comes the let-down. It should thus come as no surprise that drug use was prevalent even in the 1920s. A letter written by Bertrand Russell to Gilbert Murray in December 1902 typifies the mood of evil for evil's sake of these circles:

I have been merely oppressed by the weariness and tedium and vanity of things lately: nothing stirs me, nothing seems worth doing or worth having done: the only thing that I strongly *feel* worth while would be to murder as many people as possible so as to diminish the amount of consciousness in the world. These times have to be lived through: there is nothing to be done with them.

As the "beautiful boy" ages, he is left with the wayward exercise of power and the collection of beautiful objects, including working-class boys, as solace.

Kim Philby, Guy Burgess, J.B.S. Haldane, John Strachey, Stephen Spender, Graham Green, Claud Cockburn (father of *Village Voice* columnist Alexander Cockburn, who has often slandered the U.S. Labor Party), George Orwell, and Esmond Romilly, Jessica Mitford's husband and a Churchill nephew—all so-called leftists—were "Children of the Sun." Most of them went to Eton, all went to a "public

school," and then on to either Oxford or Cambridge University, except for Orwell who went directly into the service of the Burmese prince.

To emphasize the evil of this circle, I need cite only a few cases in more detail. Guy Burgess, after his period as a communist, associated himself as a financial advisor to Victor Rothschild and attended a Hitlerjugend camp in the company of a conservative member of parliament, as well as running drug orgies out of the Rothschilds' house. John Strachey was an associate of British fascist Sir Oswald Mosley for seven years before his conversion to communism; his books, stretching over both periods, featured the same call to action. J.B.S. Haldane's uncle, who was both a viscount and Lord of Cloan, was British secretary of state for war until 1912. He was particularly connected to the Admiralty. J.B.S. also did work for the Admiralty in both world wars, working on top-secret material at least until 1948, despite his known communist party connections.

What's the difference between carrying off the role of a communist or of Queen Victoria, both roles portrayed by one "child of the sun," Brian Howard? It's the style that's important, after all, isn't it, darling? Anything for a lark! . . . That is, so long as both are compatible with the infantile world of the cultist aesthete. Place the mirror of real science before this vampire, though, and you will see no reflection.

Take, for example, Professor John Desmond Bernal, British historian of science, winner of the Stalin Prize, and honorary member of the Soviet Academy of Science. Bernal has written a series of books and articles, all in the H.G. Wells tradition. In 1929, he published a book titled *The World, the Flesh and the Devil: An Inquiry into the Future of the Three Enemies of the Rational Soul*. In it he predicted that organic man will evolve into a brain enclosed within a sort of cylinder, thus becoming a crustacean supporting a brain that could be directly connected

## Priroda



institute is built on a democratic basis," writes Shelishch.

The practical realization of these ideas was, of course, the London Royal Society.

All these ideas make Bacon the father of the idea of a "mass science," according to Shelishch:

"...the social function of science which he formulated and the inductive-empirical method which he constructed led with inexorable logic to the picture of a mass, collective and organized science whose successes in enriching society 'with new knowledge and new power' are rather a result of the quantity of human labor invested in cognition and on the degree of the organization and social

encouragement given to science than on outstanding creative individuals. Asserting the primacy of nature over human reason, Bacon believes that knowledge can progress only by a gradual and successive process of induction based on the principle of posing questions to nature by means of experiment. . . .

"This is the fundamental difference between his method and that of Descartes, which is based on the primacy of reason and which is capable of immediately—via intuition of 'the obvious,' 'the true,' 'the distinct and clear' (in Descartes' terminology)—and logically deriving truth by means of deduction."

Shelishch offers several quotes to

to other brains. No longer would we need to be concerned with "consciousness itself . . . in a humanity that has become completely etherealized, losing the close-knit organism, becoming masses of atoms in space, communicating by radiation and ultimately perhaps resolving itself entirely into light."

Ten years later in a revised edition, Bernal again elaborated the idea, specifying that these mechanized men would be an elite of scientific guardians composed of 10 percent of the population. The rest of the population would gradually be reduced in number as they were rendered relatively quiescent. (What else could he have had in mind but the mass-manipulation, brainwashing techniques pioneered by such zombie factories as the Tavistock Institute, located, of course, on Russell family property.)

J.B.S. Haldane was equally blunt in a series of essays published in 1932, *The Inequality of Man and Other Essays*, in which he stated that he refused to accept either American or Soviet ideals, believing that both would lead to a "mechanization of life and standardization of man." He confessed to having no love for machinery, owning neither motorcar nor wireless.

Both of these men were encouraged to spread their pernicious propaganda for a nightmarish New Dark Age in the Soviet Union by precisely the same Bukharinite networks that are still allowed to flourish unchallenged, even in the pages of *Priroda*.

### Ending the British Science Fraud

I propose to you, Academician Basov, that we collaborate to drive these swine out of the halls of science. We have a massive job ahead of us. We must reeducate the masses of youth in the developed sector who have been mind-damaged by the drug-rock culture, and we must quickly raise all the peoples of this globe to an urban level of culture. To that end, the humanist tendencies in your

country and mine can lay claim to carrying forward the city-building tendency of Gottfried Wilhelm Leibniz, who worked directly with Peter the Great to found the Russian Academy of Science and indirectly through networks associated with James Logan to shape the thinking of our Benjamin Franklin.

The work of the Znanie Society and the Fusion Energy Foundation must be expanded on an international scale. It is important that we continue to educate about science, but more important that we educate scientists. We can no longer afford to tolerate frauds:

*Carol White, the author of Energy Potential: Toward a New Electromagnetic Field Theory (New York: University Editions, 1977), is a frequent contributor to Fusion. Formerly on the mathematics faculty of the City University of New York, White is a member of the National Executive Committee of the U.S. Labor Party.*

### Notes

1. Carol White's articles on Bacon include "The Royal Society," *Fusion*, Dec.-Jan. 1977-1978; "Science is Politics," *Fusion*, May 1978; and "I Don't Make Hypotheses—I Manufacture Data," *Fusion*, Dec. 1978. Among LaRouche's relevant articles are "Poetry Must Begin to Supersede Mathematics in Physics," *Fusion*, Oct. 1978 and "Sir Isaac Newton Was a Hoax," *New Solidarity*, Oct. 18 and Oct. 21, 1977. As for other articles on the British sabotage of science, the March-April issue of *Fusion* develops the case of Riemann, as well as the more recent attempts of the British to classify U.S. fusion research. Finally, the FEF is involved in the research and writing for a book on the new Dark Ages promoted by H.G. Wells and Bertrand Russell.
2. See "The Secrets Known Only to the Inner Elites," by Lyndon H. LaRouche, Jr., in *The Campaigner*, May-June 1978; and "Aristotle and the Craft of Intelligence," by Criton Zoakos, in *New Solidarity*, Feb. 24 and Feb. 28, 1978.
3. The series of articles appeared in *New Solidarity* Feb. 20, 23, and 27, 1979.
4. See "Poetry Must Begin to Supersede Mathematics in Physics," *Fusion*, Oct. 1978 and "The Long Waves in Scientific Progress," *New Solidarity*, Sept. 19 and Sept. 27, 1978.
5. See "Science and Spooks" by John Schoonover in *Fusion*, March-April 1979.

prove that Descartes is opposed to the idea of a collective science. The conclusion, then, is that: "Thus, whereas we see in Bacon's ideal of science a rationally organized republic of many scientists, Descartes's ideal is, in essence, an empire of a single knowing subject."

