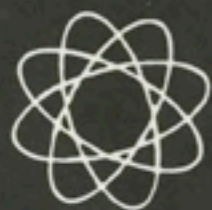


SHARON GILBERT

A  
NUCLEAR ATLAS



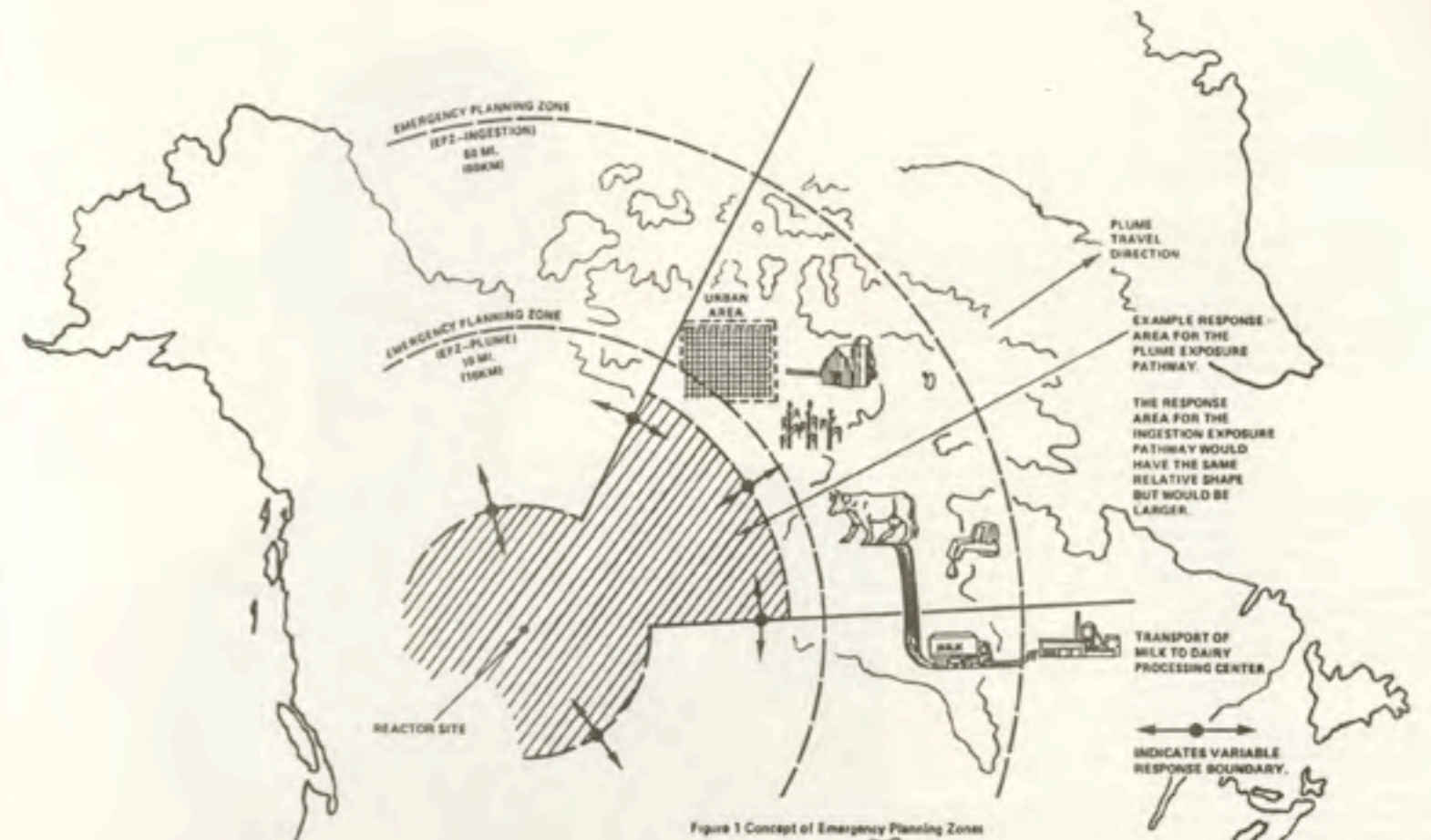


Figure 1 Concept of Emergency Planning Zones

**Panel Faults U.S. Inspection System for Nuclear Plants  
 Plan for Evacuating Area Near Nuclear Plants Assailed  
 Steel Turned Brittle by Radiation Called a Peril at 13 Nuclear Plants  
 Long Shutdowns Could Be Forced By Rust in Some Nuclear Reactors  
 U.S. Notifies 44 Nuclear Plants to Test for Susceptibility to Cracking  
 15 Nuclear Plants' Operation Rated 'Below Average'  
 Federal Study Is Pessimistic On Fleeing Atom Accidents.**

pleted and ready to be put into effect.  
 The states were each responsible for an overall plan encompassing areas within 50 miles of a nuclear plant; counties were required to submit plan "annexes" dealing with areas within 10 miles of the plants. The plans were to deal with methods of alerting the population to a crisis, monitoring the problem and protecting or relocating residents, particularly pregnant women and children.

TABLE 1

HAZARDS
A. Reactor accidents
B. Radioactive emissions
C. Radioactive wastes
D. Plutonium

Present Imperfect, Future Tense

Every month numerous leaks of radioactive wastes are reported in the U.S.A. in quantities from several gallons to 200,000 gallons. When this dangerous fluid leaks it will inevitably

contaminate the water system of the planet, and the various elements are taken up by the food cycle. Radioactive iodine, strontium 90, and cesium are absorbed by roots of grass and vegetables and are further concentrated in the flesh and milk of animals when they eat the grass.

The route of entry of plutonium is by inhalation of contaminated air into the lungs. Small particles of plutonium are deposited deep in the respiratory passages, where they tend to remain for years. It is accepted that one millionth of a gram of plutonium is sufficient to produce lung cancer 15-30 after the initial inhalation of the element.

Plutonium is also absorbed from the lungs into the blood stream where it is carried to the liver (to produce a very malignant liver cancer) to bone (where like strontium 90, it causes osteogenic sarcoma and leukemia), and it is selectively taken up from circulation by the testes and ovaries where, because of its incredible gene changing properties, it may cause an increased incidence of deformed and diseased babies, both now and in future genera-

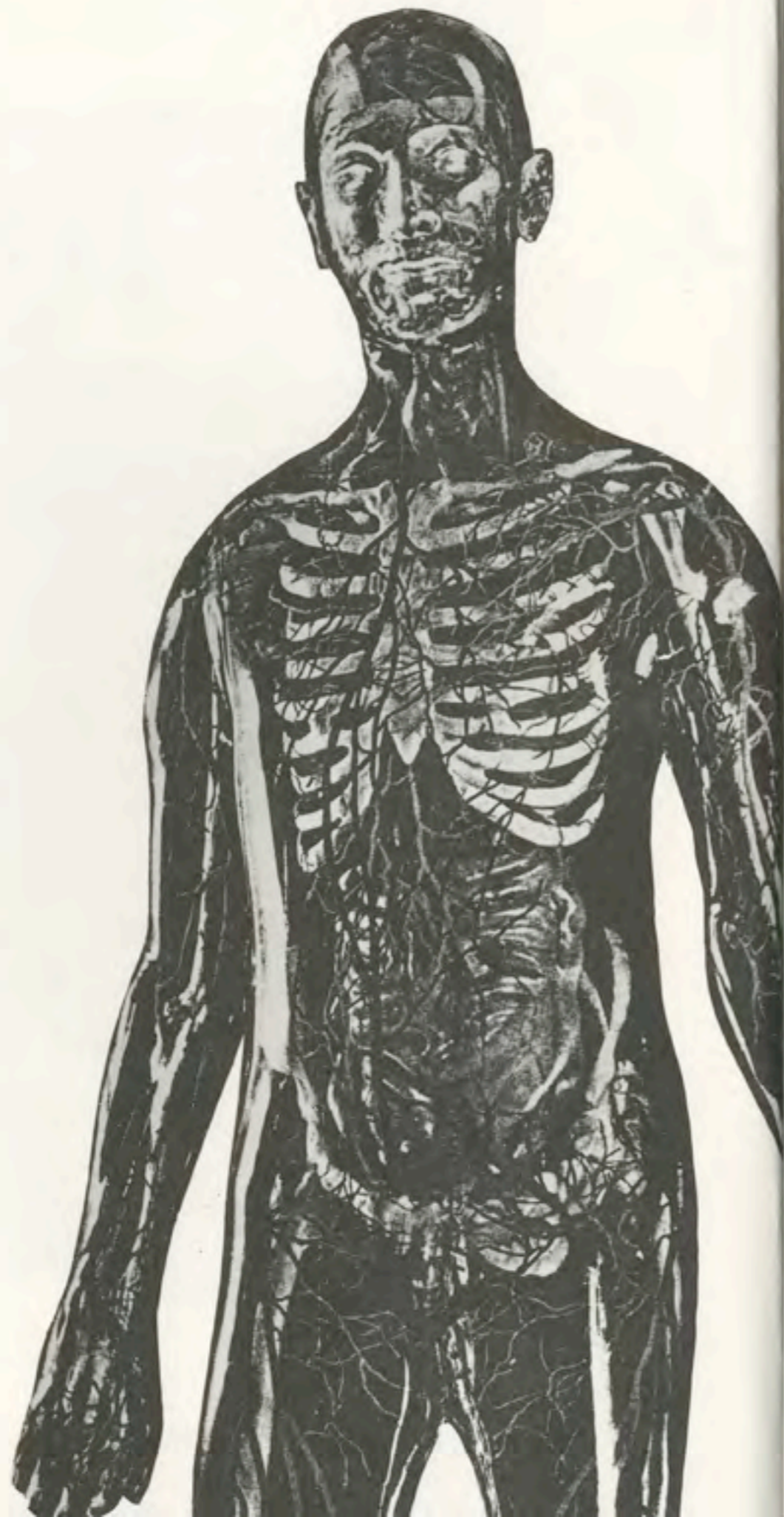
Cesium 137 is deposited in muscles of the body where it can produce malignant changes.

