

# PEACE DOSSIER 5

## MEDICINE AND NUCLEAR WAR

JOHN ANDREWS, JOHN POWLES and JOHN WARD



*Courtesy of Nicholson and The Age.*

*John Andrews specialises in nuclear medicine; John Powles in social and preventive medicine and John Ward is a specialist physician with a special interest in prevention. All are members of the Australian Branch of the Medical Association for the Prevention of War.*

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## WHY DOCTORS ARE INVOLVED

For the first time, doctors in massive numbers are becoming actively involved in a social issue beyond the usual range of health concerns. In the U.S.A. 17,000 doctors have joined the Physicians for Social Responsibility while in Australia more than 600 joined the Medical Association for the Prevention of War in its first 12 months. Medical organisations from 25 countries have affiliated with the International Physicians for the Prevention of Nuclear War, the joint Chairmen of which are Prof. Bernard Lown of Harvard University and Dr. Yevgeni Chazov, eminent Russian cardiologist and personal physician to the late President Brezhnev.

What has become obvious to thousands of doctors is that the threat of nuclear war is the greatest health hazard the world has ever known. All medical work — whether prevention, therapy or research — will be irrelevant if this issue is not solved. Because changes in strategy and weapons technology have increased the risk of nuclear war there is an urgent need for the full effects of nuclear weapons to be widely understood and for public discussion to be based on factual information. The medical facts when marshalled with all the objectivity possible lead to one inescapable conclusion: if for none other than purely medical reasons, nuclear warfare must never be allowed to happen. The strength of this case is sufficiently apparent to neutralise many of the political preconceptions that often obstruct discussions of war and disarmament. This explains why the message is spreading relatively quickly among doctors.

As well as the risks of large-scale death from nuclear warfare there are also the deaths inescapably caused by the enormous diversion of resources to the arms race. In many developed countries governments are cutting expenditure on health and social services and increasing expenditure on arms. In the U.S., welfare programs that have taken 20 years to develop have been axed while defence expenditure has been increased to \$US230 billion per year. In Australia budgeted federal defence expenditure for 1982/83 exceeds health expenditure by \$232 m. — a reversal of the situation four years previously.

In developing countries 500 million people suffer ill health due to malnutrition while their governments spend up to 30% of their budgets on armaments. The W.H.O. campaign which successfully eradicated smallpox cost the equivalent of four hours of the world expenditure on arms; and less than half a day's expenditure would be sufficient to eradicate malaria. Eight weeks' expenditure on arms could provide enough schools and health services, and enough farm equipment to ensure that all of humanity was adequately fed.

"Nuclear disarmament is the ultimate medical issue of our time because nuclear war will produce the last epidemic the human race will ever know."

Dr. Helen Caldicott, President, Physicians for Social Responsibility, Boston. (Dr. Caldicott is a graduate of the Adelaide University Medical School).

The initial effects in the 'reference case' would be mainly due to intense blast and heat produced by what is equivalent to an explosion of 1,000,000 tons of T.N.T.

Usually some 50% of the energy from a nuclear explosion is released as the shock wave and other blast effects. Total destruction would occur to a radius of over 4 km from ground zero\* for concrete structures and nearly twice as far for wooden buildings. From

\* Counterforce targeting refers to aiming your missiles at the other side's offensive facilities, rather than at cities (See Alan Roberts, "Why We Have a War to Stop", *Peace Dossier* No. 2, April, 1982).

† A bomb bursting at the ground's surface produces a huge crater and vapourises buildings and soil, etc., to produce much radioactive fallout. A bomb bursting in the air, by contrast, produces little cratering and fallout, but more severe blast and heat effect. (See Glasstone and Dolan, *The Effects of Nuclear Weapons*).

‡ Ground zero is the point on the ground at or below the centre of the explosion.

Nuclear attacks on Australia can be envisaged under three circumstances:

- Counterforce\* attacks, on U.S. communication and surveillance bases (Northwest Cape, Pine Gap, Nurrungar) and possibly other naval and air bases.
- Attacks on one or more Australian cities as a step in a process of 'restrained escalation'.
- Attacks on Australian cities during an 'all out' war.

The number of deaths under (i) is likely to be in the thousands due to small surrounding populations. It will not be considered further here.