Shelishch concludes with this paragraph:

"The further history of the theory of knowledge distinguished between two inseparable sides of Bacon's philosophical legacy: the doctrine of method and the doctrine of social factors and government organization of scientific progress. The first, which stands in stark contrast to the theory of Descartes, subsequently became

the object of a long and at times very fierce struggle between the Newtonians and the Cartesians in physics, between empiricism and rationalism. The second, which obviously and quite lawfully 'disappeared' in the hegemonic idealistic philosophical systems of the 17th-19th centuries, exerted considerable influence on the formation of social self-consciousness of scientists of the 17th century and on all social and organizational ideology of the subsequent stage of development of natural science. Karl Marx had high regard for the role of Bacon both in philosophy and in natural science, and he called him the true father of English materialism and all modern experimental science."





## Conferences

Mexican Fusion Assn. May 4:

# Technologies to Conquer the Desert

More than 200 persons attended the May 4 conference of the Mexican Association for Fusion Energy on "Nuclear Energy and Desalination: Technologies to Conquer the Desert," including students and faculty from several universities, farmers, engineers, elected officials, and representatives from agribusiness, industry, and Mexico's major political party.

The conference took place in Hermosillo, the northwest state capital of Sonora, one of the most advanced agricultural areas in Mexico, whose productivity is now threatened by a

combined shortage of energy and water. A primary goal of the conference was to make the concept of a nuplex—one or more nuclear plants surrounded by an agroindustrial complex—including an advanced system of desalination and irrigation a central issue in the July gubernatorial elections and a top item on the new Sonora governor's agenda.

The Mexican Association for Fusion Energy, AMEF, presented specific proposals to build a nuplex port complex in Sonora's port city of Guaymas and a pilot desalination-irrigation

project for the fertile coastline area near Hermosillo.

Cecilia Soto de Estevez, AMEF executive director, opened the conference by outlining Mexico's commitment to increase energy and industrial and agricultural development. Discussing Mexico's ambitious industrialization program, and the key role of nuclear power, Estevez showed the need for a sustained growth rate of such development of more than 10 percent per year.

Estevez then presented in some detail the plan for a nuplex port complex

European Nuclear Congress May 6-11:

# The World Must Go Nuclear

Three thousand representatives from around the world met to discuss nuclear energy development in Hamburg, West Germany May 6-11 at a conference sponsored by Foratom, the European Community nuclear organization. The central theme of the conference was development of nuclear technology as the key to Third World industrialization and stability.

The Foratom conference was especially significant because it strongly affirmed the urgency of nuclear development, despite the general press hysteria around the Three Mile Island incident.

The keynote address delivered by West German Chancellor Helmut Schmidt laid out the necessity for industrial development and nuclear power, a theme that was repeated by all but the U.S. and British participants, who urged the nuclear industry to lie low and apologize for the mistakes at Harrisburg.

The Schmidt speech was followed by several presentations on technology transfer, including one by Klaus Barthelt, director of the Kraftwerk Union, West Germany's largest nuclear technology producer, and Klaus Knizia, a representative of the German Electrical Utilities Union.

There were detailed presentations from the Italian, Pakistani, and Brazilian nuclear agencies on the same issue, and the Pakistani representative blasted the Carter administration's policy of nuclear nonproliferation.

An equally firm address was given by the head of the Soviet fusion program, Academician E.P. Velikhov. Velikhov, who has made repeated overtures and proposals to the United States, Europe, and Japan for an international fusion effort, emphasized the importance of the fusion-fission hybrid.

French nuclear industry spokesmen laid out a clear perspective for ex-

panded nuclear development internationally. Michael Pecquer, administrator of the French Atomic Energy Agency, underscored his government's recent positive response to the lag in the Iranian oil supply. He stressed that France will build five new nuclear reactors yearly as part of its stepped-up domestic program through 1985, and he denounced so-called soft energy technologies—solar, biomass, wind—as "ridiculous" for serving France's industrial development plans.

### Support For Fast Breeder

Pecquer also reaffirmed France's strong opposition to Carter administration policy on the fast-breeder reactor, the next generation of nuclear technology and a field in which France is the most advanced technologically. Pecquer concluded by stating that Harrisburg "proves that nuclear energy is safe: The worst conceivable accident did not produce one single injury. The implementation of the 'green strategy' [environmentalist demand to end nuclear energy] could only be done in an authoritarian state."

In contrast to the presentations that

at Guaymas that could import and process raw materials for agricultural fertilizers and chemicals. The spirited discussion that followed included specifics on how the technology-proud farmers and peasants in the area could make the proposal a reality.

### Desalination

The second speaker was Calvin Larson, an agricultural engineer on the Fusion Energy Foundation staff in New York. Larson summarized how the problem of water supply affects Mexico as a whole and the Hermosillo area in particular, where overpumping of groundwater has caused seawater to flow into once-productive aquifers.

The Mexican government has a sound but limited plan, he said, to construct a connected system of canals and reservoirs to deliver surplus water from the south to the water-deficient areas along the northwest coastline. Instead, he proposed a

solution that would use surface, groundwater, and new desalination sources in order to service more land with a sustained and sure water supply.

Larson told the conference that to develop hydrodynamically induced techniques at energy and cost levels less than 10 percent of those of existing methods would require qualitatively higher theoretical conceptions. He then startled the audience with pictures of the cavitation phenomenon in which vapor bubbles are generated in rapidly flowing water without heat input. Conventional hydrodynamics cannot explain the inception, growth, and implosive recondensation of these bubbles, Larson said.

Larson also discussed the results of preliminary research on the qualitatively similar atomizing desalination process that uses a high-velocity spray of small droplets to effect vaporization and nearly immediate reconden-

sation for separating salt from seawater. Then he explained the conceptual design for a system that would meet the specific needs of the Hermosillo area. This would involve fully researching the hydrodynamic phase change process as the first stage for developing an efficient low-cost desalination method.

AMEF held its founding conference in August 1978, focusing on the just-announced Princeton tokamak breakthrough. Since that time, the organization has gained widespread recognition for its studies demonstrating the need for rapid nuclear development. Both speakers at the Hermosillo conference were interviewed by the local press, and the conference was widely covered on TV, radio, and in the newspapers.

*A forthcoming article by Calvin Larson will describe water resource development and the atomizing desalination process in detail.*

focused on the essential role of nuclear power for world development, the speeches by the publisher of the Washington-based *Energy Daily* newsletter and the chairman of the Atomic Industrial Forum (AIF), seemed to be more against the nuclear industry than for it.

*Energy Daily* publisher Llewellyn King declared flatly: "Institutional barriers preclude the nuclear option in the United States. . . . Nuclear power will have to be nationalized." King then went on to predict an explosion in the Middle East, including Iranian-backed terrorist attacks on Saudi oilfields.

The AIF, the most influential nuclear industry association, works closely with King, a former British journalist, and with the Heritage Foundation, a Washington-based British intelligence project that has advised the U.S. nuclear industry to "lie low" and avoid a pronuclear counter-offensive in the wake of the Three Mile Island incident.

AIF chairman Carl Walske, whose organization has capitulated politically on every major Carter administration offensive against nuclear develop-

ment, predicted "two to three more years of near-zero orders for nuclear plants."

The Fusion Energy Foundation distributed a press release at the conference titled "The Harrisburg Hoax—Sabotage Against the American System." Other pronuclear support came from the European Labor Party, which circulated a call by its chairman Helga Zepp-LaRouche, "Atomic Power or Nuclear War?" that caused heated discussions among the participants.

Excerpts from the conference speeches of Schmidt, Barthelt, Knizia, King, and Walske appear below.

