



# Don't Plan to Die

*How much do you really know about nuclear war?*

DO YOU BELIEVE that a nuclear war between the United States and the Soviet Union would destroy all life on earth?

That the world would be seared to a crisp and the air, water, and land radioactively poisoned forever? Do you believe that we now have bombs that can incinerate half a continent at a time and that the survivors of a nuclear war would become

BY  
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unrecognizable mutants, doomed to roam forever in a totally devastated world? Do you think a nuclear war would be over in a matter of minutes—or hours, at the most? Have you heard that any survivors would be doomed anyway by massive outbreaks of leukemia and cancer in ensuing years? Is it obvious to you that there is no point in preparing to

survive a third world war?

If you said yes to any of these questions, you'd better sit down and read this article. Otherwise, the things you *think* you know about nuclear war may one day kill you—and your family and friends. Whether or not to prepare for a nuclear war is literally a life-or-death decision. You can make this decision based on the popular images of total annihilation, or you can get the facts.

My first exposure to scientific information on nuclear warfare occurred several years ago when I was a graduate student in ecology working in Montana. Since my research was located near Minuteman missile silos, I began to wonder about the ecological consequences of a Soviet nuclear attack on Montana's 200 silos. Of course I *knew* that a nuclear war would exterminate the human race, but in a spirit of scientific curiosity I decided to look into what the war would do to the rest of the natural world.

Our university library was a federal government depository, and I was astounded to discover the wealth of nuclear war material available to even the most casual reader, including details on the construction of the warheads in some cases. One book that was especially helpful was *The Effects of Nuclear Weapons*, edited by Samuel Glasstone and published by the Departments of Energy and Defense (latest revision in 1977). This book, available at any large library, contains the exact scientific details of the effects of nuclear explosions, with abundant technical details, photographs, and even a circular slide rule for calculating the range of damage for various sizes of bombs.

I read this book closely along with many other scientific publications about nuclear war, and I made a very disturbing discovery. *The stories I had always believed about a nuclear war exterminating the human race were not true!* They weren't even nearly true. A nuclear war would be survivable, I learned. In fact, an informed and prepared family could come very close to achieving a 100 percent probability of long-term survival.

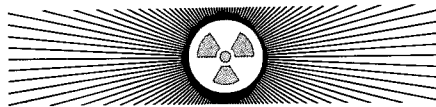
Through my library research, though, I also discovered that, in addition to the scientific literature about nuclear war, there was abundant nonscientific literature. And the nonscientific books (usually antinuclear books) made very little mention of the scientific papers at all. Frequently, the information in these books was substantially in error, and the errors *always* pointed to the conclusion that the human race could not survive a war. In fact, the few cases I discovered in which the antinuclear books did mention scientific studies, there was usually a

severe distortion or even an outright reversal of the information in the scientific sources.

I became deeply interested in the exact preparations that an individual or small group would have to make to enhance their survivability in the event of a nuclear attack, and my efforts to track down this information inevitably involved me in a close examination of the "no survivors" myths. I looked into them very carefully because I wanted to be sure that I wasn't overlooking even remote dangers to my family. All of this led me to write an article setting out the real effects of a nuclear attack on this country, compared to some of the more lurid stories that are being circulated about the impending extermination of our species.

Jonathan Schell's recent bestseller, *The Fate of the Earth* (Knopf, 1982), is but the latest in a series of antinuclear books putting forth the "no survivors" thesis. Schell was preceded by several years by Dr. Helen Caldicott, a pediatrician who wrote a popular book called *Nuclear Madness* (Autumn Press, 1978; Bantam Books, 1980); she remains a frequent lecturer on the subject. Caldicott is one of the central figures in a Boston-based group, Physicians for Social Responsibility, which has been spreading some substantially inaccurate information about nuclear weapons and nuclear war.

The tragedy is that such misleading information greatly hampers efforts to prepare the nation, or even individual families, to meet the challenges of a postwar period. The true horrors of a nuclear war need not be exaggerated to justify taking every plausible step to prevent such a war. When they *are* exaggerated, people become convinced that survival is impossible and will not make survival preparations. Because of the myths about nuclear war, these misled believers might very well die in a war or its aftermath even though they could have been saved.



When discussing the myths of nuclear war I often take a general approach, citing widespread rumors that the public erroneously believes to be the truth about nuclear conflict. I have found, though, that Dr. Caldicott's *Nuclear Madness* is a prime example of the misleading stories in actual use, so I am focusing on some of her claims to show that much of what people believe about the effects of nuclear weapons is a collection of falsehoods and exaggerations.

There are, for example, myths about the duration of a nuclear war. Most people have the idea that World War III would be a "spasm" war, lasting barely long enough for the missiles to make one round trip between the continents.