Cesium is concentrated in muscle (meat) and plutonium is also concentrated 1,000 times in fish compared to the background water concentration.

Radioactive iodine is absorbed through the bowel wall, and migrates in the blood to the thyroid gland where it may produce thyroid cancer.

Iodine 131, strontium 90 and plutonium are concentrated in milk, both human and animal.

Strontium 90 is also absorbed through the bowel wall after being ingested in contaminated milk, and incorporated in bone because it is chemically resembles calcium. This element causes osteogenic sarcoma—a highly malignant, lethal bone tumor, and leukemia, a cancer of the white blood cells.



*For You*

The report gave two sets of estimates for the risk of cancer from radiation beyond the average of one-fifth of a rad normally absorbed every year by each person from natural sources and from medical and dental X-rays. Without any increased exposure, about 165,000 of every one million people in the United States would ultimately die of cancer from all causes.

Using the compromise model, the panel calculated that there would be 750 to 2,300 "excess" cancer deaths, an increase of one-half of 1 percent to 1.4 percent, if a million people were exposed once in their lifetimes to 10 rads of low-level radiation, a dose that few are ever likely to receive.

Using the compromise model in another way, the panel assumed that if, instead of a single large exposure, one million people were exposed to an additional rad per year over a lifetime, it would result in 5,000 to 13,000 excess deaths, an increase of 3 to 8 percent.



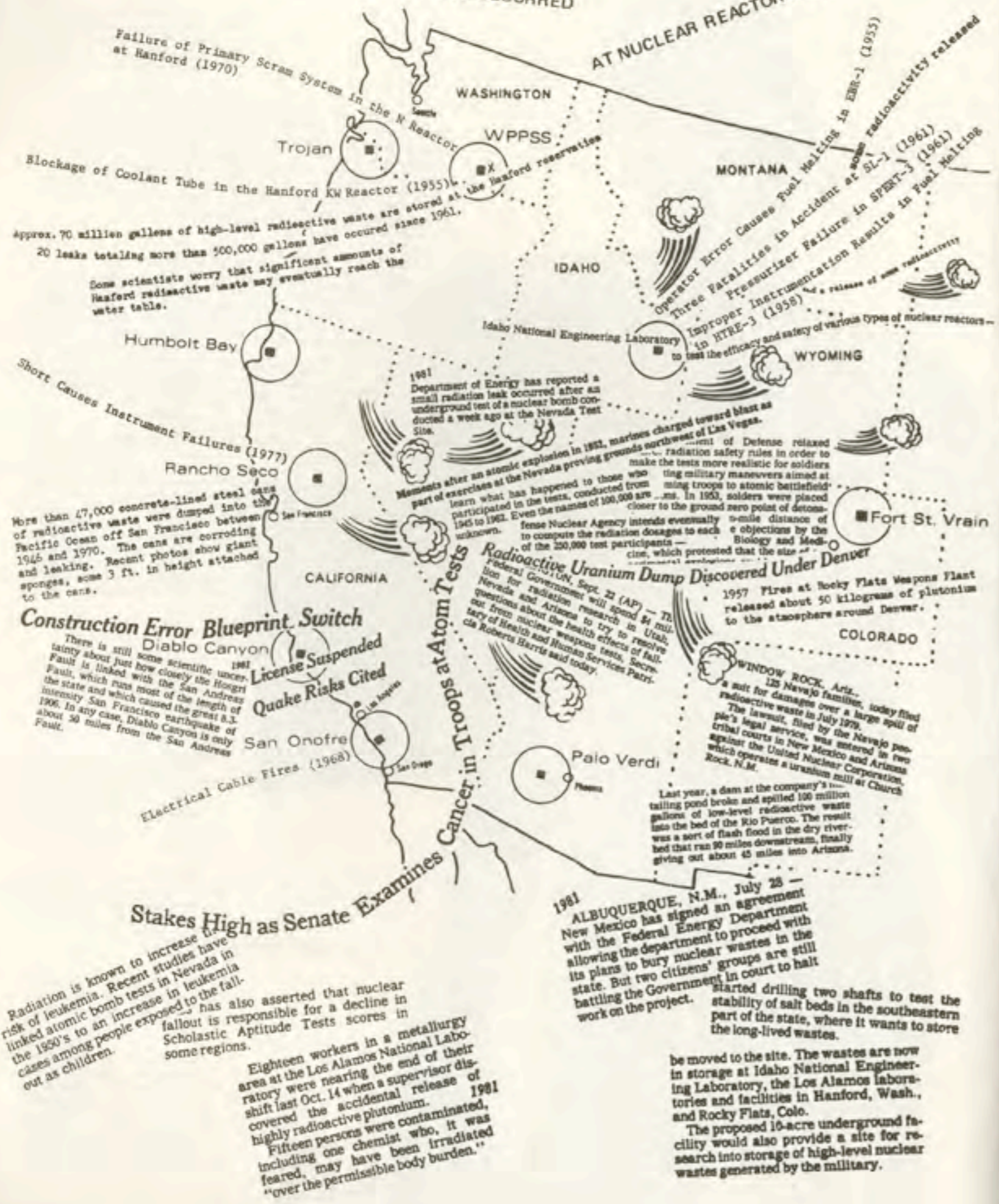
RADIATION-YEARLY EXPOSURE		UNITS (MICROREM)									
		0	10	20	30	40	50	60	70	80	90
COSMIC RAYS											
RADON AND RADON IN GROUND AND BUILDING MATERIALS											
POTASSIUM 40 (INTERNAL)											
COSMIC RADIATION: PASSENGER ON 10,000 km FLIGHT AT ALTITUDE 10,000m											
ONE CHEST X-RAY											
ONE DENTAL X-RAY											
FALLOUT											
MISCELLANEOUS (TELEVISION, WRIST WATCHES)											
LIVING AT STATION BOUNDARY											
		NATURAL RADIATION									
		MAN MADE RADIATION									

THE INVISIBLE TOUCH

"Once you're exposed to radiation, you're contaminated forever," a scientist explains. "You can't get immune to a process that breaks down the molecules your body is made of."