—William Engdahl

### Schmidt: Energy Essential To Maintain Peace

Experts calculate that world energy needs by the year 2000 . . . will double from 6.5 billion coal equivalent units to 13 billion. . . . A worldwide distribution fight for energy can also lead

to confrontation among the big powers, or, in other words, I want to state clearly that a sufficient energy supply has become one of the essential elements of maintaining peace in the world—a recognition which will generally be seen everywhere in a few years. . . .

If one looks at the country which is the biggest consumer of energy, the United States, it would be necessary to consume an additional 90 million tons of oil per year to replace the energy already produced by nuclear energy—if you wanted to replace it, regardless of the investments which would be necessary to make this possible.

This clearly means that no industrial country, neither in the West nor in the East, can afford . . . to exclude the use of this additional energy source.

I am talking about nuclear energy which already plays an indispensable role quantitatively in the world economy, even though it is still only an extending, complementary role in energy supplies. I think that nuclear energy must play this role for the foreseeable future—for the rest of this century at least—in order to be able

to cover the needs of the developing countries for energy transfers at good economic conditions. . . .

Nuclear technology is not only important for immediately covering energy needs. It is, at the same time, the basis of modern industry with a large number of future-oriented jobs, and is an important element in technological progress for industry as a whole. Industrial countries with high wage levels—for instance, this country—with higher levels of social services, will be able to keep pace in the world economic structural change only if they continue technological and economic progress. They would otherwise—in any case, if they are democratically governed states—be in no position to increase their development aid. Even the Federal Republic will be able to keep its position in this group of especially productive industrial nations only if we perfect nuclear technology. . . .

Many of the arguments against nuclear technology are actually arguments against the entirety of modern industrial society, which, in many ways, gives rise to deep-reaching philosophical questions far beyond just this technology. . . . But pessimism about civilization is not the order of the day; it is not the renunciation of new technologies but, rather, the promotion of better technology. . . .

*Helmut Schmidt is the West German Chancellor.*

**Barthelt:  
Knowledge Can't  
Be 'Off Limits'**

In 20 years there will be 6 to 8 billion people on earth. . . .

These people need food, work, and a roof over their heads. They need energy. . . .

The salvation doctrine of soft technology accepts the death from starvation of many millions of people; their prophets conceal the fact that in their world hardly more humans than today would be able to survive and

that they can reach their soft goals only by using force and in a totally undemocratic manner. . . .

Whoever interferes with the supply of energy, above all with the sufficient supply of electricity, at all times jeopardizes the creation of jobs, all jobs. . . . In order to give you a figure at this point: each worker has approximately 250 times his own energy available in the form of electricity. . . .

Please consider for the moment the association between freedom and a full stomach. It was never want that made man free. Want did not promote human development, but culture, civilization, and a life worthy of human beings—here I would also include liberation from the heaviest physical work—were rendered possible by making adequate quantities of energy available. . . .

In the common synthesis of resources, raw material, capital and know-how, nuclear energy has the chance of becoming, in the positive sense, a technology which unites nations, from which all participants, even the raw materials-producing nations, will benefit. . . .

It has never been possible to obstruct the propagation of ideas; this is also true in the fields of natural science and technology, where it is totally impossible to lock the genie back into the bottle, as it were. . . .

We cannot put up a fence around certain regions of the world and erect a sign: "Knowledge off limits." Of course, the nuclear fuel cycle must be controlled. These controls should, however, not exclude, which could give rise to acts of defiance, but should include and not impede partnership.

We must not give up. If we do so, some of our opponents have succeeded in making us despondent. We know that we possess the moral foundation, based on which we have not only the right but also the duty to stand up for our cause. When no one remembers the names of our present opponents anymore, and at most, shakes his head at them, when nuclear energy will be utilized as something to be taken for granted, just as all preceding technologies since man has lived on this earth, then we per-

haps won't experience it but know already that it was the efforts, ingenuity, and persistence of us all that made this possible.

*Klaus Barthelt is the director of the Kraftwerk Union, West Germany's largest nuclear technology producer.*

**Knizia:  
Creativity Finds  
New Resources**

Man plays no physical role in the energy budget our world needs. Rather, it is his creativity that makes him the decisive factor. Creativity improves productivity, finds new resources. . . . Economic growth is an ethical necessity. . . . If the material world is limited, then man in his creativity is unbounded, and is therefore able, in this limited world, to improve his conditions of life. His power of self-organization allows him to create negentropy, by which he applies natural laws to reach results which never occur in nature. . . . The development of natural science and technology is thus in a broad sense a "mutation" of man, which has vastly increased his insight and powers. . . . This evolution brings new reason into being. . . .

*Klaus Knizia is a representative of the German Electrical Utilities Union. His speech was titled "Technology—A Prerequisite to Humanity in Our Times."*

**King:  
Nuclear Industry  
Can't Fight Back**

Institutional barriers preclude the nuclear option in the United States. We will only be able to put through nuclear energy in the United States if the government takes control of the nuclear industry. Nuclear power will have to be nationalized. . . .



The problem is that the antinuclear movement is irrational. Look at Iran.

The nuclear industry cannot fight back. I think the mood of anger [against nuclear energy] in the population is very strong. . . . Crises will solve the nuclear power question. The key is adversity. So far in America there has been no adversity. The book *Future Shock* was very effective in this respect. Adversity could come quite soon to the United States. . . .

*Llewellyn King is the publisher of the Energy Daily.*

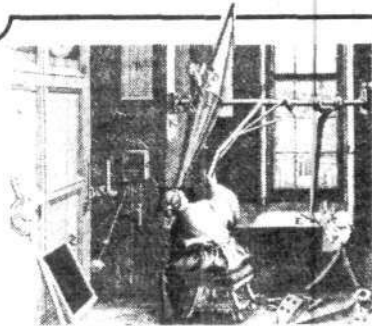
**Walske:**

### **A Word Of Caution**

In the United States we have now entered a somewhat turbulent period during which we shall be considering the lessons from Three Mile Island and making the changes necessary to reduce the likelihood of repeating that accident or something similar to it. There are good indications that this review process will be approached constructively by the industry, the executive branch of government, by the Congress and the American people. I am hopeful that we shall be through this period in one, two, or three years at the most. . . .

A word of caution might be in order. There is always a temptation to declare that other people's accidents could not happen to us. There has been some tendency to do this in the case of Three Mile Island, perhaps to fill some perceived political need. I suggest that this is foolish. . . . There will remain, as we now project the future, some small probability of accidents that can injure or kill people. . . .

*Carl Walske is the chairman of the Atomic Industrial Forum. These excerpts are from his printed text. In his actual speech, Walske was more pessimistic and noted that "thousands of people could be killed in nuclear accidents."*