*A full-scale nuclear confrontation could last about 30 to 60 minutes from beginning to end.*

—Caldicott, p. 63\*

Although this kind of sudden-death scenario is one that many free-world planners have used for their studies, it has a fatal flaw. *The Soviets don't believe in it.* Their military manuals and journals clearly portray the nuclear missile and bomber exchange as only the first phase of the war; in fact, they call it "the nuclear battle" rather than "the nuclear war." They envision a subsequent conventional war for world domination lasting for years after the initial exchange of missiles.

Then there are myths involving the size of the bombs. I do not wish to minimize the destructive potential of the nuclear warheads in the world's arsenals. Many people believe, however, that the bombs are big enough to destroy entire cities, or even continents, in a single explosion.

*A 1,000-megaton device exploded in outer space could devastate an area the size of six western states.*

—Caldicott, p. 65

This impressive picture does not square with the facts. First of all, *there aren't any 1,000-megaton bombs.* There probably aren't any 100-megaton bombs, either, although Khrushchev did once boast that Soviet scientists had built one. The largest bomb ever tested was between 50 and 60 megatons, and the largest warheads currently in service are in the 20- to 25-megaton range. Most of the Soviet warheads aimed at this country are in the 1-megaton class, and most of the warheads that we have aimed at the Soviets are about one-fifth megaton or less.

But since Dr. Caldicott brought it up, what would be the effects of a hypothetical 1,000-megaton bomb "exploded in outer space"? The blast wave theoretically would be able to cause significant damage to houses about 100 miles away. Of course, if the bomb were detonated in outer space it wouldn't produce a blast wave at all, but there would be radiated heat.

The heat from this imaginary bomb would be capable of igniting dry grass, dry pine needles, and similar materials to

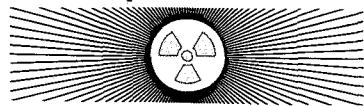
\*Excerpts from *Nuclear Madness*, copyright © 1978 by Helen M. Caldicott. Brookline, Mass.: Autumn Press. Excerpted by permission of the publisher.

a radius of 30 to 40 miles or so (it is difficult to be precise because very large bombs do not start fires as effectively as small ones). Exposed people who did not dive for cover within 5 to 15 seconds could receive a first-degree skin burn as far as 85 miles away. An "outer space" burst, though, really ought to be at least 100 miles above the ground, and dry grass, pine needles, and so forth would not be up there in orbit with it. In short, even if a 1,000-megaton bomb did exist, it would be big enough to devastate a typical county but not "six western states" and not if detonated in outer space.

Dr. Caldicott's 1,000-megaton mistake is probably due to a very common misunderstanding about the size of nuclear weapons. It is usually phrased something like this: "The Hiroshima bomb started fires two miles from the hypocenter. Today we have bombs a thousand times bigger than that." The implication, of course, is that today's bombs would start fires 2,000 miles away. But it doesn't work that way.

The fact is that the radius of bomb damage does not increase in proportion to the megatonnage of the bomb. Specifically, every time you multiply the size of the bomb by 10, you multiply the danger radius by a factor of 2. So a 10-megaton bomb is only twice as dangerous as a 1-megaton bomb. If there were any 100-megaton bombs, they would be only 4 times as dangerous as a 1-megaton bomb; a 1,000-megaton bomb would be only 8 times as dangerous.

This is why there aren't any really big bombs. A single 100-megaton bomb couldn't do nearly as much damage as 100 1-megaton bombs. And continent-busting bombs are simply out of the question.



There are, however, lots of small bombs in the world's nuclear arsenal, and this brings up some of the most pervasive myths about nuclear weapons, having to do with "overkill."

*The world's major military powers have built tens of thousands of atomic bombs powerful enough to kill the world's inhabitants several times over.*

—Caldicott, p. 8

*The United States and the Soviet Union already have enough firepower in their*

*arsenals to destroy every city on earth seven times over.*

—Caldicott, p. 67

Cresson Kearny, a gifted civil-defense researcher formerly at Oak Ridge National Laboratory, pointed out in his *Nuclear War Survival Skills* that statements like these tend to be exercises in sleight-of-hand with statistics. Usually the calculations involve such erroneous steps as looking at the Hiroshima experience to determine an average number of casualties per kiloton and then multiplying this casualty figure by the total number of kilotons in the arsenals of the world.

The deaths at Hiroshima amounted to about 70,000 persons, give or take a little depending on your definition of bomb-related deaths. The bomb was about 12.5 kilotons in size, which gives us a casualty rate of 5,600 per kiloton. A good-sized nuclear war by modern standards would involve about 10,000 megatons, which is 10 million kilotons. By multiplication, the current nuclear arsenal could kill 56 billion people, or many, many times the current world population.