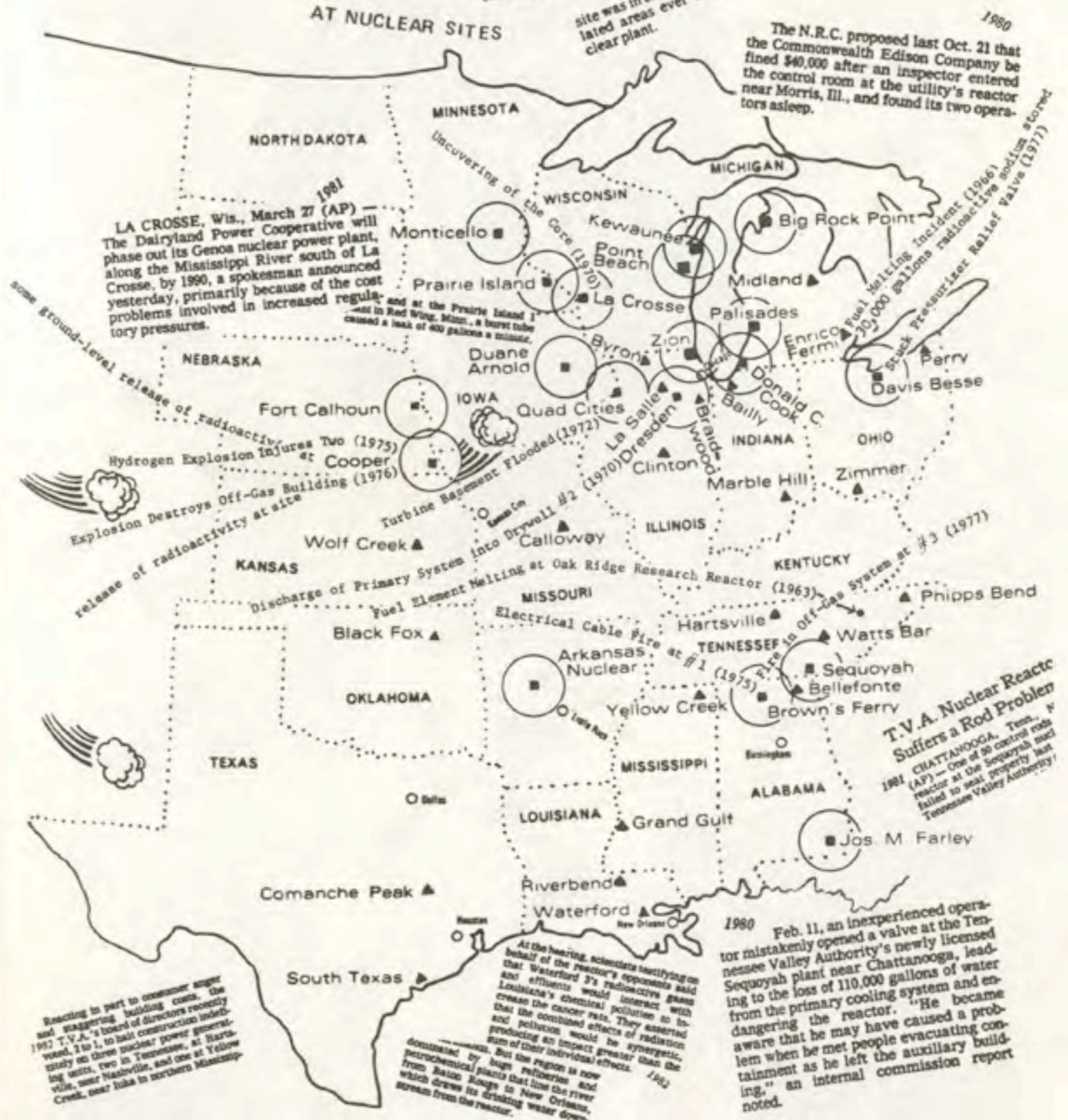
# ACCIDENTS THAT HAVE OCCURRED

# AT NUCLEAR REACTOR FACILITIES



# Bits and pieces

# AT NUCLEAR SITES



RADIATION SYMBOL  
 1. Cross-hatched area is to be magenta or purple.  
 2. Background is to be yellow.



THE NEW YORK TIMES



Technicians at the damaged reactor vessel. The cleanup of the core is expected to take several months.

**Cheating on Exams Is Charged in Report On Three Mile Island**

WASHINGTON, Sept. 15 — The House of Representatives today approved a bill that calls for the Federal Government to clean out 560,000 gallons of highly radioactive nuclear wastes from a storage tank in West Valley, N.Y. A. FitzPatrick Nuclear Plant on Lake Ontario was shut down after the instant battle, calls for spending \$225 million over the next five years for the job, which the automatic shutdown system, in danger, according to officials of the state's Power Authority, the plant's operator. They said the plant would be out of operation for about a week. On Tuesday, the authority said it would not contest a \$40,000 fine for failing to inform the Nuclear Regulatory Commission when a valve at the plant was substituted earlier this year. The replacement valve did not meet N.R.C. specifications, officials said.

**3d Indian Point Plant Is Closed After a Leak In a Turbine Building**

WASHINGTON, Sept. 15 — The House of Representatives today approved a bill that calls for the Federal Government to clean out 560,000 gallons of highly radioactive nuclear wastes from a storage tank in West Valley, N.Y. A. FitzPatrick Nuclear Plant on Lake Ontario was shut down after the instant battle, calls for spending \$225 million over the next five years for the job, which the automatic shutdown system, in danger, according to officials of the state's Power Authority, the plant's operator. They said the plant would be out of operation for about a week. On Tuesday, the authority said it would not contest a \$40,000 fine for failing to inform the Nuclear Regulatory Commission when a valve at the plant was substituted earlier this year. The replacement valve did not meet N.R.C. specifications, officials said.

**Top officials of the Consolidated Edison Company said they believed "a design weakness" in the cooling units caused the leak of 100,000 gallons of water into the company's Indian Point 2 nuclear plant that flooded it and led to its shutdown a month ago.**



**1979 Richmond, Va. (AP) — A leak at Virginia Electric & Power Co.'s North Anna power station automatically shut itself down yesterday after a heat exchanger tube failed and about 100,000 cubic feet of radioactive xenon gas was released.**

Interior radioactive waste gas compressor at the Salem 1 atomic power plant caused a brief morning alert. Officials at the Nuclear Regulatory Commission and the Public Service Electric and Gas Company said, however, that there was no hazardous exposure to the public in southern New Jersey or to plant employees. A leak of radioactive waste gas from a compressor at the Salem 1 atomic power plant caused a brief morning alert. Officials at the Nuclear Regulatory Commission and the Public Service Electric and Gas Company said, however, that there was no hazardous exposure to the public in southern New Jersey or to plant employees.

Although krypton 85 is a heavy, inert gas whose beta radiation normally cannot penetrate the skin, it can be inhaled. It is highly radioactive and its half-life — the time it takes half the atoms to disintegrate or "cool off" — is almost 11 years. Three Mile Island plant contains one to two cubic feet of krypton 85 mixed with 22 million cubic feet of air inside the containment vessel, which houses the reactor. Krypton has about 57,000 curies of radioactivity, compared with the two million curies or so that were accidentally released during the accident a year ago.

The Army and a defense contractor dumped more than 37 million gallons of radioactive caustic wastes from the World War II atomic bomb project in shallow wells at Tonawanda, N.Y., near Buffalo, between 1944 and 1946, a New York State toxic waste task force reported yesterday.

But radium has a half-life of 1,622 years, and chunks of the material, left in the rubble when the plant was razed, have continued to emit radiation up through the floors of the new buildings, which house an electronics company, an auto-body shop, a restaurant and a gas station.

The disposal method was specifically chosen, the panel said, to hide the source of the contamination.

Children playing on railroad tracks at the site of the old United States Radium Corporation plant in Orange, N.J. Radium residues left there date from the 1920's.

**It All Happened**

a) "Calendar year" means four consecutive calendar quarters starting in the calendar quarter which begins in January.

3. The undesignated center heading preceding § 20.101, 10 CFR Part 20, is amended to read "Radiation Protection Standards Applicable to Doses, Levels, and Concentrations."

4. Section 20.101, 10 CFR Part 20, is revised to read as follows:

§ 20.101 Radiation protection standards for individuals in restricted areas. Except as provided in § 20.104, no licensee shall possess, use, or transfer licensed material in such a manner as to cause any individual in a restricted area to receive in any period of one calendar quarter or one calendar year from radioactive material and other sources of radiation a total dose in excess of the standards specified in the following table:

	Dose per calendar quarter	Dose per calendar year
1. Whole body, head and trunk; active blood-forming organs; lens of eyes; or hands	3	75
2. Hands and forearms; feet and ankles	18%	75
3. Skin of whole body	5%	20

5. Section 20.102, 10 CFR Part 20, is revised to read as follows:

§ 20.102 Determination of prior dose. Each licensee shall require any individual prior to first entry of the individual into the licensee's restricted area during each employment or work assignment under such circumstances that the individual will receive or is likely to receive in any period of one calendar quarter a dose in excess of 5 percent of the applicable annual standards specified in § 20.101, to disclose in a written, signed statement, either (a) that the individual had no prior dose during the current calendar year, or (b) the nature and amount of the dose, which the individual may receive during each specifically designated calendar quarter of the current calendar year.

**RICHMOND, Va., Dec. 9 (AP) —** Thirteen security officers at the Surry nuclear power station were dismissed or resigned after being caught smoking marijuana on their way to work, and 10 were dismissed or resigned for refusing to cooperate or for lying to company officials, the utility said. Five other persons resigned in the course of the company's weeklong investigation into accusations of drug use, the utility said.