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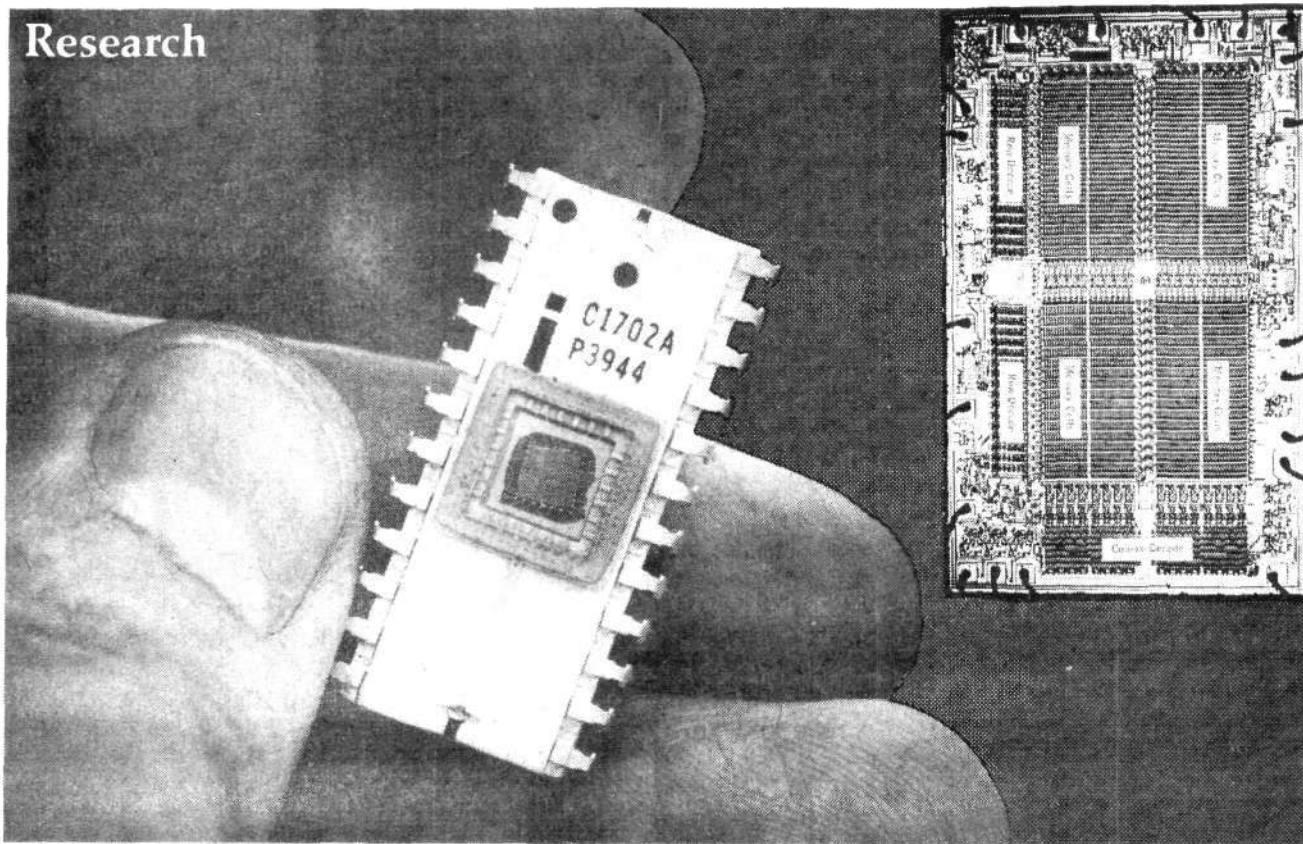


Photo by Ulanowsky

Typical semiconductor chips. The hand-held encased chip is the U.S. Intel 1702, a programmable, erasable, 2,048-bit read-only memory. The inset at right is a photograph of the Soviet Union's 4,096-bit random access memory circuit.

## Science Promotes Fiction The State of Soviet Electronics

The state of Soviet electronics capabilities has been hidden from the American people by carefully structured media mythologies whose major theme is generally "Soviet backwardness." An example of this practice is the April 20 *Science* magazine article "New Chips Shed Light on Soviet Electronics," which says something about the politics of the editors of *Science*, but sheds little light on the state of Soviet electronics.

The "new chips" the article refers to are sample Large-Scale Integrated Circuits, the basic electronic semiconductor components of present-day computers, including a 4-bit Microprocessor and a 16,000-bit Random Access Memory (RAM) chip that Lynn W. Gallup, an executive of the Con-

trol Data Corporation (CDC), obtained from Soviet officials and displayed at a Washington press conference Feb. 28. Gallup's statement that "the Soviets obviously have developed the semiconductor processes and knowhow sufficient to make devices close to the edge of technology. . . [and may soon] branch off into a leading position . . . in some areas of semiconductor[s]" stirred the editors of *Science* into a hurried gathering of denials and denigrations from its cothinkers in government agencies and elsewhere.

For example, *Science* quotes a Department of Defense expert opinion: "CDC is getting all the publicity because . . . it is trying to make the point that the Russians really have the tech-

nology to make big computers that CDC wants to sell. . . ." A Department of Commerce official's opinion of the Soviet RAM chip is that it "is very similar to Mostek's," the leading American semiconductor memory manufacturer. The intended meaning of this opinion is underlined by another official's ominous suggestion that the Soviet chip was fabricated by means of "help they may have had from other countries. . . ."

Yet another electronics expert is quoted. This unidentified person grants that . . . "at their laboratory at Novosibirsk, they could produce a few of anything . . . but semiconductor production is a black art. . . . The Soviets have a tremendous ability to do individual pieces of science, but

they have never been good at translating that into production."

This same theme is repeated over and over again in the *Science* article: Without outside help, the Soviet bloc is incapable of implementing advanced semiconductor devices in useful quantities; somehow the Soviets have never mastered the "black art" of semiconductor production!

These statements are patently false. On the contrary, U. S. Department of Defense reports in the public domain show that since 1971 at the latest the Soviet Union has had the capability to implement the most advanced semiconductor technologies. In addition, in that same year the Soviet Union made the political decision to commit its resources to mass produce all advanced semiconductors essential for the forced-march expansion of its computer industries as well as those semiconductor devices essential for its instrumentation and defense electronics industries.

#### Thermonuclear War Games

Certainly, the editors of *Science* are familiar with the contents of these documents. Why, then, the fraudulent concoctions of Soviet backwardness in semiconductor production? It is to hide the underlying reality from its readers; namely, that the United States is pursuing a strategic policy of confronting the Soviet Union along its borders with destabilizations in a thermonuclear game of "chicken."

Every conceivable idea has been conscripted to address the U.S. population's understandable anxiety regarding a thermonuclear war with the Soviet Union, including the idea that Soviet backwardness in semiconductor technology gives the United States an overwhelming strategic advantage. According to this view, the United States does not have to be overly careful about poking at the Soviet flanks; The Soviets would not dare respond directly to U.S. provocations since "the force" is with us! Secret "chips" mounted on U.S. wonder weapons (MX Cruise Missiles, and so forth) would glide silently and unseen over tree tops following preprogrammed terrain markings toward Soviet strategic targets and—zappo-ka-boom-kaboom—we win!

Sounds crazy, doesn't it? Yes, but it is the best story the "chicken" game planners have come up with, and from the *Science* editors' hysterical defense of "chip" superiority, it looks like they are sticking with the story.

Such behavior on the part of the editors of a U.S. science magazine is not surprising, since the publishers of *Science*, the American Association for the Advancement of Science, sold out American science long ago to the un-American ideas of zero growth, nominalism, and the likes of Dame Margaret Mead. In the same spirit, the AAAS and *Science* editor Philip Abelson now put forward a strategic policy based on the anti-Russian warmongering that has characterized British policy for 200 years.

#### What Gap?

What is the truth regarding Soviet capabilities in semiconductors? In 1972, the Defense Department's Advanced Research Projects Agency

(ARPA) addressed important aspects of this question by commissioning the Rand Corporation of California to undertake a study of Soviet work with photolithographically prepared semiconductor integrated circuits (thin films) as reported in open Soviet literature, especially during the 1970-1972 period.

Two of the relevant summary conclusions of the ARPA Feb. 1973 report (ARPA-R-1181), *Soviet Research on Semiconductor Thin Films*, are:

(1) "Soviet film preparation techniques do not differ from those in the West."

(2) "The published Soviet work leads one to conclude that in semiconductor technology, the USSR is generally a few years behind the United States, with the exception of some narrow aspects of materials in which it is ahead."

