

# NUCLEAR WINTER: THE ANTHROPOLOGY OF HUMAN SURVIVAL

---

*Proceedings of a Session at the 84th Annual Meeting  
of the American Anthropological Association,  
December 6, 1985, Washington, D.C.*



*M. Pamela Bumsted, Organizer*

Panelists

*George J. Armelagos  
M. Catherine Bateson  
Robert Dirks  
Eric M. Jones  
Laura Nader*



**DO NOT CIRCULATE**  
**PERMANENT RETENTION**  
**REQUIRED BY CONTRACT**

NUCLEAR WINTER: THE ANTHROPOLOGY OF HUMAN SURVIVAL

Proceedings of a session at the 84th annual  
meeting of the American Anthropological Association,  
December 6, 1985, Washington, DC

M. Pamela Bumsted, Organizer

Panelists

George J. Armelagos  
M. Catherine Bateson  
Robert Dirks  
Eric M. Jones  
Laura Nader

This invited session was sponsored by the Program Board of the American Anthropological Association and the Biological Anthropology and General Anthropology Sections, Institute of Geophysics and Planetary Physics of the University of California, and the US Department of Energy.

The US Government retains a nonexclusive, royalty-free license to publish or reproduce this document or allow others to do so.

This document was prepared by Lois Schneider, CHM-DO.

For additional information about this document, LA-UR-86-370, contact:

M. Pamela Bumsted  
Los Alamos National Laboratory  
MS-G740, CHM-1 and INC-DO  
Los Alamos, NM 87545, U.S.A.

Telephone (505) 667-3151 or 667-4087  
(FTS-843-4087)

Note to Readers

NUCLEAR WINTER, a public, unrehearsed panel and general discussion, was given December 6, 1985, at the American Anthropological Association annual meetings in Washington, DC. The five panelists and the organizer presented summaries to an audience of approximately 100 anthropology and other interested professionals. This transcript was made from the audio record. We have tried to render the transcript faithful to the spoken word, yet readable in itself.

Discrepancies between the audio and written records may reflect corrections for errors or misstatements [////////] or additions or clarifications [.....].

Double angle brackets <<.....>> signify the speakers' asides to the audience or to the Vu-Graph projectionist.

Breaks in the record caused by the switch to a new cassette tape are indicated by a row of asterisks and the new tape side number:

\* \* \* \* \* side 3 \* \* \* \* \*

Reference to figures and bibliographic citations has been added to the text. The suggested readings emphasize secondary texts that assess the physical models or evaluate consequences of nuclear winter on other systems. Additional primary scientific literature is included in the bibliographies to these texts.

Panelists are identified by name in the discussion. Speakers in the audience are identified by individual letters. At the beginning of the session it was announced that the session would be recorded; names of speakers from the audience were not recorded.



## PREFACE

This document records the only exposition of Nuclear Winter that focuses explicitly on humans. We consider our discussions beginnings, not conclusions, to an anthropological assessment of Nuclear Winter.

The arguments are based on our existing knowledge of human systems. Thus, the inferences we draw and the degree of impact are not dependent on the outcome of any particular model of Nuclear Winter.

The impetus for organizing this panel session came from a resolution against nuclear war that was considered by the 1984 American Anthropological Association annual meetings. My own, very strong reaction was that anthropology should go further--should be actively and effectively involved and should explicate the effects of Nuclear Winter's physical reality on human relations. Without participation by anthropologists, the world can realize only a small part of the human costs of nuclear weapons use. My reaction stemmed from three significant aspects of my research.

- o Findings from studies of prehistoric or archaeological populations must be accessible to and understood by contemporary society. Without such necessary knowledge, we will never have a fundamental understanding of human biology and chemical composition nor a greater understanding of social change.

- o My current research involves a particular population of village farmers, 600 of whom were massacred by their neighbors in the late 14th century. Such catastrophes obviously continue in the late 20th century. What can we learn?

- o The people I live and work with at Los Alamos National Laboratory are real people, with the same dreams and fears all humans experience. Among other tasks, the Laboratory has a responsibility--mandated by law and by heritage--to provide the best scientific and technical advice possible pertaining to nuclear weapons and their effects. Encouragement of diverse basic and applied research, including the anthropology of the long-term consequences of nuclear weapons use, is part of that responsibility.