What's wrong with this calculation? Many things. First, big modern warheads are not as efficient in producing casualties as were the smaller bombs used at the end of World War II. (There isn't as much kill per kiloton, so to

speak.) To put it bluntly, once a bomb kills someone, using a bigger explosion to throw his lifeless body another 50 yards down the street doesn't make him any more dead. The estimate of 5,600 deaths per kiloton is inapplicable to today's megaton warheads.

Then, as Kearny points out, there is the unstated assumption that it would somehow be possible to gather all the people of the world into circular crowds approximating the population of downtown Hiroshima and then to drop a bomb on each crowd. It would be a remarkable feat to persuade the world's population to go along with such a plan. The point is that, even if there is enough theoretical "firepower" available to kill us all, as a practical matter the arsenals are only big enough to kill about half of the population of either warring country. For one thing, the warheads are mainly aimed at one another. The first act of World War III would be the commitment of nearly half of the world's arsenal to the immediate destruction of the other half!

Here's a slightly different version of this myth:

*Between them the United States and the Soviet Union, alone, have deployed over 50,000 nuclear bombs which stand ready to exterminate virtually all life on earth.*

—Caldicott, p. 61



I could quibble about the survival of radiation-resistant organisms like grasshoppers and crabgrass, but it is more to the point to mention *Long-Term World-Wide Effects of Multiple Nuclear Weapons Detonations*, a 1975 study by the National Academy of Sciences. This report estimated that the total radiation dose received by citizens in nonwarring countries in the 30 years following a war would be on the order of 10 rems.

It takes at least 150 rems of radiation exposure within a few days to threaten the life of a healthy human being. Except for a slight rise in the cancer rate, a 10-rem dose over 30 years is trivial. Since a war could not possibly kill off even the relatively susceptible human population, the extermination of "all life" is a little hard to envision.



Exaggerated claims about the effect on civilization are also widespread. Statements like this are typical:

*A war fought with nuclear weapons would put an end to civilization as we know it.*

—Caldicott, p. 61

It is probably quite true that a nuclear war would severely disrupt, perhaps destroy, the economic and social structure of the United States and western Europe. It is possible that it would also destroy the national structure of the Soviet Union, but that is less likely. (In some areas of Russia, for instance, the standard of living is so low that a nuclear war could do little to make it worse.)

It is very narrow of us, however, to state so blatantly that the destruction of the United States and western Europe would be the end of *civilization*. The people of Canada, Australia, New Zealand, and South Africa (to name only English-speaking countries) might not view our demise with such total despair. The Chinese would not miss us at all! Civilization is not confined within the borders of the United States, nor within English-speaking countries, and it will not vanish just because our cities have been badly used. Don't worry about civilization. Concentrate on staying alive to enjoy it.

In reality, even a very severe nuclear war that would kill half or more of the population of the warring countries would be expected to have little direct impact on the population of the rest of

# How to Be a Survivor

How can you increase the odds that you and your family would be among those surviving a nuclear attack on the United States?

To begin with, don't depend on the government to help you. After years of virtually ignoring civil defense, the feds are suddenly interested again. But the main focus of government activity—"crisis relocation"—is a nonstarter. Mass evacuation of city populations to unwilling host communities is impractical for a variety of reasons and, in any event, is unlikely to get through Congress. Unfortunately, its defeat will tend to discredit the whole concept of civil defense, which will be tragic.

What can you do on your own? Your basic need is solid, useful information on what will happen and what you can do to protect yourself. A basic reference work is *The Effects of Nuclear War* by the congressional Office of Technology Assessment (\$5.00, Government Printing Office, Washington, DC 20510). This tells you in detail about blast and radiation effects, fallout patterns, and so on.

There are two essential works explaining basic methods of *self-help* civil defense—how to build simple, low-cost, improvised shelters and radiation detectors, what to do about food and water, emergency medical techniques, and the like. One is *Nuclear War*

*Survival Skills* by Cresson H. Kearny (\$9.95, available from Nuclear War Survival Bureau, Box 1144, Coos Bay, OR 97420, or from Caroline House Publishers, 920 W. Industrial Drive, Aurora, IL 60506; the latter takes credit card telephone orders at (312) 897-2050). Kearny, a civil engineer, developed these techniques while at Oak Ridge National Laboratory in the early 1970s. Many of the ideas are based on Soviet civil-defense manuals, hundreds of thousands of which have been distributed throughout the USSR. The other basic self-help book is Dr. Clayton's own *Life after Doomsday* (\$19.95, Paladin Press, Box 1307, Boulder, CO 80306).

In addition, there are several periodicals that provide a wealth of relevant information. The newest of these is *Survive* (\$12/year, 5735 Arapahoe Ave., Boulder, CO 80303), started last year. Regular contributors include Clayton, Jerry Pournelle, and Nancy Tappan. A British-based counterpart is *Protect & Survive Monthly* (\$30/year, available in this country from Ark Enterprises, Box 1164, Fairborn, OH 45324). On a more technical level, there's the bimonthly *Journal of Civil Defense*, whose contributors include Drs. Edward Teller, Eugene Wigner, and Leon Goure (\$12/year, Box 910, Starke, FL 32091).