In *Peace Dossier 4* "Nuclear War: The Threat to Australia" Barrie Pittock has argued that the risks of (ii) and (iii) should not be taken as lightly as they have been by official bodies in Australia. Reference is made to the scenario for an 'all-out' war published in *AMBIO*, the environmental journal of the Royal Swedish Academy of Sciences (See 'Further Reading'). In the *AMBIO* scenario 45% of estimated global megatonnage is used. Thirty-three megatons are dropped on Australia, including 10 megatons on Sydney and 3 on Melbourne.

In this Dossier the potential medical effects of an attack on an Australian city will be illustrated by a 'reference case' of a one-megaton ground burst† on the centre of Melbourne or Sydney.

BOX 1  
BLAST EFFECT  
OF 1 MEGATON SURFACE BURST

Peak over-pressure* (pounds per square inch)	Approximate distance from ground zero (km)	Effects on Buildings	Effects on Population
12	3	most levelled	98% dead; 2% injured.
5-12	5	houses destroyed	50% dead; 40% injured 10% safe.
2-5	10	severe damage to houses	5% dead; 45% injured 50% safe.
1-2	16	windows blown in	25% injured 75% safe.

\* The amount by which the air pressure exceeds its usual value (14.7 pounds per square inch — psi or 10 tonnes per square meter) as the peak of the shock wave passes.

an explosion over the centre of Melbourne, most people living within the area bounded by Brunswick, Key, St. Kilda and Port Melbourne would be expected to die from the blast, burns and radiation. From an explosion over the centre of Sydney most of those living within an area bounded by Woollahra, Kensington, Newtown, Drummoyle, St. Leonards and Mosman would similarly be killed. The number of fatalities would obviously depend on the numbers in the city at the time, and thus the time of day and the day of the week, but up to 500,000 immediate deaths and an equivalent number of injured would be expected.

Blast casualties would be caused by collapsing buildings and people being hurled at solid objects and vice versa. The shock or over-pressure wave would cause such injuries as ruptured lungs and eardrums.

About 35% of a bomb's energy is released as intense heat, and unprotected people would receive burns varying from charring, blistering, or redness of the skin, depending on distance, up to about 14 km. On a clear day flash burns would destroy the full thickness of directly exposed skin on persons within about 8 km of ground zero. Flash dazzle, and permanent blindness from burns to the retina, could be expected at a much greater distance in those looking directly at the bomb flash. Spontaneous fires could be expected to about 10 km.

Very many of the victims of severe burns could be expected to die of complications because of lack of medical care, as most of the medical services and major hospitals would be destroyed. Burns accounted for about one third of the fatalities in the atomic bomb attacks on Japan.

The initial radiation from the explosion would be intense, but in the area of its immediate fatal effects most people would be killed by blast or heat. A greater problem, following a ground burst, comes from the subsequent radiation from fallout. This can produce lethal radiation to exposed people over a 14 day period in an area of 125 km long and nearly 20 km wide down wind of the explosion with even a modest wind speed. The fallout pattern would depend on wind speed and direction and rainfall, but could affect up to 1,000,000 people in and near Melbourne or Sydney. The fatal level of radioactivity from fallout would commence soon after the explosion and last for about two weeks. High, but non-fatal, levels would remain for much longer periods of time.

BOX 2  
APPROXIMATE DIMENSIONS OF AREAS RECEIVING DIFFERENT ACCUMULATED DOSE OF RADIATION DURING FIRST 2 WEEKS AFTER 1 MEGATON, 50% FISSION YIELD GROUND BLAST, ASSUMING A STEADY WIND OF 24 KILOMETERS PER HOUR

	Accumulated dose (rads)			
	90	150	450	1000
Downwind distance (km)	288	224	126	80
Maximum width (km)	34.4	27.5	17.3	11.8
Ground zero width* (km)	16	14.4	11.5	9.6
Area (square km)	8218	5146	1870	832

\* Ground zero width is the plume width at the place of explosion and perpendicular to the wind direction.

Source: Humphreys, J., Hartog, M., Middleton, H. *The Medical Consequences of Nuclear Weapons* London 1982.

Survivors may receive a substantial dose of radiation, which may subsequently induce leukemia and other malignancies as occurred in Japan. A large increase in infectious illnesses could be expected due to increased susceptibility to infection (from damage to the body's immune system and lowered white cells in the blood), the disruption of sanitation, housing, food and water supplies, unburied corpses and the lack of medical services to cope with the situation.