M. Pamela Bumsted

SUBJECT GUIDE

Note to Readers..... iii  
Preface..... iv  
Subject Guide..... v  
Panelists..... vii  
Introduction..... 1

Jones: Definition of Nuclear Winter..... 5  
Patterns of smoke distribution  
Factors considered in predicting temperature changes  
Reality of Nuclear Winter as cause of temperature decrease

Dirks: Long-term effects of famine on human societies..... 11  
Reduction of crop yields leading to starvation  
Social and cultural effects of "scars of hunger"  
Child-parent relationships  
Patterns of and attitudes toward eating  
Increased male dominance and male/female distancing

[Audience: What the hell...! Talking about the "unthinkable"  
makes it inevitable!]

Armelagos: Biological consequences of Nuclear Winter..... 23  
Absurdity of government plans for survival  
Impact of nuclear attack on health patterns  
Alteration of immune system  
Infectious disease increase, radiation effects  
Psychological stress and genetic damage  
Effect on southern hemisphere of incapacities of  
northern hemisphere

[Audience: Anthropological discussion of current issues--commended  
and criticized.]

Bateson: Reasons for discussion and study of Nuclear Winter... 31  
Need to disseminate information about Nuclear Winter  
Obligation of anthropologists to carry such discussion  
forward  
Fantasies and realities of life after nuclear war  
Task of anthropologists to provide a "modeling" of  
human relations to parallel the climatic model of  
the physical sciences

[Audience: We should question our political conditioning.]

Nader: Discussion of Nuclear Winter seen as ritual talk..... 39  
Need for anthropologists to examine the consequences of  
Nuclear Winter in order to counter current fantasies  
No model available for life after Nuclear Winter  
Recognition that the most important decisions are made  
by a very few people  
Need to "de-isolate" the experts and specialists

Audience/Panel Discussion..... 45

Notes.....	61
Figures.....	63
References cited and recommended reading.....	81

## PANELISTS

M. Pamela Bumsted, Organizer  
Chemistry (CHM-1) and Isotope  
and Nuclear Chemistry (INC-DO)  
Los Alamos National Laboratory  
Mail Stop G740  
Los Alamos, NM 87545

(Ph.D. U. of Massachusetts,  
Amherst 1984; Postdoctoral  
Fellow) Human biology,  
stable isotope and element  
bone chemistry, disease  
ecology, paleonutrition,  
archaeology; North America.

George J. Armelagos  
Anthropology  
University of Massachusetts  
Amherst, MA 01003

(Ph.D. U. of Colorado 1968;  
Prof.) Physical anthropol-  
ogy, skeletal biology,  
demography; Mediterranean,  
Africa.

M. Catherine Bateson  
Anthropology and Sociology  
Amherst College  
Amherst, MA 01002

(Ph.D. Harvard 1963; Prof.)  
Psychological anthropology,  
anthropological linguis-  
tics; Middle East.

Robert Dirks  
Sociology, Anthropology, and  
Social Work  
Illinois State University  
Normal, IL 61761

(Ph.D. Case Western Reserve  
1972; Assoc. Prof.) Social  
organization, human ecology,  
food and culture, ritual;  
Circumcaribbean.

Eric M. Jones  
Earth and Space Sciences (ESS-5)  
Los Alamos National Laboratory  
Mail Stop F665  
Los Alamos, NM 87545

(Ph.D. U. of Wisconsin  
1970; Laboratory Fellow)  
Global climate modeling,  
astrophysics; solar system  
development.

Laura Nader  
Anthropology  
University of California  
Berkeley, CA 94720

(Ph.D. Radcliffe College  
1961; Prof.) Social anthro-  
pology, comparative ethno-  
graphy of law and dispute  
resolution, conflict, con-  
trolling processes, compar-  
ative family organization,  
anthropology of professional  
mindsets; ethnology of Middle  
East, Mexico, Latin America,  
and contemporary United States.