—R. P.

the world. The nations of the Southern Hemisphere and many Northern Hemisphere countries as well would emerge essentially untouched by direct weapons effects. There would be some rather substantial economic and social readjustments to be made, of course, especially if the Soviets were to succeed in launching their projected war of conquest following the nuclear exchange.

Another myth—of unprecedented destruction—shows dramatic historical myopia:

*The detonation of a single weapon of this nature over any of the world's major cities would constitute a disaster unprecedented in human history.*

—Caldicott, p. 62

On a qualitative basis, one recalls that the Black Death of the 15th century killed 25 percent of the population of the then-known world, but a very severe nuclear war threatens about 5 percent of today's world population. And this passage refers to only *one bomb*! On the quantitative side, the 25 million Russians who starved to death in the early 1920s deserve at least a nod. Then there were the volcanic eruptions at Pompeii and St.

Pierre that killed almost everyone in these cities. The Romans, and later the Crusaders, were not above leveling conquered cities (so that no two stones remained together) and putting *all* of the defeated inhabitants to death. Neither a nuclear bomb nor a volcano can deal out death and destruction that thoroughly. Let's pause, too, and remember the millions of innocent people who got in the way of Hitler and the Nazis. *Unprecedented* isn't really the right word.

It should also be noted that a single bomb would destroy only a small part of one of "the world's major cities." As big as the bombs are, the cities are far larger. Civil defense experts anticipate that a Soviet attack on the Los Angeles area, for instance, could involve as many as 40 scattered one-megaton warheads. Even this saturation attack could be expected to leave a substantial proportion of the residents alive in pockets of the city that were not badly hit.

But the idea that cities would even be a prime target is itself a myth. Many people still picture a nuclear war as an exercise in "mutual assured destruction," in which the warheads would be aimed at

major population centers.

*Every American city with a population of 25,000 or more is targeted... Both major and minor population centers would be smashed flat.*

—Caldicott, p. 65

There was a time when the missiles had to be aimed at cities because their guidance systems were not reliable enough to hit targets less than several miles across, but that time has passed. Today's warheads can all hit within a few hundred yards of the target, and some of them can literally crash on the lid of an enemy silo after 6,000 miles in flight. Big, "soft" city targets are no longer in vogue.

With the publication of *Soviet Strategy for Nuclear War* by the Hoover Institution at Stanford University, we now have a much better idea of the targets that the Soviets are likely to attack. Drawing on Soviet documents, the authors of this study show that major population centers as such are not on the list, although many of them would receive damage because of their proximity to other targets.

The Soviet targeting doctrine (and the US doctrine as well) places primary emphasis on destroying the other side's strategic weapons. In our case, this means that the first targets the Soviets would engage would be our Strategic Air Command bomber bases, Minuteman and Titan missile complexes, and our missile submarines both at sea and in port.

The second priority appears to be military bases of *all types*. In this category we might well include all civilian airfields capable of handling jet aircraft. (From the Soviet point of view, a TWA Boeing 707 is just a C-135 troop transport with a flashy paint job.)

The third target priority is our electrical generating plants, including nuclear power plants, conventional gas- or coal-fired plants, and hydroelectric dams. After these comes a long list of government centers, industrial facilities, mines, transportation centers, and other targets reminiscent of World War II strategic bombing policies.

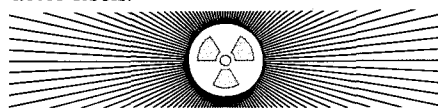
Many people are particularly worried about nuclear power reactors being struck by nuclear warheads. Often, the mode of discussion in popular anti-nuclear forums is to ask a few rhetorical questions and hint that the answers are obvious. The facts, however, tell a different story. (See Carsten Haaland's "Reactor Targeting: How Much Fallout?" *Journal of Civil Defense*, Oct. 1980.)

First of all, it is impossible to get a thermonuclear explosion out of a reactor by any means whatsoever. It just isn't

built for it. Even a nuclear warhead cannot be detonated by another exploding warhead. Uranium and plutonium are not shock-sensitive like chemical explosives are.

But, could an enemy warhead smash open a reactor and throw radioactive material in all directions? It *could* happen, but most people overlook the fact that our nuclear power plants have been built within "containment" buildings whose walls are made of several inches of steel plate within several feet of reinforced concrete. The reactor itself is also encased in a similar steel and concrete capsule.

Our precautions against a runaway reactor have inadvertently made these power plants among the "hardest" targets in the nation. It would be far easier for the Soviets to use a normal warhead to smash the peripheral facilities, putting the plant out of business, than it would be for them to use one of their expensive new silo-busting warheads just to break through to the reactor itself.