Hence, from the open Soviet literature alone, the ARPA authors judged

## Computer Envy?

The charge by *Science* in its "New Chips" article that the business of Soviet semiconductor samples given to CDC official Lynn Gallup was connected with Soviet lusting for CDC's 7600 computer recalls a similar incident two years ago involving the 7600. At that time the defense of the U.S. 7600 computer from communist hands was led by syndicated columnist Jack Anderson, who charged that the Soviet purposes for the CDC 7600 were more sinister than its application to the study of international weather patterns.

Is there any truth in either charge? Of course, the Soviet Union would be pleased to evaluate CDC's 7600 as well as machines from other leading computer manufacturers in a variety of applications including weather tracking. It is a common practice among all computer manufacturers to put their competitor's computers through benchmark tests to objectively evaluate how their own computers measure up. In addition, the Soviet bloc will occasionally buy individual computers whose organized characteristics meet current needs not efficiently serviced by their own mix of computers. An example of this practice is the recent Soviet purchase of a few French computers to handle the large volume of hotel and airplane reservations expected during the Moscow 1980 Olympics.

But only the most paranoid reader would be taken in by the implication in *Science* that the Soviet Union is dependent on individual Western computers of even the most advanced type to meet its strategic needs. The Soviets have stated a firm commitment to meet all of their economic and strategic needs with computers built within the Soviet bloc. In fact, the Soviet bloc has "antiimport committees" that take even longer to approve Western imports of computers than the United States takes to approve export licenses.



the Soviet capability in semiconductor technology as almost on a par with the West at the beginning of this decade. Could the Soviets translate this capability into effective mass production of advanced semiconductor devices? The 1973 ARPA document quotes Soviet Chairman Brezhnev's 1971 report of the Central Committee to the 24th Congress of the Communist Party of the Soviet Union as setting "the task of dramatic improvement in quality control of its electronic semiconductor industry" and the "mass production of high performance computers" and all auxiliary instrumentation.

The ARPA report adds that on the basis of this commitment by the 24th Congress "it is quite reasonable to expect the Soviets to make a major effort in the development of semiconductor thin films during 1972-1975." Finally, the report suggests that even larger successes were to be expected for the remainder of the decade.

#### The Fairchild Case

The sudden increase in demand for semiconductors after Brezhnev's 1971 report quickly outpaced the productive capacity of old and new manufacturing facilities coming on line in the Soviet sector. In late 1972 or early 1973, the Soviet Union awarded a contract to Fairchild, one of the leading U.S. semiconductor manufacturers, for the construction of an additional plant within the Soviet Union. While the Fairchild application was pending in various U.S. government agencies, the Soviet Union gave a Fairchild executive, Harry Sello, samples of semiconductors the plant would manufacture.

The Fairchild plant construction application was turned down. The April 20 *Science* article contributes its own twist of "Soviet backwardness" to this story as follows: "The 1973 Fairchild case backfired. Analyses of the devices showed that the Soviets were seriously behind the United States in the then-exploding field, and the government denied Fairchild's request to construct the plant."

The very opposite is more likely true. The Fairchild request was turned down because of the advanced state

of the 1973 Soviet sample semiconductors.

The case of the "Fox-Bat" plane a Soviet defector used for his flight from Vladivostok to Japan a few years ago is fairly well known. Much was made of the backwardness of Soviet electronics because the plane's navigation and radar gear included many vacuum tubes—until it was discovered that these tubes had better frequency characteristics than available semiconductor replacements.

The case of the Soviet plane shot down by the Israelis during the 1973 Mideast war is less well known. A careful analysis of this plane's semiconductor electronics yielded the considered judgment that these Soviet semiconductors were on a par with the very best U.S. efforts.

Since the 1973 ARPA document there have been no further public reports by ARPA on the Soviet semiconductor industry, and the Department of Defense has shrouded the Soviet semiconductor story in mystery. Why the secrecy? Certainly, the Soviets know their own capabilities. This knowledge is being withheld from the American people, thereby making them vulnerable to a barrage of misinformation. The Soviet Union can strike a blow for peace and sanity by making public a survey of its current capabilities in semiconductor electronics and computers. We'll see that such a survey is widely published here.

—Michael Tobin

## Develop Hydrogen Superconductor

Researchers P.M. Bell and H.K. Mao at the Carnegie Institution in Washington, D.C. think that within the next six months they will achieve sufficiently high-pressure compression of hydrogen to force it to undergo a phase transition to the metallic state.

According to theoretical predictions, at a pressure of 1 megabar, or 1 million times atmospheric pressure at sea level, hydrogen should become a superconductor. Furthermore, this exotic new state of hydrogen should maintain its superconducting properties at room temperature, about 300 degrees Kelvin (a Kelvin is a degree Celsius as measured from absolute zero, -273 degrees Celsius). By comparison, conventional superconductors exist at temperatures below about 25 degrees Kelvin.

Using a specially designed apparatus that compresses liquid hydrogen between diamond anvil faces, Bell and Mao had achieved compression to 500,000 atmospheres early this year. At these pressures they observed that the hydrogen existed as a yellow crystal. Under increased pressure, the bonds holding the atoms of hydrogen together in its normal diatomic molecular state gradually break down. The transition to the metallic condition occurs when this process is completed.

## Bell Devises Optical Semiconductor

Bell Labs scientists report that they have devised an all-optical, micron-sized semiconductor device that could some day be used to manipulate light beams just as electronic devices manipulate electrons. This would represent a tremendous leap forward in information handling, since it would increase the density and speed with which data could be stored and transferred by many orders of magnitude. The ultimate limits of the device would be determined by nonlinear interactions of light.

The tiny chip containing a layer of gallium arsenide sandwiched between two layers of aluminum arsenide could become one of the active components for integrated optical circuitry. Initial experiments have been successful, and Bell researchers will be working on shrinking the device to submicron dimensions, decreasing the switching times, and achieving room-temperature operation.

In a recent interview, Bell indicated that their apparatus has been able to compress hydrogen at room temperature to 800,000 atmospheres and that the properties are evolving in the right direction to achieve the predicted superconducting state at about 1 million atmospheres.

Although the practical consequences of a room-temperature superconductor are tremendous, there is still significant work to be done to get to mass production from the present experimental stage in which near-microscopic amounts of solid hydrogen are created. Nevertheless, there are already patents for highly efficient electrical generators using room-temperature superconducting hydrogen.

As a spin off from this research, Bell noted that the compression apparatus achieved 1.7 megabars during testing without hydrogen in it. This pressure corresponds to a depth of about 3,000 km below the earth's surface, and this technique would make it possible to perform a number of geophysical experiments simulating conditions deep within the earth.

—John Schoonover

## Stanford Reports Storage-Ring Laser

Stanford University physicists reported that they are developing a high-powered isochronous storage ring laser that will be continuously tunable from the infrared into ultraviolet frequencies. Such a laser offers enormous opportunities for large-scale industrial photochemistry, as well as improved isotope separation for the production of nuclear fuel and important medical tracers.

The Stanford approach is based on the free-electron laser system in which an electron beam is introduced into a magnetic field and generates coherent light.

By combining the free-electron laser with a storage ring in which electron beams can be circulated for long periods, the same electrons can be used repeatedly to boost the power of the laser, thus allowing high efficiencies to be attained.