## NUCLEAR WINTER

BUMSTED: Good Morning. Welcome to NUCLEAR WINTER. This is session 2-002 of the American Anthropological Association's annual meetings. This session is hosted by the AAA Program Board and by the Biological and General Anthropology Sections. I'm Pamela Bumsted, organizer for a panel-audience discussion of the long-term consequences of nuclear winter on human existence.

Our purpose in today's discussion is to stimulate anthropology's contributions to the scientific issues of Nuclear Winter.

Over the past 40 years, the immediate [~~local~~/effects] and local effects of nuclear weapons have been documented. These effects are simply awful. Recently, the term "Nuclear Winter" has been coined for the global climatic effects following nuclear weapon exchange. <<And we will have a synopsis of the latest climate models shortly.>>

There will, of course, be secondary impacts from a Nuclear Winter that will affect humans. Long-term environmental consequences are under current examination by groups such as the Institute of Medicine, Swedish Academy of Sciences, and SCOPE, or the Scientific Committee on Problems of the Environment. [see Recommended Reading] The focus of these studies has tended to be on the non-human environment, although consequent trophic level effects such as agricultural sufficiency, fuel, and communication have been mentioned. However, effects have been evaluated for only some segments of human society, such as economics.

There has yet to be a holistic examination of human consequences, one which would account for interactions within the human system. We do not yet have an examination which is broad enough in scope to assess effects on nonindustrialized societies.

Anthropologists have generally not participated in the scientific and technical issues of nuclear war and nuclear peace. We are not usually part of the institutional communities or other sciences which are involved. Additionally, our research results and conclusions tend not to be oriented to other communities or to broader issues.

I believe anthropology can contribute its expertise concerning the cultural and biological adaptability of humans. We can point out the comprehensive nature and evolution of human existence. It is important that the consequences of a nuclear exchange not be underestimated nor made unrealistic. For example, we know that Nuclear Winter, to whatever magnitude, will not mean a return to the Dark Ages, as one economic researcher has said. We cannot just go back to some mythic Rousseauian past and start over. We cannot comfort the survivalists who may think Nuclear Winter is a 5-year camping trip. We know that human existence is more than the minimum daily allowance of food, water, and shelter from the elements (radioactive and otherwise).

Can we today begin to define some of these components of human existence? How will they be affected after a Nuclear Winter? Would a world after Nuclear Winter be like anything in our past 6 million years, or is it entirely new?

The format of this morning's session is somewhat unusual. The panel members are outstanding researchers in various areas of anthropology and the environmental sciences. Each panelist will present a 10- to 15-minute summary of the anthropological aspects they feel should be considered in an evaluation of Nuclear Winter. This will be followed by a half-hour discussion between the panel members. After a brief intermission, the remainder of the session will directly involve the audience.

At this point I'd like to thank the Institute of Geophysics and Planetary Physics of the University of California for a grant to cover the audio record of this session.

Today's discussion will not deal with the immediate consequences of Nuclear Winter nor with the effects of nuclear weapons, themselves. The technical issue or the physical models of Nuclear Winter are not the topic of discussion but please do take advantage of Dr. Jones' expertise in this area.

The strategic role of Nuclear Winter is more appropriately discussed elsewhere. Although for purposes of discussion we will

assume there are survivors of Nuclear Winter, our purpose today is not to predict the outcome of a nuclear exchange. We will not predict the likelihood nor the "how-to" of surviving a Nuclear Winter.

By 11:00, I hope the session could summarize some of the components of human existence that should be systematically examined in studies of Nuclear Winter, and secondly, point out where our existing knowledge of human patterns is weak or absent and needs directed research.

Finally, I hope an anthropological perspective of the issues can remind ourselves and the rest of the public what is at risk in a nuclear exchange--for human existence is far more colorful, complex, and worthwhile than any two-dimensional crayon drawing can suggest.\*

I would like to introduce the panel to you and then turn the session over to George Armelagos, who will moderate.

I am very sorry that Glynn Isaac is not with us. His death will continue to be felt by anthropology and within the scientific community.

Eric Jones is with the Earth and Space Sciences Division of Los Alamos National Laboratory. He is an astrophysicist with special expertise in global climate modeling.

Bob Dirks, from Sociology, Anthropology, and Social Work at Illinois State University, has emphasized food stress and cultural evolution in his studies.