Firestorms are the subject of another myth about nuclear weapons. Here is the popular image:

*Each weapon's powerful shock wave would be accompanied by a searing fireball with a surface temperature greater than the sun's that would set firestorms raging over millions of acres... Every 20-megaton bomb can set a firestorm raging over 3000 acres.*

—Caldicott, p. 65

Notice first the remarkable internal contradiction in asserting that "each" weapon can incinerate "millions of acres," then asserting that each 20-megaton (largest available) weapon can set fire to 3,000 acres. But there are some other distinctly misleading ideas in this passage.

Let's look at those "acres": Three thousand acres is actually a little over 4.5 square miles, the area contained within a circle a little over a mile in radius. To put this in perspective, damage to lightly constructed houses can occur as far as 36 miles from a 20-megaton explosion. That means that the 3,000 acres is not a very big part of the total area devastated by the bomb and that most of the people caught within Dr. Caldicott's "firestorm" would almost certainly be dead or doomed by other factors anyway.

There is another difficulty here. US military and civil-defense planners tend not to be concerned about firestorms in this country. Modern cities are con-

structed largely of concrete, steel, glass, masonry, asphalt, marble, plasterboard, and similar materials. Although elements of the rubble from a modern city would certainly catch fire and burn, the special conditions necessary for the development of a true firestorm would be rare.

Firestorms are not an automatic result of nuclear explosions. There was no firestorm at Hiroshima or Nagasaki.

A related fear is of a wall of fire. Years ago, when the first hydrogen (thermonuclear) warheads were about to be tested in the South Pacific, some people speculated that the hydrogen in the warhead would "ignite" the hydrogen in the seawater and air, creating a self-propagating flame front which, they predicted, would sear all life from the surface of the planet. The bombs were set off and failed to exterminate us, but this failure did not exterminate the rumor.

Today no one seriously suggests that nuclear explosions will propagate through the atmosphere and envelop the planet with flaming gases, but there still lingers a miniature version of this myth called the "wall of fire." One example of it is embodied in Robert Merle's novel, *Malevil*, in which a single nuclear weapon exploded over Paris emits an expanding sphere of superheated gas that instantly cremates the entire population of France, leaving nothing but flakes of charred bone behind. I have seen this image discussed seriously in some nuclear-war survival manuals.

The imaginary "wall of fire" is a confused combination of three different nuclear-weapon effects. One of these is the *blast wave*, which spreads out from the center of the explosion like a ripple in a pond, crushing and knocking over buildings and other structures. The second effect is the *thermal pulse*, which is a few seconds of extremely bright light—bright enough to char or temporarily ignite the surface of exposed objects up to 10 or more miles away.

The third effect is the *fireball* itself, a bubble of incandescent gases that forms in the immediate vicinity of the exploding bomb. (The glowing fireball radiates the light that forms the thermal pulse.) A megaton-range fireball is about half a mile to a mile in radius, so even if it is actually in contact with the ground, it contributes little to the destructive effect of the explosion.

When a bomb explodes, the relatively small fireball quickly begins to rise into the air like a hot-air balloon. During the first 5 to 10 seconds, the heat and light radiated by the fireball shine on everything within several miles, scorching exposed surfaces and starting fires. The

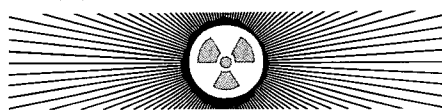
blast wave moves out much more slowly, taking two or three minutes to spread to the limit of its destructive radius.

The "wall of fire" misconception occurs when it is assumed that the fires started by a nuclear explosion must result from actual physical contact with the fireball itself, rather than by radiated heat, as is actually the case. It is only a short jump to the conclusion that, as Caldicott says, "each weapon's powerful shock wave would be *accompanied by a searing fireball*" (emphasis added). This is not the case at all. First there is a searing light; then there is a spreading shock wave. Except for the relatively small fireball itself, there is no expanding ball or wall of fire.

About that searing light: One of the best survival novels I know is *The Day of the Triffids*, by John Wyndham. The main calamity involves a secret weapon that backfires and blinds virtually everyone in the world. Many uninformed people believe stories predicting that this would happen to us in a nuclear attack.

The flash from a nuclear explosion is so bright that persons caught in it sometimes suffer from dazzlement for a period of several minutes. Even in severe cases, the effect is temporary, and there would be plenty of survivors who were indoors at the time and whose vision would be totally unimpaired.

Actual damage to the retina of the eye can also occur. If the victim were looking at the sky in the direction of the bomb at the instant of the explosion, the intense image of the fireball would burn a spot on the retina. Even in this case, however, the result would not be blindness, but slight, though permanent, vision impairment from a tiny spot of retinal scar tissue. This effect gets a lot of attention from antinuclear spokesmen because the retinal-spot burn can occur over 200 miles away under ideal conditions—but those are rare.