# PART 20 • STANDARDS FOR PROTECTION AGAINST RADIATION

Appendix C		Material		Microcuries	
Americium-241	100	Osmium-191m*	100	Any alpha emitting not listed above or alpha emitters of unknown position	
Antimony-122	10	Osmium-193	100	Any radionuclide other than alpha emitting radionuclides, above or mixtures of both types of unknown composition	
Antimony-124	10	Palladium-103	100		
Antimony-125	100	Palladium-109	100		
Arsenic-73	10	Phosphorus-32	100		
Arsenic-74	10	Platinum-181	10		
Arsenic-76	100	Platinum-193m	100		
Arsenic-77	10	Platinum-193	100		
Barium-131	10	Platinum-197m	100		
Barium-133	100	Platinum-197	100		
Barium-140	10	Plutonium-239	100		
Bismuth-210	10	Potassium-42	10		
Bromine-82	10	Praseodymium-143	10		
Cadmium-109	1	Praseodymium-143m	10		
Cadmium-115m	10	Promethium-147	100		
Cadmium-115	10	Promethium-149	10		
Calcium-45	100	Radium-226	10		
Calcium-47	10	Rhenium-186	10		
Carbon-14	10	Rhenium-187	100		
Cerium-141	100	Rhenium-188	100		
Cerium-143	100	Rhodium-103m	100		
Cerium-144	100	Rhodium-105	100		
Cesium-131	100	Rhodium-106	100		
Cesium-134m	1	Rubidium-86	100		
Cesium-134	1,000	Rubidium-87	100		
Cesium-135	100	Ruthenium-97	10		
Cesium-136	1	Ruthenium-99	10		
Cesium-137	10	Ruthenium-103	100		
Chlorine-36	10	Ruthenium-105	10		
Chlorine-38	10	Ruthenium-106	10		
Chromium-51	10	Samarium-151	10		
Cobalt-58m	1,000	Samarium-153	1		
Cobalt-58	10	Scandium-46	10		
Cobalt-60	10	Scandium-47	100		
Copper-64	10	Scandium-48	10		
Dysprosium-165	1	Selenium-75	100		
Dysprosium-166	100	Silicon-31	10		
Erbium-169	10	Silver-105	10		
Erbium-171	100	Silver-110m	100		
Europlutonium-152 9.2 h	100	Silver-111	10		
Europlutonium-152 13 yr	100	Sodium-24	1		
Europlutonium-154	1	Strontium-85	100		
Europlutonium-155	1	Strontium-89	10		
Fluorine-18	1	Strontium-90	10		
Gadolinium-153	1,000	Strontium-91	1		
Gadolinium-159	10	Strontium-92	0.1		
Gallium-72	10	Sulphur-35	10		
Germanium-71	100	Tantalum-182	10		
Gold-198	10	Technetium-96	100		
Gold-199	100	Technetium-97m	10		
Hafnium-181	100	Technetium-97	10		
Holmium-166	100	Technetium-99m	100		
Hydrogen-3	10	Technetium-99	100		
Indium-113m	1,000	Tellurium-125m	10		
Indium-114m	100	Tellurium-127m	10		
Indium-115m	10	Tellurium-127	10		
Indium-115	100	Tellurium-129m	100		
Iodine-125	10	Tellurium-129	10		
Iodine-126	1	Tellurium-131m	100		
Iodine-129	1	Tellurium-132	10		
Iodine-131	0.1	Terbium-160	10		
Iodine-132	1	Thallium-200	10		
Iodine-133	1	Thallium-201	10		
Iodine-134	10	Thallium-202	100		
Iodine-135	1	Thallium-204	100		
Iridium-192	10	Thorium (natural)*	10		
Iridium-194	10	Thulium-170	100		
Iron-55	100	Thulium-171	10		
Iron-59	100	Tin-113	10		
Krypton-85	10	Tin-119	10		
Krypton-87	10	Tin-125	10		
Lanthanum-140	100	Tungsten-181	10		
Lutetium-177	10	Tungsten-185	10		
Manganese-52	10	Tungsten-187	10		
Manganese-54	100	Uranium (natural)*	100		
Manganese-56	10	Uranium-233	10		
Mercury-197m	10	Uranium-234-Uranium-235	0.01		
Mercury-197	10	Vanadium-48	10		
Mercury-203	100	Xenon-131m	10		
Molybdenum-99	100	Xenon-133	1,000		
Neodymium-147	10	Xenon-135	100		
Neodymium-149	100	Ytterbium-175	100		
Nickel-59	100	Yttrium-90	100		
Nickel-63	100	Yttrium-91	100		
Nickel-65	100	Yttrium-92	10		
Niobium-93m	10	Yttrium-93	10		
Niobium-95	100	Zinc-65	100		
Niobium-97	10	Zinc-69m	100		
Osmium-185	10	Zinc-69	10		
		Zirconium-93	1,000		
		Zirconium-95	10		
		Zirconium-97	10		

Any alpha emitting not listed above or alpha emitters of unknown position

Any radionuclide other than alpha emitting radionuclides, above or mixtures of both types of unknown composition

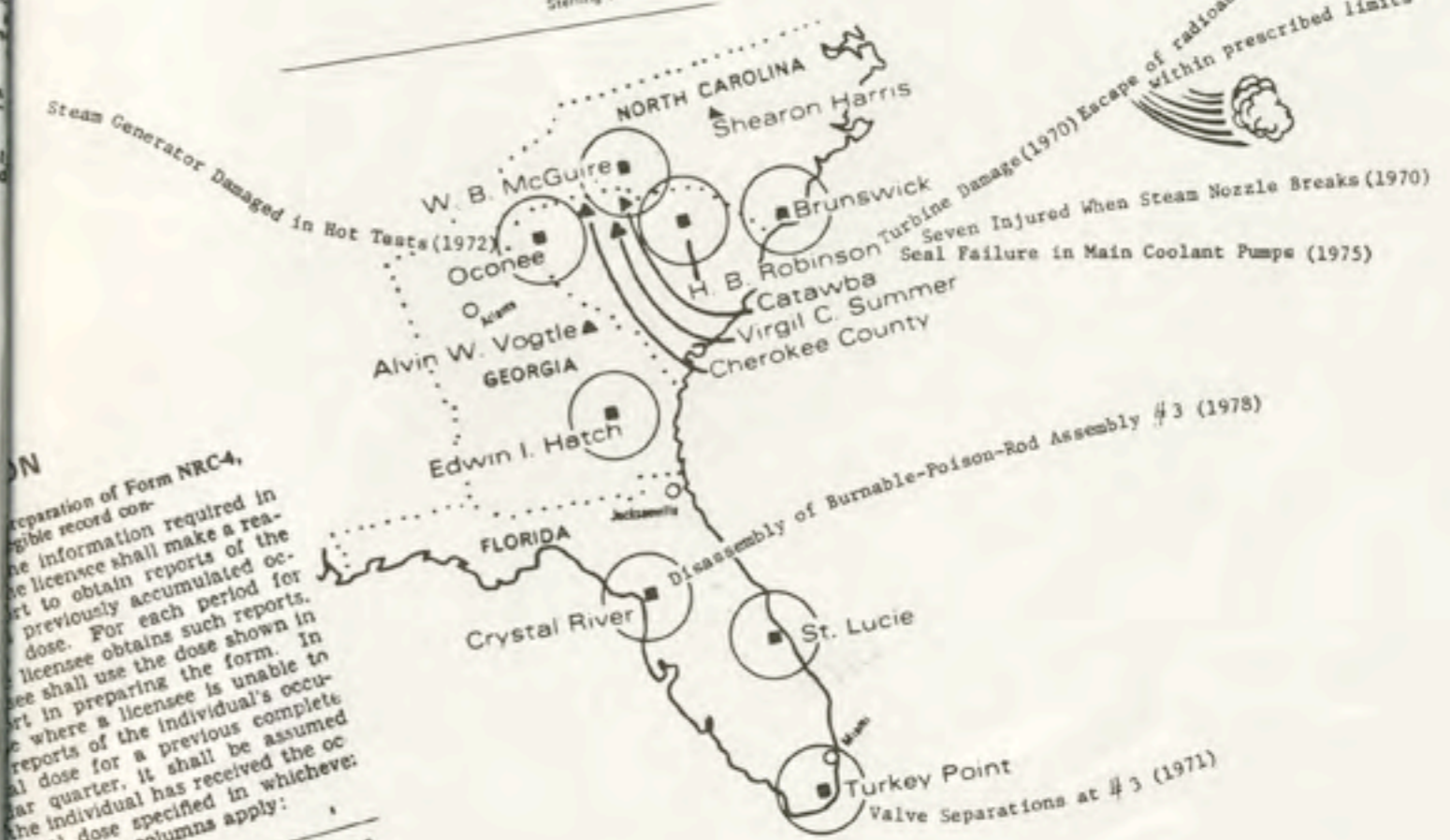
Note: For purposes of this table where there is involved a combination of known isotopes in known amounts, the ratio between the isotopes in the combination and the established for the specific isotopes in the combination. The sum of all the isotopes in the combination shall not exceed "1" (i.e., "unity"). Example: If a particular combination contains 20,000  $\mu\text{Ci}$  of Au-198 and 300  $\mu\text{Ci}$  of  $^{131}\text{I}$ . This limit is as follows:

$\frac{20,000 \mu\text{Ci} \times 1.54}{100,000 \mu\text{Ci}} + \frac{300 \mu\text{Ci} \times 1.4}{100,000 \mu\text{Ci}} = 0.14$

The denominator in each ratio was obtained by multiplying in the table by 1,000 as provided.

TABLE V. REACTORS CANCELLED DURING 1980

Country	Station name
USA	Davis-Besse 2
	Davis-Besse 3
	Erie 1
	Erie 2
	Forked River
	Green Wood 2
	Green Wood 3
	Haven 1
	Jamesport 1
	Jamesport 2
	North Anna 4
	Sterling 1



Preparation of Form NRC-4, and a record of the information required in the license shall make a report to obtain reports of the previously accumulated occupational dose. For each period the licensee obtains such reports, the licensee shall use the dose shown in the reports of the individual's occupational dose for a previous complete quarter, it shall be assumed the individual has received the occupational dose specified in whichever of the following columns apply:

Part of body	Column 1 Assumed exposure to report for calendar quarters beginning prior to Jan. 1, 1961	Column 2 Assumed exposure in years for calendar quarters beginning on or after Jan. 1, 1961
Whole body, hands, active blood-forming organs, head and trunk.	3H	1H

A \$40,000 fine was proposed Feb. 18 1980 against the Florida Light and Power Company after inspectors found that no one was at the controls of one of two units that were operating at full power.

(2) The licensee shall retain and preserve records used in preparing Form NRC-4 until the Commission authorizes their disposition.

Calculation of the individual's occupational dose for all calendar quarters beginning on or after January 1, 1961 yields applicable occupational dose.