George Armelagos will be representing biological and medical anthropology. He is with the Department of Anthropology at the University of Massachusetts, Amherst.

Catherine Bateson is at Amherst College (Anthropology and Sociology) and will be presenting aspects of psychological anthropology.

Laura Nader, from Anthropology at Berkeley, University of California, is representing law and complex societies.

Unfortunately, Paul Bohannon and Richard Lee are unable to attend, although Richard Lee has sent a statement.



I am an anthropologist with the Divisions of Chemistry and Isotope and Nuclear Chemistry at Los Alamos National Laboratory, [which is operated by] the University of California [for the US Department of Energy]. My research interests are primarily in human bone chemical composition and the relation to diet, disease, and social change in the past.

This [note] has been sent from Richard Lee, who says he has "decided not to participate in the panel discussion on NUCLEAR WINTER: THE ANTHROPOLOGY OF HUMAN SURVIVAL. I disagree fundamentally with the philosophy that argues that nuclear war is survivable and that therefore anthropologists should put their expertise at the disposal of the military. The panel sounds ominously like the Reagan administration argument that nuclear war is survivable. There is only one legitimate approach to nuclear winter, and that is to make sure that it never happens. Any other path is species suicide. When an AAA panel is convened on how to prevent nuclear war, I shall be happy to participate." Richard Lee, University of Toronto.

ARMELAGOS: The first statement is by Eric M. Jones on global climate modeling.

JONES: Good morning. My job today is to tell you what a nuclear winter is so that we have at least some basis of thinking about it.<sup>15</sup> The concept arose in [1985] ...<<would you hold on the Vu-Graphs just a second, Pam?>>...1982 when Paul Crutzen and John Birks<sup>6</sup> first pointed out to all of us that--something we knew all along--that nuclear explosions could cause fires and inject smoke into the earth's atmosphere, would have a massive cumulative effect from the many fires that might result from a war. Since that time there have been several studies, most notably in the press the so-called TTAPS study, Richard Turco et al.,<sup>30</sup> where the group also included Carl Sagan, and more recently a study by the Carrier committee, a committee of the National Research Council,<sup>24</sup> which reviewed the issue for the National Academy of Sciences. I was a member of that committee. I am here under slightly false pretenses. I don't work in climate modeling, per se; however, the group that does do the work at Los Alamos is very heavily involved in writing computer programs and examining physical models, and it's best that folks like myself give these talks so that they can get the work done. <<And so we'll look at the Vu-Graphs now.>> This is the group of folks<sup>20</sup>--Robert Malone is a climate modeler who has been working with the National Center for Atmospheric Research at Boulder for a number of years on development of three-dimensional (altitude, latitude, and longitude) computer models for studying the atmosphere. [His Los Alamos colleagues were Larry Auer, Gary Glatzmaier, and Michael Wood.] And Brian Toon, down at the bottom, at NASA Ames Research Center, was one of the authors of the TTAPS study.

<<Next.>> Very briefly, what we are talking about is the effect of smoke that is injected into the atmosphere. If there is sufficient smoke, sunlight entering the atmosphere is absorbed by the smoke cloud and does not reach the earth's surface. Also, the cloud will be thin to infrared radiation, which is the way the ground cools. The infrared radiation will pass through the smoke and escape

from the earth and the result is that the ground surface cools. As long as the smoke is of sufficient concentration in the atmosphere to block the entering sunlight: that is what nuclear winter is. The problem, of course, is to try and determine how much smoke and how long it lasts in the atmosphere. And, how the smoke interacts dynamically with the earth's atmosphere.

<<The next Vu-Graph. (Fig. 1a)>> This is a very complex process [as illustrated in the figure]. What we are trying to get at--to give some estimates of use to the biological and anthropological communities who can help give answers that could be used in policy decisions and in public debate--is the surface cooling. That depends on how much smoke is in the atmosphere and where it is, and that's a highly nonlinear process. Just very briefly, running you through this [Fig. 1a]--if one has a certain amount of smoke in the atmosphere with a certain initial distribution, that smoke coming back up to the line on the left absorbs sunlight. The smoke is heated; it heats the air that contains it and is lofted to higher altitude: the box at the upper right. It changes the structure of the atmosphere. It changes the distribution of precipitation, which is the principal removal mechanism of the smoke from the atmosphere. It also influences the wind pattern in the atmosphere, which will change the distribution. And so, we go around and around the cycle, and the hope is that the computer models can give us some sense of what is going on.