Some of the more pernicious myths about a nuclear war state that even if survival itself were possible, the survivors would eventually be wiped out by radiation-induced cancers. This story attains its greatest credibility when spread by physicians, who ought to know better.

*The long-term fallout effects in the countries bombed would give rise to other epidemics. Within five years, leukemia would be rampant. Within 15 to 50 years, solid cancers of the lung, breast, bowel, stomach, and thyroid would strike down survivors.*

—Caldicott, p. 66

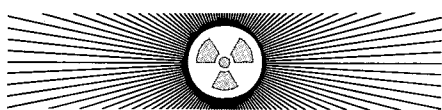
What does this passage say, exactly? Would all survivors be struck down, or only a few? What does it mean to say that leukemia would be "rampant"? Are we talking about the *long-term effects* of fallout or the effects of *long-term fallout*?

Long-term fallout is a very fine dust suspended in the atmosphere as an aerosol. It would slowly sift down to the ground over a period of several years after a war. It would spread itself all over the world more or less evenly, but by the time it reached the ground it wouldn't be very radioactive anymore. This is the source of a 10-rem, 30-year dose mentioned above.

By contrast, the fallout that might be able to cause "rampant" leukemia is *local* fallout, which would come to the ground in the vicinity of the target within the first 24 hours after an explosion. This would not be a worldwide effect and therefore would have little impact on the survival of the human race.

And the local inhabitants? According to Glasstone's *The Effects of Nuclear Weapons*, the experience of the Japanese indicates that there would be a surge of leukemia cases 5 to 10 years after a war, but only among those people who received large doses of radiation and were fortunate enough not to die of radiation sickness. The predicted incidence of leukemia among adults who were exposed to 100 to 200 rems would be between two and four cases per thousand. Surviving severely irradiated children who were under 10 years old at the time of exposure would be twice as susceptible, which means four to eight cases of leukemia per thousand. A leukemia rate approaching 1 percent of the radiation patients would be tragic, but it wouldn't exactly mean the end of our species.

How about those other cancers that would "strike down survivors"? Over the period of 15 to 20 years following the war, the *heavily irradiated* survivors as a group would produce three cases of cancer where we would normally have expected to find only two. In Japan, out of 109,000 A-bomb survivors, only 5,700 were heavily irradiated. Of these, between 1960 and 1970 (15 to 25 years later) a total of 47 had died of cancer, as opposed to an expected cancer death toll of 30.



Other health-related myths center on radiation and genetics. Typically, the claim is either that a nuclear war would make human reproduction impossible or that our children would be severely deformed by the radiation.

*Exposure of the reproductive organs to the immense quantities of radiation in the explosions would result in reproductive sterility in many. An increased incidence of spontaneous abortions and deformed offspring, and a massive increase in both dominant and recessive mutations, would also result. Rendered intensely radioactive, the planet Earth would eventually become inhabited by bands of roving humanoids—mutants barely recognizable as members of our species.*

—Caldicott, p. 66

*Reproductive genes will mutate, resulting in an increased incidence of congenitally deformed and diseased offspring—not just for the next generation, but for the rest of time.*

—Caldicott, p. 3

Dr. Caldicott, a specialist in the genetic diseases of children, is no doubt moved by compassion for her patients. But let's take a closer look at what is known in this area.

According to Glasstone, most of the Japanese victims who were exposed to enough radiation to be rendered sterile did not survive the experience. Of the remaining heavily irradiated and supposedly sterile survivors, some subsequently produced normal children, which indicates that the condition was actually a temporary one.

As for spontaneous abortions, it is important to realize that these unpleasant events are nature's way of *preventing* the birth of malformed infants. Not many people are aware that between 10 percent and 40 percent of all normal pregnancies terminate spontaneously anyway, probably due to developmental abnormalities of the embryo.

What about those unrecognizable mutants roaming the earth? Would this really happen? Would there be substantial genetic damage to the human race? Would the damage be permanent, as Dr. Caldicott indicates? There are four interesting lines of evidence to examine here.

First is the universal observation of biologists, geneticists, and physicians that a fetus that is so deformed as to be *unrecognizable* virtually always dies. (There are exceptions in plant genetics, but they do not concern us here.) An equally universal observation is that a severely deformed (but recognizable) individual who manages to reach sexual maturity usually has a terrible time acquiring a mate and eventually dies without offspring. The establishment of a race of unrecognizable mutants would be quite difficult.

Additional evidence against the likeli-

hood of unrecognizably mutated offspring is to be found in two reports published by the National Academy of Sciences in 1975 and 1977. The first estimated that a 10,000-megaton war would result in significant but temporary damage to the gene pool of our species.

spring of the irradiated survivors. Even that one extra malformed infant did not put in an appearance.