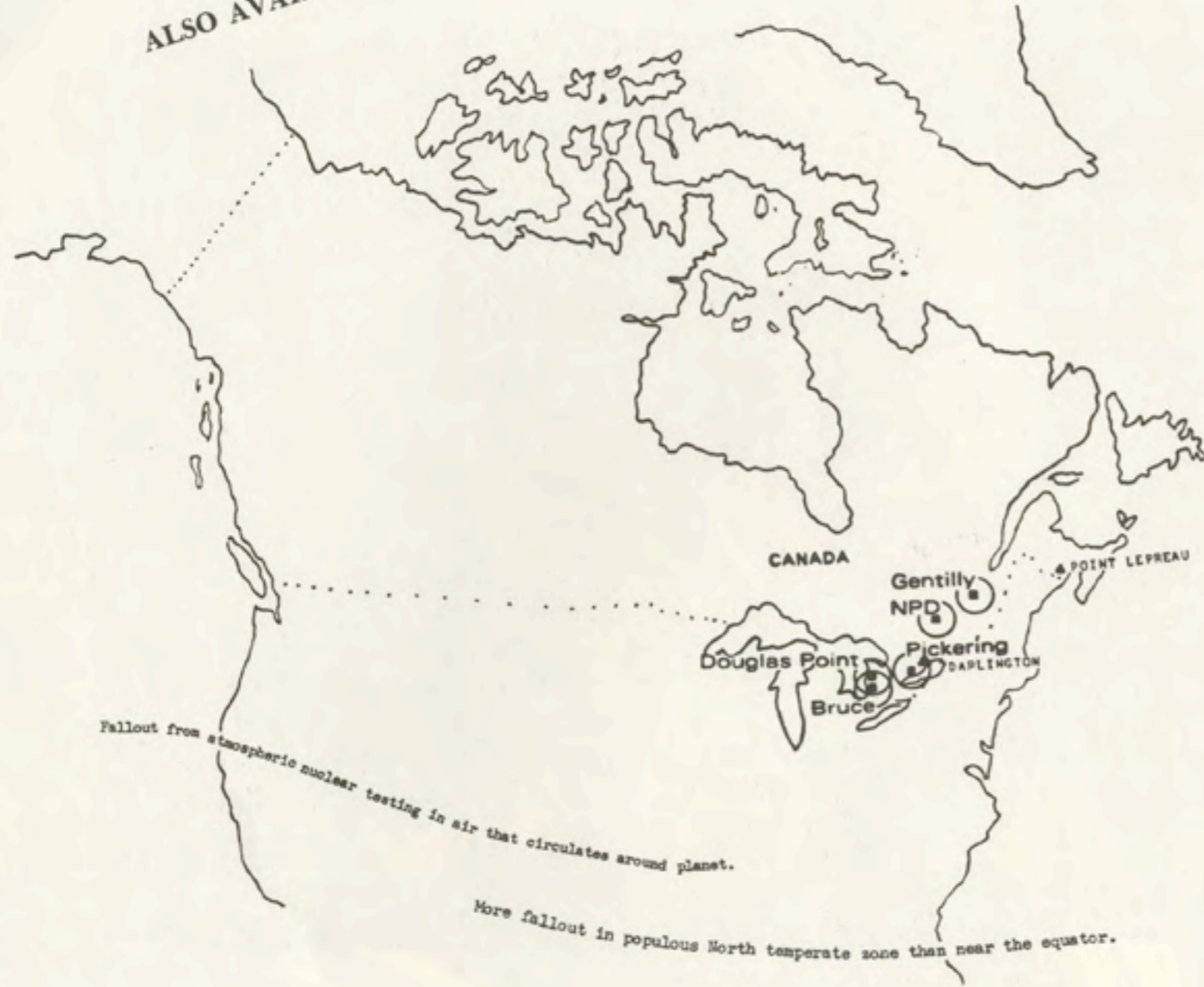
\* Based on alpha disintegration rate of Th-232, Th-230 and their daughter products.  
 † Based on alpha disintegration rate of U-238, U-234, and U-235.  
 \*\* Amended 36 FR 16898.  
 \*\*\* Amended 39 FR 23990.  
 †† Amended 38 FR 29314.





ALSO AVAILABLE

Nuclear Traffic

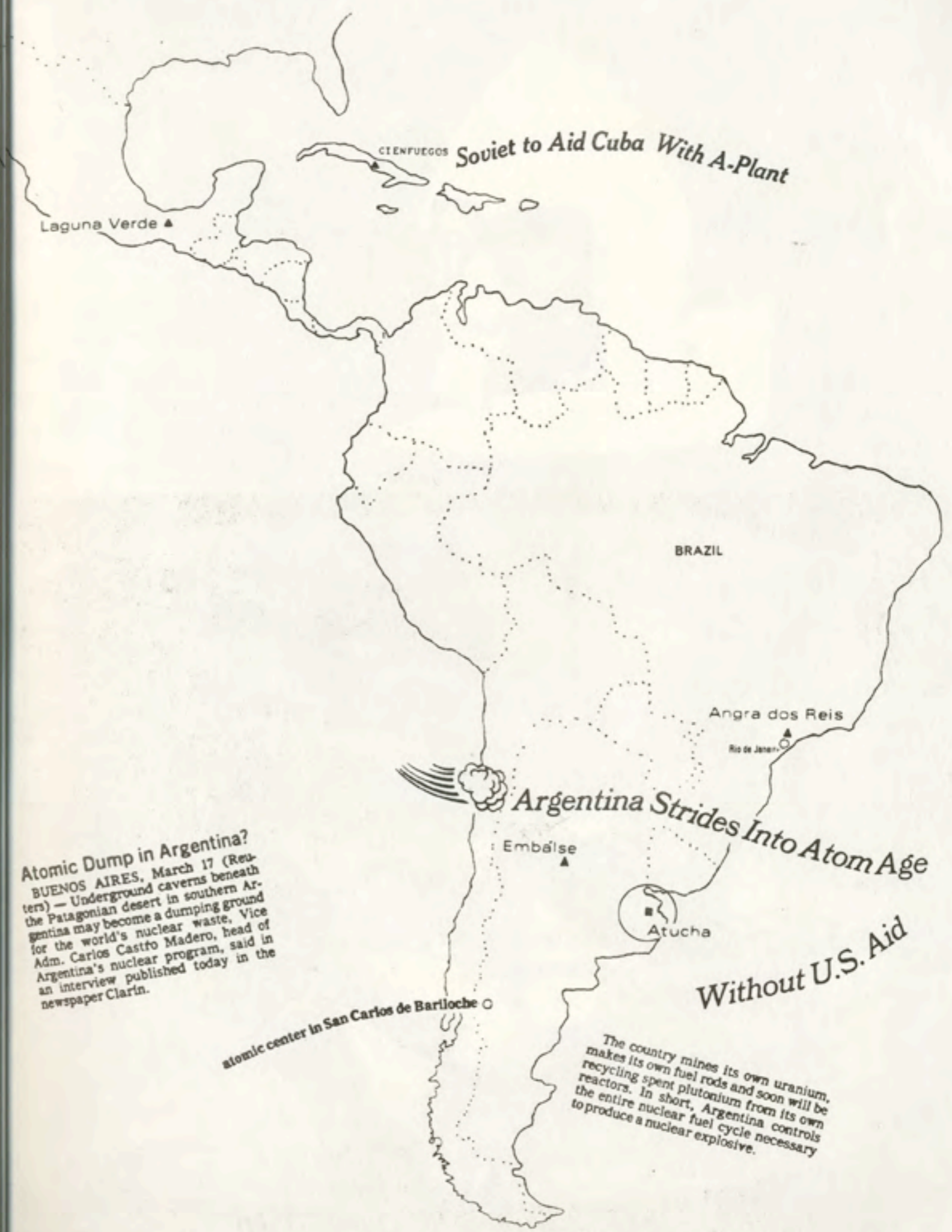


# Around the World

Spreading

Effects

Soviet to Aid Cuba With A-Plant



(Visible and Invisible)