# IGC—very big in superconducting magnet systems.

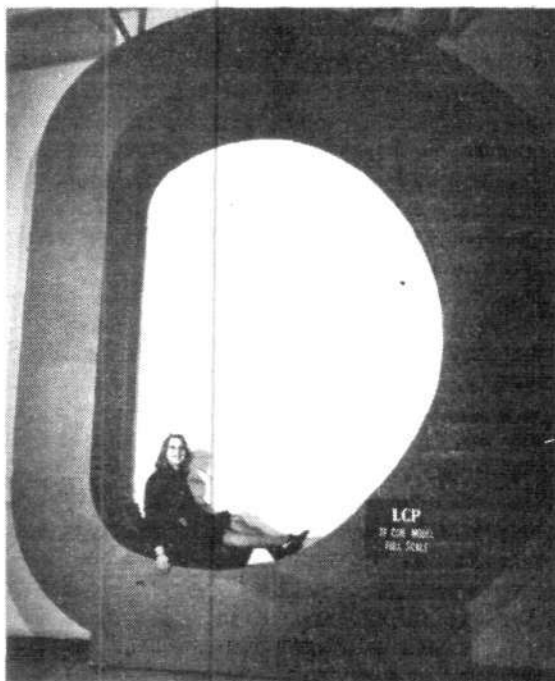


PHOTO: COURTESY OF OAK RIDGE NATIONAL LABORATORY.

Full scale model of superconducting winding for Tokamak toroidal field coil (Oak Ridge National Laboratory Large Coil Program).

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## FEF Files Amicus In Progressive Case

The Fusion Energy Foundation will file a friend-of-the-court brief in the *Progressive* case with the Seventh Circuit Court of Appeals where the case will be heard this fall, announced Dr. Steven Bardwell, FEF director of plasma physics.

The case, in which the government is enjoining the *Progressive* magazine from publishing what the Department of Energy claims is classified information about the construction of the hydrogen bomb, is now a set-up, Bardwell said.

Bardwell explained that both sides of the case have the same objective: closing down advanced theoretical research. "There is a faction in the DOE—the Schlesinger faction—that has attempted for the past several years to tighten classification around scientific research in fusion on the pretext of national security. And on the other side, the antitechnology *Progressive* magazine has stated its intention to shut down scientific research in areas like fusion that have overlapping civilian and military applications on the bogus issue of nuclear proliferation. The publishers of the *Progressive* don't hide the fact that they would like to shut down America's economy and return the nation to a more 'natural' state," Bardwell said.

"What we intend to do in our *amicus curiae* brief is make it clear that the real issue here is rescuing U.S. scientific research from the Dark Ages faction of H.G. Wells and Bertrand Russell that wants to classify the frontiers of science for use in geopolitical war games.

"This concept of classification is not in the U.S. national interest," Bardwell said, "although it may benefit the British, who have been classifying atomic research in this country since World War II. It will aid the military cartelization of industry and retard

the development of fusion energy," he explained.

So far the arguments by both sides, as well as those by the other *amicus* brief filers, have concentrated on the narrow questions of whether classification is justified in any situation or of whether the information in the *Progressive* article is of the sort the government claims. The bulk of these arguments have focused on the constitutionality of the 1954 Atomic Energy Act, under which information on nuclear weapons is classified.

### The Constitutional Question

As the FEF *amicus* brief points out, the 1954 Act, in fact, is one of the most constitutional pieces of recent legislation. In introducing the bill, President Dwight Eisenhower stated that its aim was to ease the strictures on scientific research on fission and fusion set up by the first Atomic Energy Act in 1946 and to establish a government safeguard for the dissemination of atomic energy information. As Congress specified at the time, they wanted to ensure "the strengthening of the defense and the economy of the United States and the Free World."

The point of Eisenhower's bill and the congressional passage was to realize the connection between real national security, economic health, and advanced technologies like nuclear energy.

As Eisenhower said: "In respect to defense considerations, our atomic effectiveness will be increased if certain limited information on the use of atomic weapons can be imparted more readily to nations allied with us in common defense. In respect to peaceful applications of atomic energy, these can be developed more rapidly and their benefits more widely realized through broadened cooperation with friendly nations and through greater participation by American industry. By enhancing our military effectiveness, we strengthen our efforts to deter aggression; by enlarging our opportunities for peacetime development, we accelerate our own progress and strengthen the free world."

Summarizing the impact of the brief, Bardwell said: "We expect this brief to totally disrupt the controlled psychological environment into which the case has thrown scientists, journalists, and the legal profession. As the judge in the lower court said: 'bad cases make bad law,' and this case qualifies as bad. It addresses the wrong question in the wrong form, and, if left to its present course would be a disaster for fusion research—*whoever won*."

"Our brief will address the real question of what defines a country's national security, and in so doing show that the 1954 Atomic Energy Act and the U.S. Constitution agree on the chief issue: the encouragement of scientific research and its implementation in industry and agriculture.

"To the extent that classification is necessary for military affairs—fine. But our brief will show that the recent history of classification is just the opposite. Classification has been consistently applied to stifle fusion research. We intend to change that."

## Gilbertson at Oak Ridge Lab

Jon Gilbertson, FEF director of nuclear engineering, addressed 30 scientists in Oak Ridge, Tennessee May 16 on the question of sabotage at the Three Mile Island plant. "The planned six-year attack on nuclear power in this country, led by Schlesinger and other antidollar interests and culminating with sabotage at TMI, is actually an attack on the value of the human mind," Gilbertson said. "The environmentalists create the myth that science and technology are bad and dangerous, that a mind-destroying counterculture is better than technological development for the Third World."

"The Oak Ridge National Laboratory, which has done some of the most advanced work in fusion and fission research, is now being dismantled by this attack on technology. Research on nuplexes has been dropped, replaced by 14th-century



wind and solar projects. We can win the battle against Schlesinger, but you've got to stop being the silent majority," Gilbertson told the group.

## **WOR Radio Show Big Success**

Morris Levitt's hour-long appearance on the popular Joan Hamburg radio interview show on WOR May 16 brought in scores of requests for subscriptions to *Fusion* magazine. The show focused on the question of sabotage at the Three Mile Island plant and the campaign to destroy nuclear power.

Callers into the radio show included one Harrisburg resident whose husband works at the Three Mile Island nuclear plant. "I'm so glad somebody's telling the truth that there never was any real danger," she said.

## **Real Economics Versus Malthus**

In a special FEF seminar organized June 5 to bring a voice of sanity to the participants of the Malthusian annual meeting of the International Association of Energy Economists in Washington, D.C., Dr. Steven Bardwell explained how the Riemannian economic model works. About 40 persons attended, including several economists from the conference. Topics included how the Riemannian model differs from traditional economic models, how it would apply to both socialist and capitalist economies, and how it can simulate the impact of such factors as trucking deregulation.

## **Parpart Trounces Environmentalism**

Three-hundred people voted 3 to 1 in support of nuclear power development after a May 31 debate in Los Angeles between Uwe Parpart, FEF director of research, and Sheldon

Plotkin, a spokesman for the antinuclear Alliance for Survival. The debate was sponsored by the Informed Voters League, which sent telegrams after the debate to Governor Jerry Brown and President Carter informing them of the organization's overwhelming support for nuclear energy.

Plotkin, whose resumé includes 20 years experience in national defense laboratories and who now writes for the environmentalist magazine, *In These Times*, was apparently unprepared for an opponent who knew the facts about nuclear power and could refute his lies.

## **Levitt Briefs Boston on Harrisburg**

FEF executive director Morris Levitt addressed a fundraising dinner in Boston May 23 attended by 40 representatives from the area's manufacturing, engineering, aerospace, and electronics companies. The topic was the Harrisburg hoax, and Levitt posed the following problem to the audience: "Suppose for a moment that you suspend your disbelief and accept the arguments given for nuclear shutdown and gasoline shortages. If these arguments were true, then you would expect the government to accelerate its fusion research and development program!"