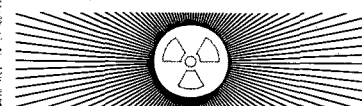
Here's another example of the claim of mutations running riot:

*In the aftermath, bacteria, viruses, and disease-carrying insects—which tend to*

radiation, and probably no point.

A less obvious comment is that the natural evolution of infectious diseases tends to be from more virulent to less virulent forms. Disease organisms are parasites, after all, and it is poor practice for a parasite to kill its host. The residual radiation from a nuclear war could produce new and "extremely virulent" diseases, but it could just as easily result in dangerous disease organisms mutating to *benign* forms. From an evolutionary standpoint, the latter would be more likely.

There is some concrete evidence for this prediction in the work of Soviet geneticists studying native populations of heavily irradiated plants and animals in the region of the 1957 Kyshtym nuclear waste accident in the Urals. Radiation levels there were far in excess of those expected from nuclear war fallout. After the local ecosystems had experienced more than 10 years of severe radiation stress, the geneticists discovered that several species of plants and animals had developed definite signs of genetic mutation and adaptation... toward increased resistance to radiation. The final point, therefore, is that radiation-induced mutations, even if they did occur, would not be all bad and could even be beneficial.



Would the survivors of a nuclear attack be able to continue to survive?

*Those who survived, in shelters or in remote rural areas, would reenter a totally devastated world, lacking the life-support systems on which the human species depends. Food, air and water would be poisonously radioactive.*

—Caldicott, p. 66

I will state for the record, as have countless civil-defense writers before me, that fallout radiation passes harmlessly through air, food, and water without making them radioactive. The only danger would be to eat food with fallout particles on it. Wrapped food would not be contaminated even if there was fallout dust on the wrapper—you'd just need to be careful about how you opened it.

Water from deep wells and surface water from fallout-free areas would be as potable as ever. (Careful—some of it isn't



The report forecast that damaged genes would increase the birth-defect rate and that natural selection would weed out these damaged genes over a period of about 1,000 years. That's quite a while, but not "the rest of time."

The "significant" rise in birth defects predicted by the report was from today's normal rate of 60 per 1,000 births to a postwar peak of 61 per 1,000. Once again, this would be a tragedy for the individuals involved but not a destruction of the genetic integrity of the human race.

The 1977 NAS study was even more reassuring. This was a 30-year follow-up study of the Japanese atom-bomb survivors, which showed among other things that there was *no* abnormal incidence of genetic disease among the off-

*be thousands of times more radio-resistant than human beings— would mutate, adapt and multiply in extremely virulent forms.*

—Caldicott, p. 66

There has been some scientific concern that increased background radiation might produce an increased mutation rate among insects, bacteria, fungi, and viruses, but the concern is more often expressed in terms of our agricultural crops. The rate of mutation and evolution of crop pests is staggeringly high even under normal conditions. Insecticides rarely work for more than a few years before the target insects develop genetic immunity to them, and micro-organisms can become resistant to antibiotics even faster, sometimes in a matter of hours. There is no need to invoke

safe to drink even now.) Fallout cannot make water radioactive, but fallout dust in the water would have to be removed before drinking. Simple straining or settling will catch most of it, and there are simple chemical procedures that will remove most dissolved radioactive chemicals from water, such as filtering it through a bucket of earth. A standard water softener does a good job, too.

This is one area where a little preparation would help, but even people who would have to drink contaminated water wouldn't just curl up their toes from the "poison." Fallout is radioactive, but it is not chemically poisonous like nerve gas.

As for radioactive air—air is already radioactive. Carbon-14 is in the air and in your bones, not to mention everywhere else, and after a nuclear war things wouldn't be much different. During fallout emergencies, it would be a good idea to filter the air you breathed to avoid getting radioactive dust into your lungs and to remove any gaseous radioiodine. A prepared person would have no difficulty dealing with these temporary hazards.

Another concern about survival has to do with the ozone layer. The *ozone layer* is the popular term for the portion of the atmosphere that absorbs most of the ultraviolet (UV) light in sunlight. UV light is the part of the spectrum that causes sunburn and can burn animals and plants as well.

The 1975 National Academy of Sciences study predicted that a nuclear war would produce atmospheric chemical reactions that would deplete the ozone shield by 30 percent to 70 percent, resulting in a possible six-fold increase in the amount of UV at the surface. This quantity of UV, it was calculated, would be enough to give Caucasians a severe sunburn in a few minutes; and many plant species, including some crops, would not be able to withstand it. The report predicted major ecological disruption, with a return to normalcy requiring 30 years, although near normalcy would be realized within 4 or 5 years.