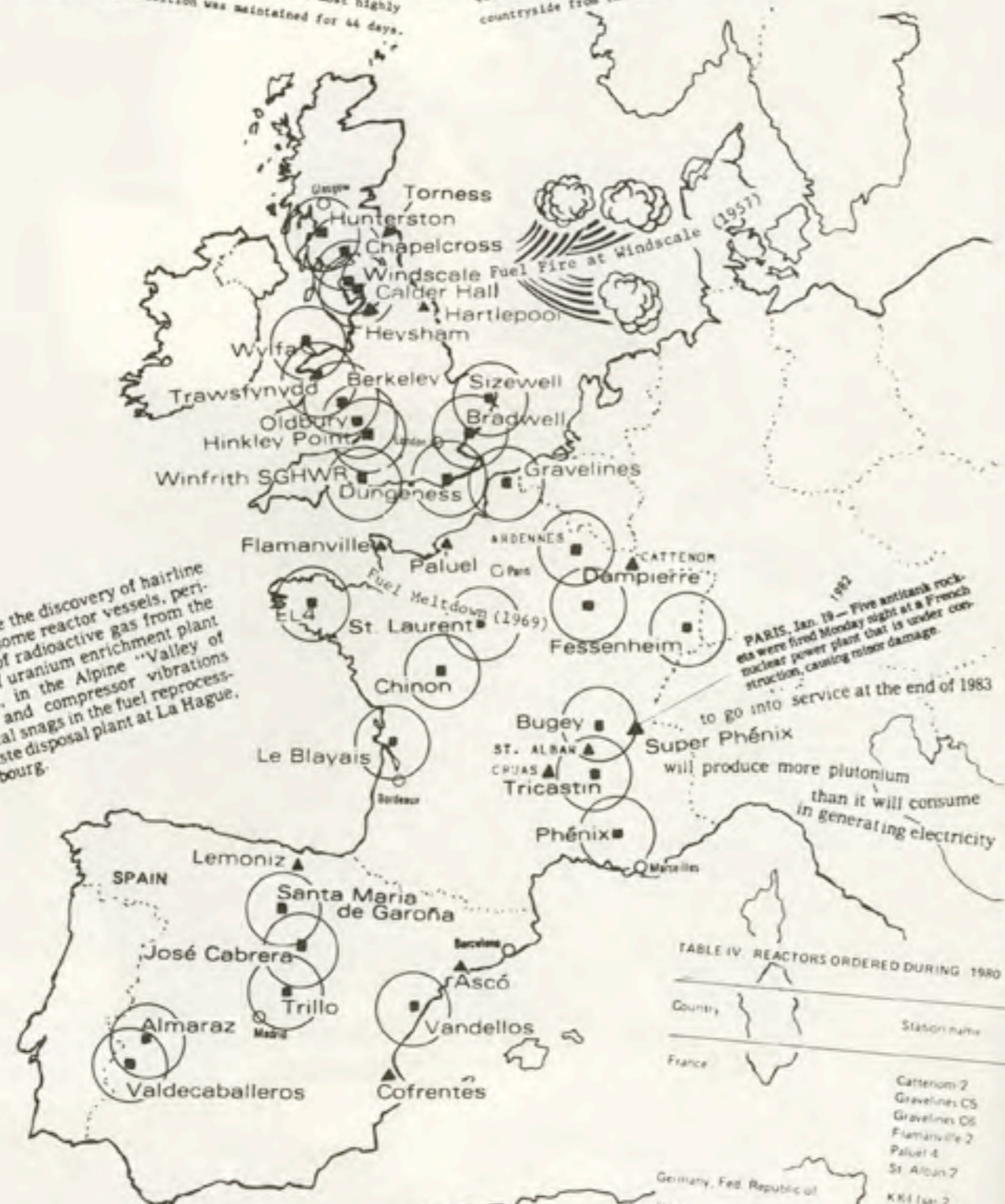
**Health & Fitness**



- Thrilling Adventure
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Radiochemical analysis of milk taken over a larger area at a later date showed that the ban on milk distribution had to be extended to a total area of about 200 sq miles, beginning 2 or 3 miles north of the plant and extending over a strip 7 to 10 miles wide to a distance of about 30 miles south of the plant. The use of milk by the population in the restricted area was prohibited for 25 days; for the most highly contaminated locations, this prohibition was maintained for 44 days.

The reactor was ruined, and there had been widespread release of volatile radioactivity, primarily iodine and noble gases. Over a period of many hours and under varying meteorological conditions, an estimated 20,000 Ci of I131 was released into the atmosphere of the countryside from the 405-ft stack.



These include the discovery of hairline cracks inside some reactor vessels, periodic escapes of radioactive gas from the large Eurodif uranium enrichment plant at Tricastin, in the Alpine "Valley of Reactors," and compressor vibrations and technical snags in the fuel reprocessing and waste disposal plant at La Hague, near Cherbourg.

PARIS, Jan. 19 — Five antitank rockets were fired Monday night at a French nuclear power plant that is under construction, causing minor damage.

TABLE IV. REACTORS ORDERED DURING 1980

Country	Station name
France	Cattenom 2
	Gravelines CS
	Gravelines CS
	Fliamanville 2
	Paluel 4
Germany, Fed. Republic	St. Alban 2
	KRI Isar 2
Japan	Fukushima II 3
	Fukushima II 4
	Takahama 3
	Takahama 4
Korea Republic	Korea 9
	Korea 10
Romania	Romania 2
United Kingdom	Suezell B
	Heysham B

MADRID, Feb. 17 — Spain's largest private utility company has announced that it will suspend work on a nearly completed nuclear power plant outside Bilbao, which has been attacked by Basque terrorists. If the Government does not resolve its dispute with Basque home-rule authorities over control of the project.

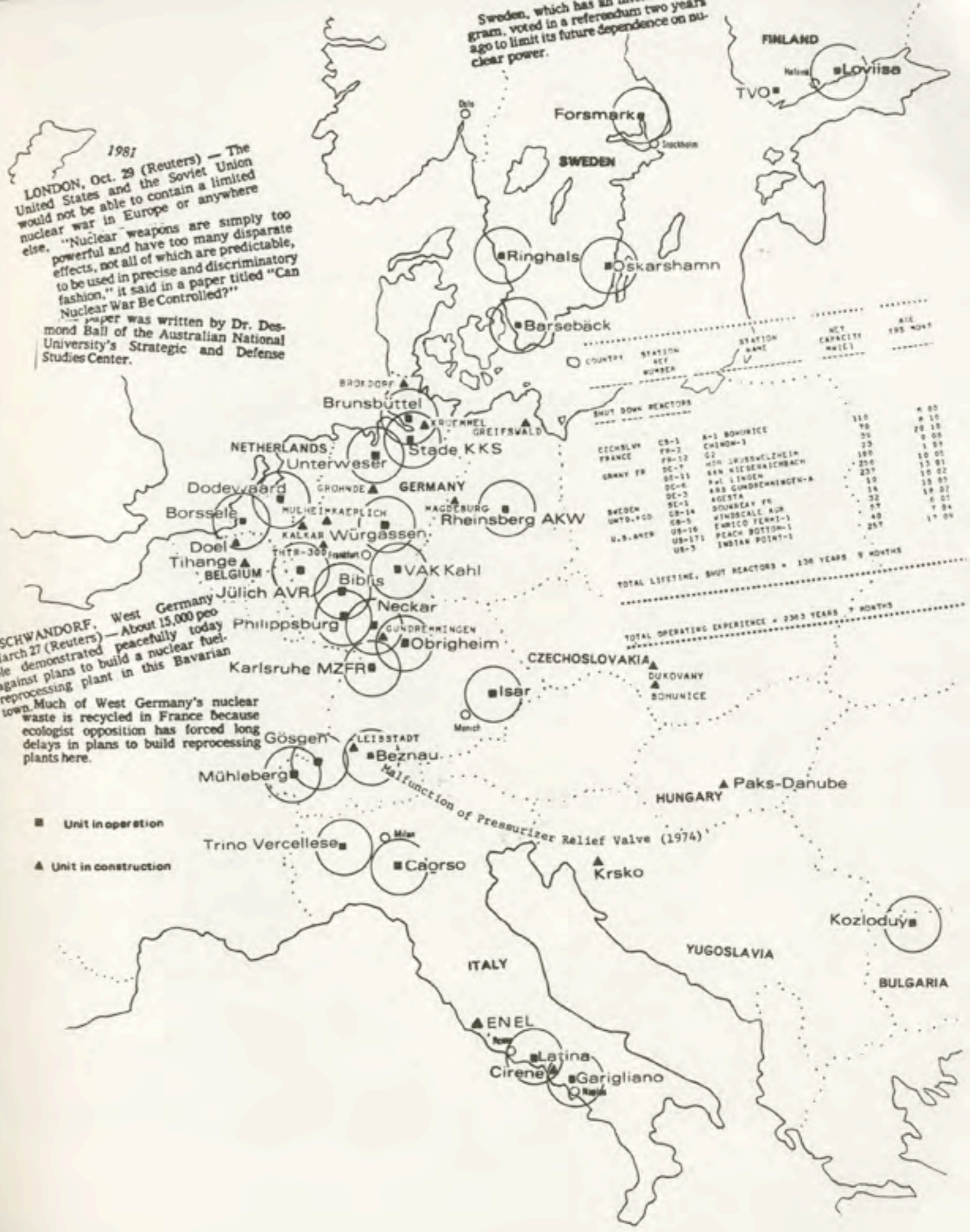
1983

1981  
LONDON, Oct. 29 (Reuters) — The United States and the Soviet Union would not be able to contain a limited nuclear war in Europe or anywhere else. "Nuclear weapons are simply too powerful and have too many disparate effects, not all of which are predictable, to be used in precise and discriminatory fashion," it said in a paper titled "Can Nuclear War Be Controlled?"

The paper was written by Dr. Desmond Ball of the Australian National University's Strategic and Defense Studies Center.

SCHWANDORF, West Germany (Reuters) — About 15,000 people demonstrated peacefully today against plans to build a nuclear fuel-reprocessing plant in this Bavarian town. Much of West Germany's nuclear waste is recycled in France because ecologist opposition has forced long delays in plans to build reprocessing plants here.