## **Fusion Subscriptions Top 13,000**

*Fusion* subscriptions topped the 13,000 mark and are climbing rapidly. As of this month, *Fusion* switches to a new computer system and a new mailing procedure for subscriptions, which should considerably speed up delivery to subscribers. Total circulation is now 55,000, and the business office is launching an advertising campaign to finance further expansion. "We guarantee advertisers a protechnology audience in the fastest growing science magazine in the country," said business manager Ken Mandel.

## **Letters**

*Continued from page 4*

### **The Editor Replies**

If our Founding Fathers had fought the American Revolution the way the nuclear industry is "advocating" nuclear energy today, we'd still be British subjects.

### **DEATH WITH DIGNITY?**

To the Editor:

I am rather appalled by your attitudes toward the "living will" and the "death with dignity" concepts. Obviously none of you has been faced with the problems of death.

There is a point at which science and medicine fail, and nothing can be done. Due to cancer, I am faced with this fact, and have, myself, composed a "living will" even though such is not legal in this state.

Face the obvious: man must die. There comes a point where nothing meaningful can be done, and the only solution is to make the patient comfortable and for God's sake let him die.

Only when you are faced with this inevitable consequence of living will you understand.

William C. Zeek  
New York, N.Y.

### **The Editor Replies**

Yes, I have faced the problem of death and experienced the pain of seeing someone close to me fight for his life against a debilitating terminal disease. The point is that science and medicine fail to the extent that the society decides human life is worth so little that we can stop the basic scientific and medical research that we know, with absolute certainty, will be able to find cures for killers like cancer or that we can close down hospitals and medical technology and pretend that nothing will happen.

"Death with dignity" is a big lie; behind it are the politics of Hitler.

*Fusion* welcomes comments from readers. Address correspondence to *Fusion*, 304 West 58 Street, New York, N.Y. 10019.

## Fusion News

Continued from page 31

ment on the political scene, and fusion will certainly need strong political backing if it is ever to achieve its ultimate goal. There is, however, a danger in extensive international cooperation if the United States should slow down its efforts unduly, in the hope that key achievements will be made elsewhere or as a result of joint efforts. In spite of their new enthusiasm, the rest of the world has a long history of conservatism and lack of focus. The management structures typical of joint projects . . . would surely slow the development of fusion by many years and make radical changes in direction difficult. . . .

I would be very much concerned if the United States were to bypass its own attempt to achieve ignition in favor of a German effort and simultaneously continue along a path that could result in the ETF being an international machine. Collaboration in the thinking process has been and is most beneficial, but I hope that the United States will not sit by and allow these facilities to go into construction elsewhere.

### Rekindle Confidence

I believe the magnetic fusion program has reached a stage of maturity in terms of its scientific basis, at least for the main approaches (tokamaks and mirrors). Fusion is ready to move into a development phase where engineering issues should dominate our thinking and our planning. I am concerned about an emerging conservative management approach which seems to ask "how slow can we go without stopping?" and which seems to prefer another year of conceptualization, and then another and then another. We need to rekindle our confidence. I believe we can keep the train on the right track, but unless we again think in terms of taking risks and focusing, rather than broadening, the program, the train will move very slowly if at all. Regardless of where I am, I hope to participate in technical discussions from which will emerge the successful development of fusion for all mankind.

## Wash. Conference Announces Laser Fusion Advances

The largest international gathering of laser scientists and engineers was held in Washington, D.C. May 30-June 1—the 1979 Conference on Laser Engineering and Applications, or CLEA '79. Jointly sponsored by the Institute of Electrical and Electronics Engineers and the Optical Society of America, the conference drew 1,500 scientists and engineers who heard more than 200 papers covering inertial fusion, laser isotope separation, and the full range of laser developments.

A number of important developments concerning laser fusion research and its spinoffs were reported at the conference, two of which are highlighted in this news section.

Just as significant, however, was that certain subjects were not covered at all at CLEA. For example, there were no papers by U.S. scientists on uranium laser isotope separation; the only papers presented on the subject were by Japanese and Soviet scientists. The laser separation technique would almost double the amount of available uranium-235 for fission fuel by efficiently separating the usable  $^{235}\text{U}$  from the so-called uranium tails that are now wasted in the uranium diffusion plants.

The silence on the part of the U.S. scientists reflects the Carter administration policy of suppressing this important near-term energy technology. White House sources have quoted the president as saying: "As long as I am president, there will be no laser isotope separation of uranium."

Although President Carter has named proliferation concerns as the reason for this policy, this is a bogus issue. A leading group of scientists headed by Dr. Hans Bethe at Cornell University recently concluded that uranium laser isotope separation technology would not aid proliferation of nuclear weapons in any significant manner and would greatly cheapen and expand nuclear energy resources.

## ZETA Produces Billion Neutrons

Scientists at the University of Rochester's Laboratory for Laser Energetics reported that the six-beam ZETA laser system generated more than 1 billion laser fusion neutrons with just 1.65 trillion watts of laser power. Previously, the best result was 200 million neutrons with the Lawrence Livermore Argus laser.

The Rochester laser lab is an international center for laser fusion research (see *Fusion*, June 1979).

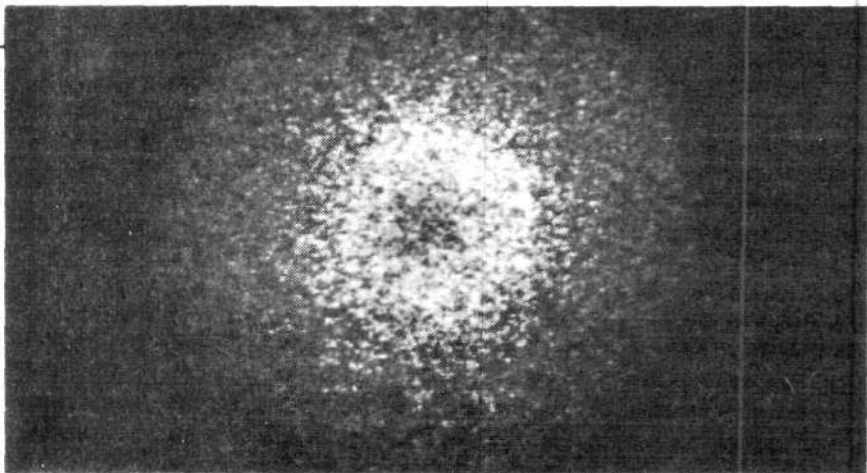
## NRL Reports on Thin Shell Targets

The laser fusion team from the Naval Research Laboratory in Washington, D.C. gave the most important presentation at CLEA '79 on its successful work with laser fusion using "thin"-shell hollow targets. This small, resourceful group has always been at the forefront of basic science discoveries in laser fusion—for example, in laser-induced magnetic fields, measurement of laser absorption, and stimulated Brillouin back scatter.

The latest NRL experiments using thin-shell hollow targets confirm the work first presented by Soviet laser fusion head N.G. Basov and his co-workers in 1975. (See Yu. V. Afanasev et al., 1975, *JETP Lett.*, 21: 68.)

In laser fusion, hollow spherical shell pellets are imploded by the reaction to the thrust produced by laser-induced ablation at the pellet surface. For the case where the shell thickness is large compared to the radius of the overall pellet—this is called the aspect ratio—the required acceleration rate to reach the implosion velocities needed for achieving fusion is relatively small. Therefore, only modest laser intensities are required (less than 100 trillion watts per square centimeter) in relatively long multianosecond pulses.

At these low-intensity levels, the NRL group reported that laser energy



Rochester Laboratory for Laser Energetics

*This X-ray pinhole camera photo is of the implosion of a deuterium-tritium microballoon target in a laser fusion experiment at the Rochester lab.*

absorption can be high, greater than 50 percent, and many undesirable plasma instabilities that occur at higher intensities, such as stimulated Brillouin back scatter, are absent.