<<Next. (Fig. 1b)>> At base we are looking at how much smoke, and that depends on the competition between the removal processes and those processes listed at the bottom, which tend to keep the smoke in the atmosphere.

<<The next one, please.>> In a typical calculation, smoke is placed in the simulation. As it turns out, it is not terribly critical where the smoke goes, and in this particular set of calculations it was put over North America and over western Europe and the western Soviet Union and injected at altitudes between 0 and 9 km and was injected, most of it, in the first couple of days and all of it during the first week.

<<Next. (Fig. 2)>> Just to indicate the kinds of things that happen: as I mentioned, the smoke absorbs sunlight, it's heated, and it rises buoyantly in the earth's atmosphere. The contours here show the results of two different calculations. The black curves show what happens to the smoke when it's not allowed to interact with sunlight: that it is just carried through the normal atmosphere and removed by normal precipitation processes. And you see here that it is all concentrated in the lower part of the atmosphere. These contours, for those of you who are interested, are in units of  $10^{-9}$  g/g of air. In the case where the smoke is allowed to interact with sunlight, it is lofted and in fact carried high in the atmosphere, where it separated from precipitation. So you can see that it is higher in the atmosphere and there is much more of it left. This is at day 20, about 3 weeks after the beginning of the calculation.

<<The next. (Fig. 3a)>> To give you just a suggestion of what happens to the atmosphere itself, these are contours of temperature in degrees Kelvin (absolute temperature). This is the ground surface. This is a slice from pole to pole; the North Pole is up here, the South Pole here, the Equator here, and this is an average of conditions, averaged in longitude. The temperature is high at the ground, decreases up to a place called the tropopause, which under normal conditions--and this is the normal atmosphere--is at around 12 km at mid-northern latitudes. And then the temperature in the atmosphere increases slowly as you go up through what's called the stratosphere.

If smoke is injected, the structure changes rather dramatically [as indicated in Fig. 3b]. Several things are happening. The smoke, which as you recall is up here in northern latitudes, is heating the atmosphere so you have a high-temperature region which wasn't present previously. That drives the tropopause lower in the atmosphere and one has some cooling at the surface.

<<The next slide. (Fig. 4)>> This one shows the smoke distribution; just some broad contours here, the modified tropopause, and the blue down here is the location of the precipitation. The

precipitation is calculated in a self-consistent way in the computer model. And the important point here is that the precipitation, as one might expect, is all below the modified tropopause and the [remaining] smoke is all above. That is not a coincidence, of course. But the fact [that] the precipitation and the smoke are physically separated means that what smoke remains in the calculation will stay in the calculation for a considerable period of time. The next Vu-Graph (Fig. 5) should show that. [This compares calculations with and without solar heating of smoke for both summer and winter conditions. *This/is/a/series/of/three/calculations/done/under/summer/conditions.*] This is the total amount of smoke that's injected into the atmosphere in a unit called "teragram [Tg]." The 170 number is close to the median estimate of the National Academy report, and one can see that there was initial injection during the first week, mostly during the first 2 days. That's this rapid rise. During those initial phases when the atmosphere is still close to normal conditions, a lot of the smoke is removed by precipitation, so you see here that the total rises to about 100 teragrams of the 170 entered, but because of the separation of the smoke and precipitation, the effect lasts for a long time. This is day 40 out here.

<<The next. (Fig. 6a)>> The number of interest, of course, is how cold it gets. The initial calculations that were done by the Sagan group were done in one dimension, and what that means is [that] they modeled what was happening as a function of height above the ground but had no information about latitude and longitude. The effect is most serious over the continental interiors. The ocean is an enormous heat [reservoir sink] and provides some mitigating [effect], and one can see that here over western Europe where relatively warm air has been brought in from over the oceans. What these contours are are areas where the temperature decline might be 15°C in the summer. The pale pink is between 5 and 15° decline (the slight increases down here in the Antarctic are not due to the smoke effect but due to normal winter storms that are modeled, at least qualitatively, in the calculation). These are

for summer conditions when the effect is most severe. And put very simply, in summer the sun is shining basically straight down on the smoke in the northern hemisphere, and the effect is relatively large. In the winter where the sun is shining obliquely, the effect is smaller. The next Vu-Graph should illustrate that. I'm sorry. That was--I got a little ahead of myself--that was averaged over days 5 to 10--this (Fig. 6b) is days 35 to 40 and the effects [are] reduced, but still the dominant effect is over the continental interiors both in North America and over Eurasia.