- Unit in operation
- ▲ Unit in construction



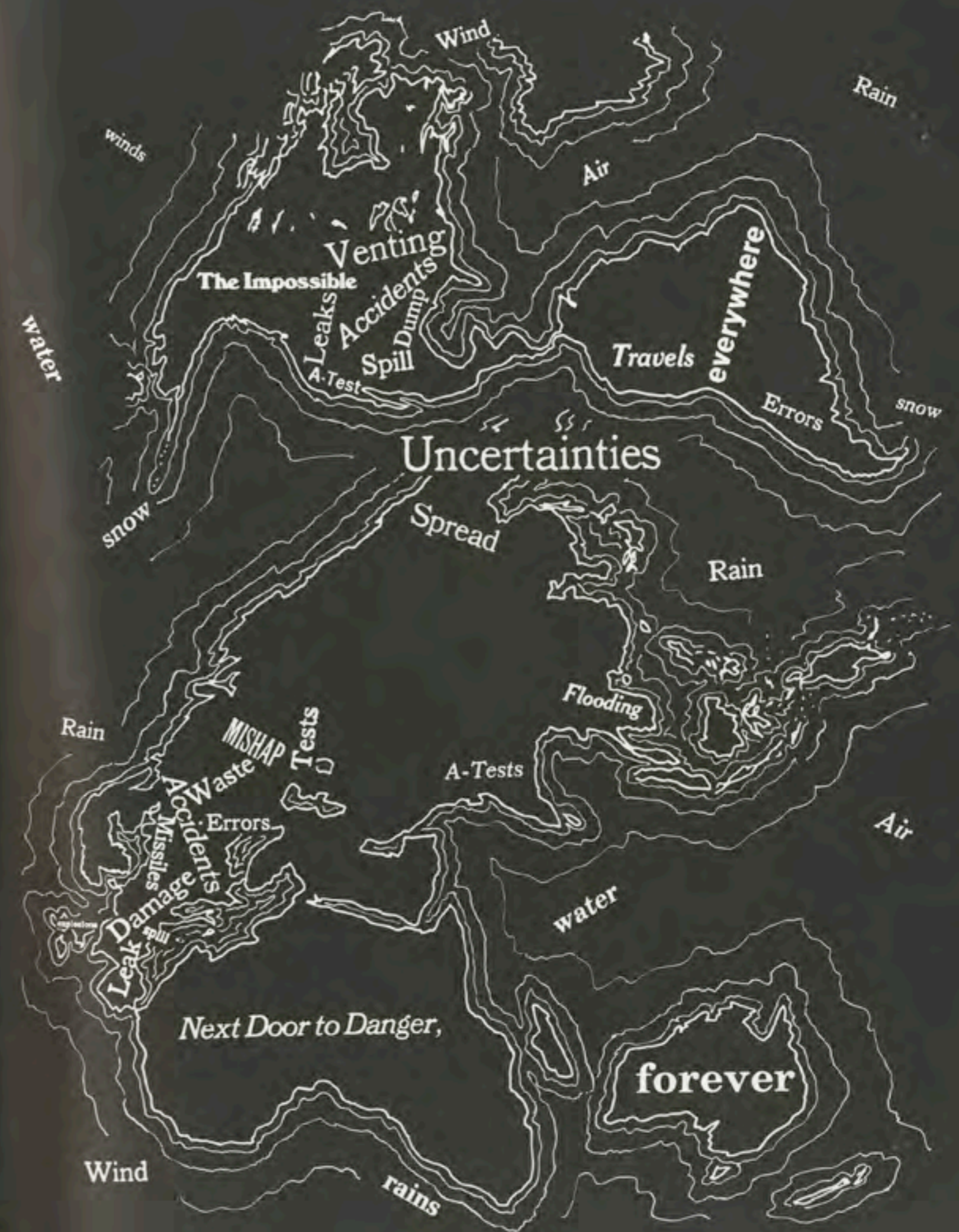
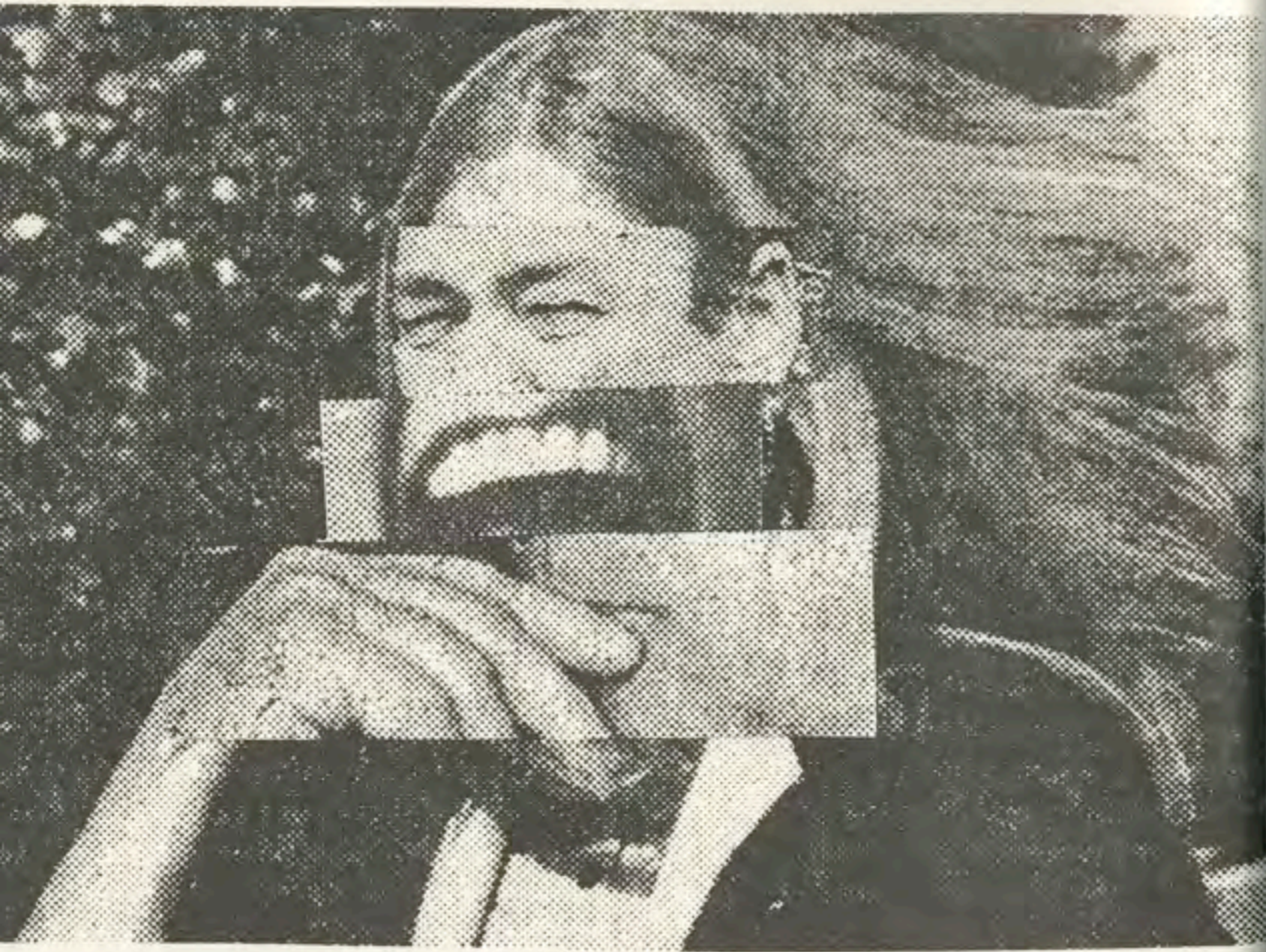
Sweden, which has an atomic program, voted in a referendum two years ago to limit its future dependence on nuclear power.