In the long term exposed children would be affected, with increased risk of malignancies and possible defects in development. The incidence of psychiatric disorders would increase significantly and genetic damage would be manifest in future generations.

The situation would be worse with a larger or a multiple bomb attack, as for example envisaged by the *AMBIO* scenario.

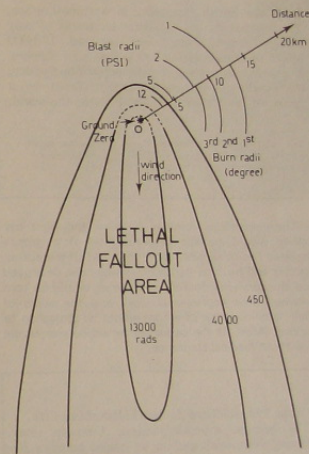


Figure 1:  
The three major effects of a 1 Megaton ground-burst nuclear bomb. Fallout is plotted for a 15 kilometre per hour wind. To see the effects on your city sketch or obtain a map of it to the same scale, then overlay this figure, centring the overlay over the likely target point, and rotating the overlay to your predominant wind direction. Radiation above 450 rads is lethal. 3rd degree burns char skin. 5 psi destroys brick houses.

## THE MEDICAL PROBLEMS OF SURVIVORS

The survivors of a one-megaton nuclear bomb attack upon Melbourne or Sydney would probably include up to 500,000 injured persons. Most would have been injured by the blast effects, some would be burned and some would have both burn and blast injuries. Many of these casualties would also have received large doses of radiation (200 rads or more).

Blast injuries would include multiple fractures, crush injuries, ruptured lung and abdominal organs,

\* A rad is a unit of absorbed radiation energy (equal to 1 Joule per 100 kg of body weight).

head injuries and lacerations. Under normal circumstances such injuries would require blood transfusions, surgery and drugs in the form of antibiotics and pain killers. A lack of blood and plasma, a shortage of drugs and a lack of medical personnel, hospital beds and operating theatres would drastically limit what could be done for these injured people. Tetanus would be a major problem for the inadequately treated victims.

The treatment of severe burns is exceedingly laborious and expensive even under ideal conditions. Large quantities of plasma and blood are required to replace dangerous losses of body fluids. An average adult with burns affecting 50% of the body needs 10 or more litres of plasma in the first 48 hours. Sterile dressings and antibiotics are needed to limit infections. Skin grafting is normally required for full thickness burns.

## BOX 3

From the British experience in wartime London, it is estimated that the acute treatment of only 34,000 serious burn cases required 170,000 health professionals and 8,000 tonnes of supplies. If a nuclear attack was merely targeted on Sydney, the resulting burn cases would exhaust by a factor of ten all the burn facilities in the world.

Source:  
E. Lovin "Physician's Perspective on the Nuclear Age"  
*Bulletin of the Postgraduate Committee in Medicine*  
University of Sydney (1982) 38:177.

The tremendous number of burn and blast casualties would be the responsibility of a grossly depleted health services. More than half of the nurses, doctors and hospital beds would have been destroyed and the surviving doctors and nurses would be torn between their professional work and the needs of their families, some of whom would be struggling to survive. Most of the casualties would survive, or die — without medical assistance.

## BOX 4

Of the 298 mobilized doctors in Hiroshima City, 270 became A-bomb victims. Casualty rates among pharmacists and nurses ranged between 80 percent and 93 percent. Death rates among all medical personnel were high. For all practical purposes, the well-prepared medical care system was rendered totally useless.

Source:  
Committee for the Compilation of Materials...  
*Hiroshima and Nagasaki: The Physical, Medical and Social Effects of the Atomic Bombings*  
Hutchinson, London, 1981, p.516.

Many of the burns and blast victims would have been exposed to excessive doses of radiation and would have signs and symptoms of radiation sickness. This would greatly reduce their chances of recovery.