(Stimulated Brillouin back scatter is a collective plasma effect that results from the interaction of intense laser light with the ions of the blowoff plasma of the laser fusion pellet. The interaction generates an "ion acoustic" wave and a new electromagnetic wave [laser light is an electromagnetic wave]. This new electromagnetic wave has a direction of propagation directly opposite to the incident laser light and therefore, in effect, backscatters the laser light.)

Among the questions to be resolved if the above approach is to succeed is whether the pellet surface can be efficiently and stably accelerated to velocities sufficient to attain fusion densities and ignition temperature upon implosion. Moreover, as the NRL group reported, severe requirements for laser beam and pellet surface uniformity may restrict the maximum aspect ratio that can be practically employed.

Current NRL experiments are addressing these potential problems using planar, thin-foil targets that are ablatively accelerated by a 3-nanosecond duration neodymium glass laser beam. By employing planar geometry, the NRL group has access to the rear surface for measurements, and the laser energies required to reach fusion velocities are modest.

NRL reported that in their initial experiments last year thin foils were successfully accelerated to velocities approximately within a factor of 2 of those required for pellet fusion.

More recently, extensive studies have been conducted at intensities between 1 trillion and 20 trillion watts per square centimeter. The measured laser energy absorption is high—80 to 90 percent—in contrast to 50 percent at 700 trillion watts per square centimeter. At the low intensities, the ion ablation velocities were measured at between 25 and 33 million centimeters per second.

Since these observed ion ablation velocities are near the desired target velocities needed for fusion (20 million centimeters per second), high hydrodynamic efficiencies for the conversion of absorbed laser energy into target kinetic energy are possible. The measured hydro efficiency approaches 20 percent, and based on simple theoretical models to which the data of the experiments correlate, potential hydro efficiencies could reach 40 to 50 percent.

In its 1977 report, Lawrence Livermore Laboratory states that hydro efficiencies of just more than 10 percent are needed for high-gain laser fusion pellets and that the Livermore high-intensity approach may not achieve this.

The NRL group reported that they are just now beginning crucial studies on the stability of accelerating thin foils.

## LASL CO<sub>2</sub> Laser Fusion Progresses

Speaking on pellet target design concepts at CLEA '79, Dr. Erick L. Lindman of the Los Alamos Scientific Laboratory Laser Fusion Program in New Mexico pointed out that theoretical and experimental studies have shown that the problems of using highly efficient carbon dioxide lasers are not as bad as once believed. The carbon dioxide laser could meet the requirements needed for economical laser fusion electric power plants, and, as Lindman put it, "the natural advantages of the carbon dioxide laser give it an overwhelming lead as a reactor driver."

The key problem, Lindman said, had been that the longer wavelength of carbon dioxide laser light generated high-energy "hot electrons" in the laser plasma interaction at the surface of laser fusion pellets. These hot electrons would then penetrate the core of these pellets and preheat the fusion fuel, preventing the attainment of the high densities needed for high-gain pellets.

Lindman reported that experiments have shown that the number of hot electrons generated with carbon dioxide lasers is not as large as previously believed. Also, theoretical studies demonstrate that the pellet size needed for actual power plants are sufficiently large so that the fusion fuel cores are shielded from the hot electrons by the target mass. This shielding effect is further enhanced when a double shell, or colliding shell target, is used.

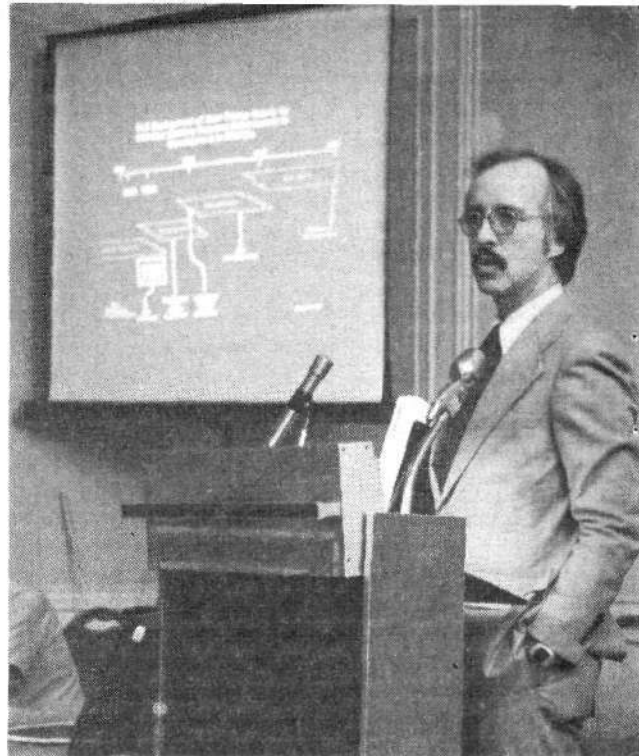
## LLL Report Issued

The fourth annual report of the Lawrence Livermore Laboratory laser program, the most comprehensive review in the field of laser fusion, was released this month. The report, compiled during summer 1978, will be reviewed in the Sept.-Oct. issue of *Fusion*.



*“You are one of the few organized groups I know of that has the courage to stand up and advocate high technology as a solution for some of the problems of the world, and for that I think we owe you a debt of gratitude.”*

Dr. John Clarke  
Deputy Director, Office of Fusion, DOE  
at the FEF annual board meeting,  
Sept. 23, 1978



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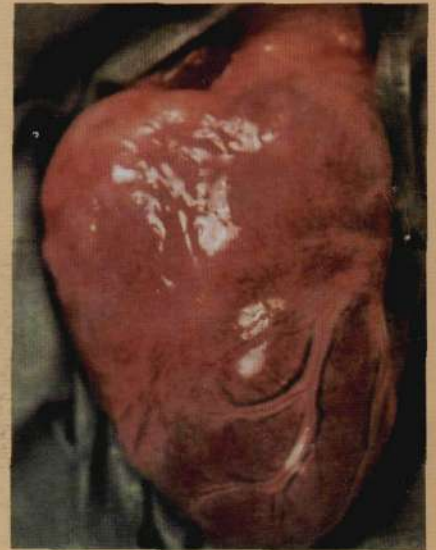
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Treatment with insulin, glucose, and potassium reduced the size of a myocardial infarction, the death of part of the heart muscle from lack of oxygen, as shown in these photographs of animal hearts without GIK treatment (l.) and with treatment.

## Curing the Unnatural State of Entropy

In this issue, noted Mexican cardiologist Dr. Demetrio Sodi Pallares discusses the successful therapeutic use of insulin in nondiabetes cases, including heart failure, shock, and malnutrition. All of insulin's effects on the metabolism are characterized by what Sodi Pallares calls *negato-entropy*, increases in the availability of free energy and the overall ordering of cellular organization.

The larger question raised by the Sodi Pallares article is whether the universe is determined by negentropic growth in which entropy exists as a subsumed, localized phenomenon, or whether it is the other way around.

The question is far from academic. The concept of prevailing entropy, or dissipation, lies at the root of present-day attacks on science and industry. As the news articles in this issue document, the "entropy faction" is behind the oil shortage hoax and the continuing fight to kill nuclear energy—both life and death matters.

Fortunately, the cure is at hand. Our groundbreaking cover story, "Economics Becomes a Science," lays out in detail for the first time the concepts of negentropic economic development that can provide the proper theoretical basis for full global development.

Cover design by Christopher Sloan. Front cover photograph by Philip Ulanowsky; photographs above courtesy of Dr. Demetrio Sodi Pallares.