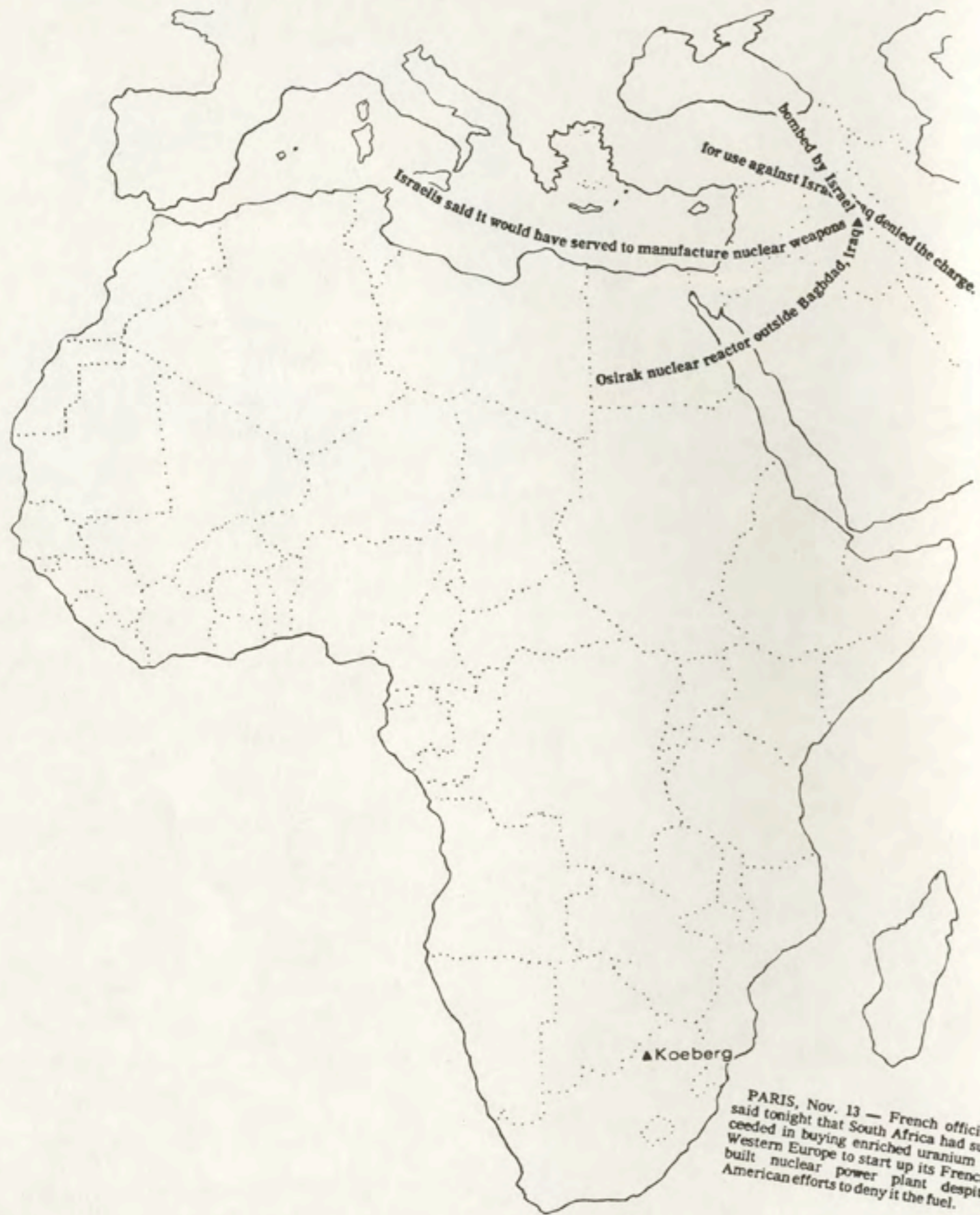
COUNTRY	STATION NAME	STATION NET NUMBER	NET CAPACITY MW(e)	AGE 1983 MONTH
NETHERLANDS	Borssele	1	110	4 00
	Dordrecht	2	110	4 10
FRANCE	Chinon	1	90	28 10
	St. Laurent	2	90	8 00
GERMANY	Stade KKS	1	23	1 00
	Würgassen	2	100	10 00
ITALY	Garigliano	1	237	15 01
	Cirene	2	10	10 00
SPAIN	Valdecaballeros	1	14	10 00
	Trillo	2	32	6 00
USSR	Chernobyl	1	1000	1 00
	Ukrainian	2	1000	1 00

TOTAL LIFETIME, SHUT REACTORS = 136 YEARS 9 MONTHS

TOTAL OPERATING EXPERIENCE = 2363 YEARS 7 MONTHS

Malfunction of Pressurizer Relief Valve (1974)







**Hiroshima Mayor Bids Tokyo Bar Atom Weapons**

Periodic checkups that are still being done on those exposed to atomic bomb radiation show that "an irreversible injury" remains in cells, tissues and organs, leading to such blood disorders as leukemia, multiple myeloma, malignant lymphoma and others "related to exposure to the atomic bomb."

The incidence and the degree of severity of eye damage, called "atomic bomb cataracts," ran parallel to the radiation doses. The longer the exposure and the closer the victim was to the point of detonation, the greater the development of cataracts years after the bombing.

Children who were subjected to radiation while still in the womb were compared to nonexposed children. In those exposed to radiation, "stature, weight, girth of chest, breadth of shoulders" were smaller than standard measurements. Small bodies and heads were prevalent, and some children were "emotionally and intellectually retarded" into adulthood.

accused the "major nuclear powers," without naming the United States, of sharing a Japanese view that Pacific islanders, because there are so few of them, are expendable.

# Islanders Fight Japan's Plan to Dump Atom Waste

to dump radioactive waste from their 21 nuclear reactors into the Pacific north of the Mariana Islands



WASHINGTON, Nov. 10 — Department of Energy officials said today that President Reagan had decided to offer Australia access to highly classified uranium centrifuge technology to enrich uranium, technology that until now has not been shared with foreign governments.

Lucas Heights Research Reactor

French Government's nuclear test program and has released untold amounts of radioactive waste into the Pacific

On Thursday, scientists in New Zealand reported that the French had detonated two more underground blasts at the atoll in the Pacific.

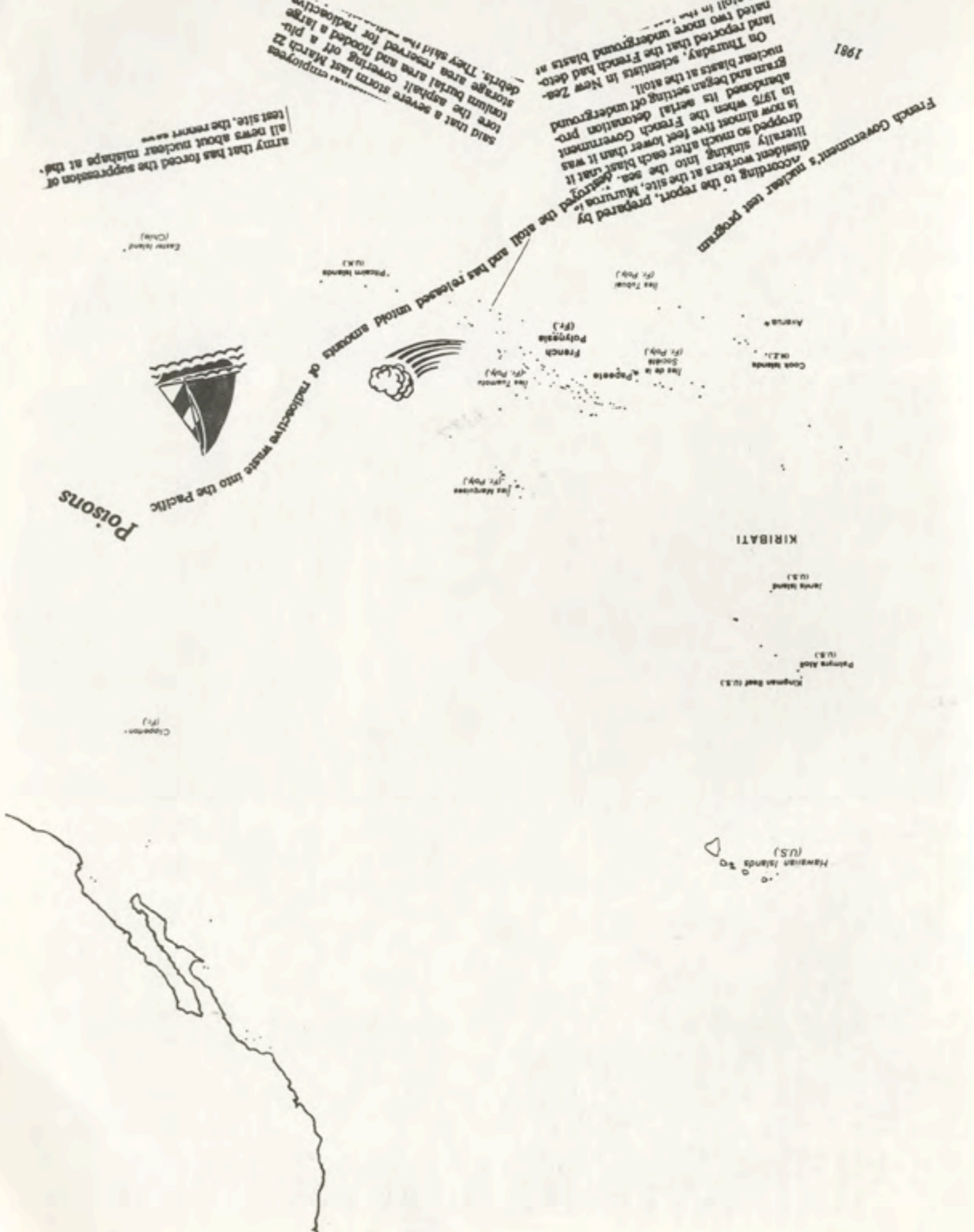
land reported that the French had detonated nuclear blasts at the atoll.

abandoned its serial detonation program and began setting off underground blasts in 1975 when the French Government dropped so much after each blast that it literally sinking into the sea.

disaster workers at the site, Mururoa, according to the report, prepared by

all news about nuclear maps at the array that has forced the suppression of test site, the report says

said that a severe storm last March 22 tore the asphalt covering of a plutonium burial area and flooded a large storage area reserved for radioactive debris. They said the debris was



1981

Dead  
End



Voice Anger



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Edition of 500

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