Other persons would be suffering from radiation sickness alone, either from the immediate radiation of the explosion or from the fallout. The danger from fallout would start within hours of the explosion and last, in some areas, for weeks. The extent and nature of radiation sickness would depend on the cumulative amount of radiation absorbed. The area in which fallout could deliver a potentially fatal dose of radiation (say 450 rads) would vary markedly with

factors such as weather conditions and terrain. Persons exposed to 1000 rads or more would die regardless of treatment. Above 5000 rads the central nervous system would be the main organ affected, with consequent convulsions, tremor and coma, and death within 3 days. Between 5000 and 1000 rads the main damage would be to the gastro-intestinal system, with diarrhoea, fever, vomiting and disturbance of the balance of salts and fluids in the body. Painful death would come within 10 days. Under 1000 rads the bone marrow would be the main organ affected, with falls in all types of blood cells causing bleeding, infection and anaemia. 50% of those persons receiving 600-400 rads would die within 30 days and it is in this group that treatment could make the difference between death and survival. Normally treatment would consist of blood transfusions and antibiotics, but both of these will be exceedingly scarce.

Finally there would be the psychological casualties. Large numbers of people would break down with uncontrollable anxiety. Still larger numbers would be gripped by apathy and depression. These mental disturbances would make the cooperation needed during sheltering and rebuilding very much harder to achieve.

## BOX 5

## TYPES OF ACUTE RADIATION SICKNESS ACCORDING TO DOSE RECEIVED

Dose of radiation to the whole body within a period of days or less (in rads*)	Days to Death (median)	Type of Sickness	Effects
10000	1		Coma, convulsions death within hours
5000	3	Central nervous system form	lethargy, unsteadiness, convulsions, coma, death within days
death certain	5	Gastro-intestinal form	day 1: Nausea, vomiting unwell week 1-2: fever, profuse bloody diarrhoea week 3: if still alive, bone marrow form
1000 death probable	20		
450 50% chance of death for healthy young adults	30	Bone marrow form	days 1-2: nausea, vomiting, unwell week 2-3: fever, blood patches in skin, mouth ulcers, loss of hair (with more than 300 rads) day 30: maximum effect
150 survival certain			

\* A unit of absorbed radiation energy, (equal to 1 Joule per 100 kg of body weight.)

An understanding of the extent of casualties from a nuclear attack, and the simultaneous destruction of the medical system, has led physicians to point out to governments that they cannot look to medical systems for any meaningful assistance in the post-attack period. There is no treatment for a nuclear attack. Prevention is the only possible approach.

"When faced with thousands of victims how does the physician select those to be treated first, if at all? How does he choose between saving the lives of the few and easing the pain of many? When pain-relieving narcotics and analgesics are in scarce supply what is the physician's responsibility to the fatally injured or those with incurable disease? Which of the duties — prolongation of life or relief of pain — takes precedence? How is the physician to respond to those who are in great pain and demand euthanasia? What then substitutes for the sacred and cherished oaths which have guided medical practice for several millenia? Modern medicine has nothing to offer, not even a token benefit in the case of thermonuclear war".

Prof. B. Lovin

## A NUCLEAR WAR LIMITED TO THE NORTHERN HEMISPHERE

The state of society after the bomb clearly depends on the type and extent of the nuclear bombing. For Australia the problem may not be the extent of direct damage at home, which could well be absent or limited, but rather the extent of destruction in the Northern Hemisphere.

Major nuclear war confined to the Northern Hemisphere would not result in severe long term nuclear fallout in Australia, because such fallout tends not to cross the equator. But we might well suffer major environmental disruption such as that resulting from destruction of part of the upper atmospheric ozone layer. Some scientists have calculated that the use of about 50% of the world nuclear arsenal would destroy 60% of the ozone layer in the Northern Hemisphere and 30% in the Southern Hemisphere. A loss of 20% of the ozone layer would allow sufficient ultra-violet radiation through the atmosphere to cause dangerous burns, cataracts and a range of serious ecological effects. There is a high degree of scientific uncertainty about the magnitude of effects on the ozone layer and about the other risks of major ecological disruption.

North America, the USSR and Europe would presumably be among the main areas ravaged by a major nuclear war. Refugees from destroyed cities would crowd into undamaged areas, bringing with them infectious diseases and radioactive contamination and using up scarce food and fuel supplies. Infections would spread rapidly because of the reduced resistance of people with radiation sickness and burns. The unburied bodies of humans and animals would act as reservoirs of infection which would then be transmitted by rats, insects and dogs. Insects are among the most radiation resistant species and would increase dramatically in number as their natural predators were reduced. The main methods of coping with infectious diseases are immunization and antibiotic therapy. Immunization campaigns would be hampered by the disorganization of public health



Figure 2  
Third-degree, whole-body burns require massive skin grafts (as shown), 24 hours a day intensive care for weeks and sterile conditions to prevent infection, if any chance of survival is to occur. During the recent bushfires in Victoria the number of burn casualties were sufficient to fill the combined burns facilities in the Melbourne area.

authorities in the post-attack period, and radiation effects would reduce the effectiveness of immunization on individuals. Surviving stocks of antibiotics would be quickly exhausted.