As an ecologist, however, I find somewhat overstated the assertions that high UV would wreak ecological havoc. If the UV threat did in fact materialize—and the whole question of normal and required ozone levels is very much in debate right now—its effects on terrestrial life would be manageable and temporary. High UV levels would be present only during the daylight hours; nights would be normal. Humans could wear protective clothing and stay out of the sun during the middle of the day. Wild animals already confine their activities to the night, early morning, and

early evening when UV levels would not be a problem.

Would high UV make farming impossible? It is true that many crops could not withstand it, but wheat, corn, and rye are not among them. We would have to do without onions for a few years, but the supply of bread and whiskey would not be interrupted—at least not by UV.

As for wild plants, they, too, routinely make use of "refuges." Even though a certain species may grow best on sunny hillsides, a few individuals will almost always be found growing on the shady side of the hill, in the shade of a tree, or in the shade of larger members of the same species. Even if the species as a whole were decimated by overexposure to UV, these refugees would make it through. Lastly, it is not uncommon for seeds to lie dormant in the forest floor for decades, waiting for a forest fire to remove the overstory before they sprout. These seeds, too, would be unaffected by high UV levels. If the ozone layer were depleted by a nuclear attack it would be a wild ride, but things would eventually return more or less to normal.



How many times have you heard somebody say something like this? "I don't have to worry about my family surviving the war. Where we live, we'll be vaporized instantly." Another version goes like this: "I just hope the first bomb drops on me—I don't want to be around to see the aftermath."

The painless, instantaneous death these people long for is another of the myths about nuclear war and may be the worst of all. Thermonuclear explosions kill by inflicting injuries similar to those of a serious automobile accident—impact injuries and severe burns. It is true that there is a zone around the bomb within which we can expect 100 percent casualties; but in an air burst over a city, there is no zone of guaranteed instantaneous death. (Ground bursts with their craters do offer a very small zone of guaranteed instant death, however.)

As an example, at Hiroshima there was a group of Japanese army antiaircraft gunners who were tracking the bomber when the atom bomb exploded almost literally in their faces. It killed them—yet they walked around pleading for help, faceless, blinded, and in agony for more than a day before finally dying.

If you have been taking refuge in the "instant death" myth, consider this: It is true that you might get lucky; a building might fall on you, and your worries would be over. But there is no guarantee

that the same building would also instantly kill your spouse, children, or other relatives. When you decide to make no preparations, hoping for the "first bomb" to fall on you, you may be condemning them to experience the terror and pain of a reality that you will not face now even in imagination.

There are many more nuclear-war doomsday myths, ranging from minor misunderstandings to outright falsehoods. People like me who are vitally interested in nuclear survivalism and in civil defense have investigated every doomsday rumor we have encountered, and they have all turned out to be false or blown far out of proportion to reality.

Why are there so many of these myths? It is true that the effects of nuclear war extend into so many scientific and military disciplines that no one person can hope to be well informed about every detail, and there are many opportunities for honest misunderstandings. But I have come a long and painful way since my early days attending disarmament meetings in college. At first I thought disarmament leaders were noble crusaders. Later I realized that their grasp of nuclear weapons effects was so faulty that they had to be either incompetent or dishonest. I concluded that their zeal to save mankind had outrun their expertise. Then I began to encounter disarmament leaders who were definitely competent and who were definitely lying to their audiences about the contents of the scientific literature in their fields.

I still believe that there are many genuinely concerned Americans participating in the peace movement, especially at the local level. At the national and international level, however, we all too often encounter physicists who promote untruths about physics, retired military men who tell falsehoods about weaponry and strategy, politicians who make apologies for Soviet aggressions and transgressions—and physicians who disseminate misleading apocalypse stories.

It is essential that Americans become aware of the nature and extent of distorted information these people have drummed into our national consciousness during the last decade. Our civil defense programs, national defense programs, and future as a free society may all depend on it. There isn't much time left, but the fact that they are still trying so hard to stop our civil defense efforts means that something can still be done. It's up to us to do it. □

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# BENITO

There were striking parallels between the economic programs of Mussolini and FDR. Were they coincidental?

# FRANKLIN



JANUARY 30TH marked the centennial of the birth of Franklin Delano Roosevelt. Congress, ever ready to honor a fellow statish, held a special celebration two days earlier. A three-hour television extravaganza on FDR and the New Deal, featuring all four living American presidents, was broadcast on January 29.

The Smithsonian Institution has come up with a year-long series of exhibits and symposia commemorating the great man. The public will be inundated with books and articles on the glories of the Roosevelt era for at least the rest of 1982 and probably into 1983, which itself marks the 50th anniversary of the New Deal. Welfare state nostalgia is running strong.

A slightly discordant note was sounded by President Reagan who, in the course of an interview last December, opined that many New Dealers espoused fascism. The *New York Times*, ever-vigilant custodian of liberal mythology, scurried to estab-



## By Donald Feder