Food supplies in damaged areas would be rapidly depleted. Transporting grain and other food from undamaged areas would be hampered by fuel shortages, especially since refineries and oil wells could well have been targeted. Food transporters would compete with farmers and industry for the scarce fuel, leading to an ironic choice between immediate hunger and long-term famine. Many areas would of course suffer both, resulting in widespread malnutrition, further encouraging the spread of infectious diseases.

Many families could emerge from whatever shelter they had occupied for days, weeks or months to find a refugee family — perhaps radiation contaminated — occupying their house. Governments could be expected to order families with houses to take in refugee families, with the subsequent overcrowding encouraging infectious diseases, especially if water supplies, electricity and waste disposal are not fully restored.

Much of North America, the USSR and Europe would be contaminated by radiation either from direct bomb attacks or from fallout. After days, weeks or months it would be possible to emerge from shelters without the risk of radiation sickness.

"Over one-third of all survivors may perish in epidemics in the 12 months following a nuclear attack, due to the combined effects of immunosuppression, malnutrition, crowding, poor sanitation, contaminated water supply, proliferation of insect and rodent vectors, inadequate disposal of the dead, lack of antibiotic supplies and poor medical care."

Prof. B. Lown

Radiation levels would, however, remain raised for years or decades, so that individuals would gradually accumulate excessive dosages. Everybody would live with the constant threat of cancer and genetic damage.

An Australia spared from the intensive bombing suffered by some northern hemisphere countries would be a 'Lucky Country' in many ways. But it would soon be engulfed by the global chaos — economic, political and perhaps ecological. It might be forced to make its facilities and resources available to one or more northern powers.

#### PSYCHOLOGICAL BARRIERS TO DISARMAMENT

The continued existence of nuclear bombs makes it highly likely that they will be used one day. In the past, states and regimes have been willing to unleash the most powerful weapons in their armory rather than accept defeat.

Why then do we not demand the destruction of these instruments of genocide? Why, 37 years after Hiroshima, has the horror of that event dimmed and an acceptance of nuclear bombs prevailed?

Part of the answer lies in human adaptability. It is necessary for survival not to be constantly responding to an unusual stimulus. The destruction unleashed by the atomic bombs on Hiroshima and Nagasaki stunned the world and so alarmed the public in many countries that efforts towards disarmament were intensive in the 1950's. But in the subsequent decades acceptance or apathy has replaced horror and rejection.

This situation is allowed to prevail by the lack of widely disseminated information and public discussion. Most Australians remain largely ignorant of the vast increase in numbers and accuracy of nuclear weapons and of the change in military strategy and technology from 'mutual assured destruction' to the much more unstable 'Counter-force'.

Confronted with this information on the new perils, the human mind tends to respond by incomprehension. We simply refuse to understand the magnitude and the immediacy of the nuclear threat. Bombs, with cores the size of rock melons, that can kill one million people, are beyond our comprehension. We grieve over one child who dies in unusual circumstances or 70 people killed in a bush fire but the possibility of 500,000 sudden deaths carries no meaning that can correspond to the reality of the tragedy.

If we relate it to our own family and friends or to the community in which we live, the prospect is too horrifying to contemplate. It is easier to 'switch off', for facing it may reduce our ability to lead a 'normal' life. Denial is one of the means of coping with a threat against which we feel powerless.

What is the point of working for a future that may not exist?

It is a common view that the arms race has a momentum of its own, beyond the control of human forces. Even persons who have a clear mental picture of the forces that perpetuate the arms race (power, greed, hatred of other ideologies, fear) feel helpless as individuals outside the corridors of political power.

Another psychological obstacle to disarmament is our tendency to transform strange concepts into familiar ones. Thus we continue to consider nuclear bombs as variants of conventional weapons, when in truth they are entirely different. They are instruments of genocide, not of war in the classical sense of a winnable struggle.

#### THE LAST EPIDEMIC?

"The enormous loss of life suffered as a result of war in the twentieth century underlines the fact that of the three major causes of catastrophic mortality — famine, pestilence and war — war remains the least subject to control. In fact, advances in science and technology, which have played such an important role in the reduction of mortality from hunger and disease, continue to increase the possibilities for devastation inherent in modern warfare."

U.N. Department of Economic and Social Affairs, *The Determinants and Consequences of Population Trends* Vol.1, 1973, p.145.

Medicine is a field where technological advance has contributed substantially to human welfare. It is easy to overlook the parallel development of technology for destruction. During this century weapons have become more powerful, and direct massive attacks on civilians became accepted practice by the end of the second World War. During the first World War in Europe deaths averaged about 0.5% of the total population per year. During the second World War in Europe and the Soviet Union this rate roughly doubled to 1% per year, and in a third (nuclear) World War 20-50% of these populations could die. With the advent of nuclear bombs, the prevention of nuclear war replaces the prevention of famines and epidemics as the central risk for people concerned to reduce the risks of catastrophic mortality.

As Box 6 shows, more research and development resources are being put into homicidal (military) technologies than into technologies in the fields of health, energy, pollution control and agriculture combined. Whether or not further advances in science and technology will lead to a long-term net gain in human welfare is therefore both an open question and a challenge. To increase the probability of a

BOX 6  
THE GLOBAL RESEARCH AND DEVELOPMENT  
BUDGET: APPROXIMATE DISTRIBUTION (%)

Basic Research	15
Military	24
Selected 'benign'	24
— Energy	8
— Health	7
— Pollution Control	5
— Agriculture	3
Others	38

100

Source:

C. Norman, "Knowledge and Power: The Global Research and Development Budget" *Worldwatch Paper* No.31, Worldwatch Institute, Washington, 1979.

favourable outcome research priorities will need to be changed, with more emphasis on benign technologies in fields such as health. Physicians are well placed to argue these points and to press for new curbs on potentially destructive technologies. 'Human factors' perpetuate the arms race and 'human factors' could stop it.

"Health workers do not possess special knowledge or direct experience in atomic matters. They do, however, have unique expertise in areas in which others are laymen, namely in those relating to the medical consequences of nuclear war, to the possibilities of medical care in the post-attack period, to the non-involvement and denial of the intended victims, to the malfunctioning of technology, and to the aberration of personality which may trigger a nuclear exchange."

Prof. B. Lown

#### CONCLUSION

The proliferation of thermonuclear explosives is increasing the risk that they will be used, whether as a consequence of an accident, or by the escalation of a regional conflict, or as a result of a super-power dispute. Their use in a major U.S.—U.S.S.R. conflict would produce human and ecological destruction on a scale hitherto unknown. Australia could become involved, through direct attacks on the U.S. intelligence and military bases here, through direct attacks on Australian military facilities or major urban and industrial centres, or as a result of fallout contamination of urban areas. Other consequences for Australia would be the economic effects of disruption of the world economy, and the possible use of Australia for the placement of refugees. In the event of a direct attack on an Australian city the medical services would be totally incapable of coping with the ill and injured.

Even without a single nuclear missile being fired in anger, the diversion of resources to the arms race is killing millions of children and adults throughout the world. In many developed countries expenditures on health and social services are being cut to allow increased expenditure on arms and the military. In developing countries, 800 million people are destitute, lacking food, shelter and safe water, while their governments devote increasing proportions of their meagre resources to arms. Health services in developing countries could gain substantially from a significant reduction in arms expenditure.

Apart from being the most important social and political issue of our time, nuclear bombs are the greatest health hazard the world has ever known. There is no treatment for the 'final epidemic' they portend. Prevention in the form of nuclear disarmament is the only solution. That is why doctors all over the world are becoming part of the new peace movement, adding their perspectives to a new and diverse peace consciousness.

#### FURTHER READING:

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#### CONTACT:

Medical Association for the Prevention of War — Australian Branch, P.O. Box 113, Camperdown, N.S.W. 2050. The Association produces a *Newsletter*. Victorian contact: Dr. John Andrews, 400 New Street, Gardenvale, 3187.

"The effects of nuclear war that cannot be calculated are at least as important as those for which calculations are attempted."

Opening statement in U.S. Office of Technology Assessment report *The Effect of Nuclear War* (See Further Reading).

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*VICTORIAN ASSOCIATION FOR PEACE STUDIES: PEACE DOSSIERS*

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