<<Next. (Fig. 7)>> This shows the January calculation during the first week, and if you recall back two Vu-Graphs earlier, the 15° patch over North America was considerably larger. The effect is reduced in the winter. It is still present. One of the people who works in this at the National Center for Atmospheric Research ([and] who is an opponent of nuclear weapons) complained that he was very uncomfortable about the research because it was telling people when to fight the war--in January.

<<Next.>> What we know so far is that the important effects are: that the smoke is lofted, that the troposphere is forced lower in the atmosphere because of the heating of the atmosphere, that the smoke is isolated from the precipitation, that the northern hemisphere continental interiors are cooled, and that the smoke does spread relatively quickly into the southern hemisphere although the effects there are considerably less than they are in the northern hemisphere. The effects will be more severe if there is more smoke, and I should emphasize that the amount of smoke that would be injected is very uncertain. A great deal of research needs to be done on fires--on mass fires. The effect will increase as the amount of sunlight that is available increases. That simply means that it is more important in the summertime, and it depends fairly weakly, actually, on the height to which the smoke is injected. There are considerable uncertainties--things that need to be fixed or improved in the models. We do not have a good handle on what the surface temperatures will be as a function of time because that depends on physics in the so-called boundary layer (the lowest kilometer or so of the earth's atmosphere), and the



[computer] codes currently are not very good at that. It will depend on the details of the hydrologic cycle; that is, how water is interchanged with the oceans and with the earth's surface, and that is not well modeled as yet. And also on precipitation rates. The code people have a good feeling about their ability to calculate, in an average sense, what precipitation rates are. However, in a highly modified atmosphere that's uncertain. And there are a few other points which we can pass over in this brief discussion.

<<And the next Vu-Graph--that's it.>> There are many quantitative uncertainties in the modeling business at present. However, it is quite clear to those of us who have looked at the problem carefully that nuclear winter is a real effect, that it is probably not as severe as was being advertised 2 years ago. However, temperature decreases of several degrees will probably persist for at least a year, possibly 2 years, after a nuclear war and that this will be a considerable stress on survivors. Thank you.

ARMELAGOS: Are there any specific questions?

AUDIENCE A: [unclear, asking about biological effects....]

ARMELAGOS: You wouldn't want to give my paper? I was getting very worried there.

ARMELAGOS: Our next presentation is by Robert Dirks on food stress and cultural evolution.

DIRKS: A number of years ago I became involved in attempting to delineate the immediate effects of famine on human societies.<sup>7</sup> As a development of that work, I have more recently moved into the area of looking at the long-term cultural evolutionary effects of famine on human societies. [WIZM] The hypothesis [is] that famine is one of these dramatic events that speeds up, or kicks evolution--cultural evolution at any rate--into a high gear. What I am going to talk about today [is/really are] some preliminary findings in connection with that work. Looking at these findings in the context of nuclear winter, which most people agree will be a famine-producing event, [and] what I intend to do is look at the social relations, [the kinds of] social interactions, that one might anticipate in what I call the post-nuclear-winter generation.

A recent study predicts the blast, fire, and radiation produced by a large-scale nuclear exchange will destroy about 10 percent of the United States' crops and livestock. People will not fare so well. The same factors will kill somewhere around--perhaps more than--50 percent of the pre-war population immediately.<sup>11</sup> Thus, the up-front loss of food resources promises to be far less serious from the standpoint of the survivors than the ensuing loss of crops due to nuclear winter. Especially if a nuclear winter were triggered during the growing season, it can be expected that agricultural yields would be reduced to near nil. Certain survivors, particularly those in rural areas, might subsist for a time, perhaps, in some places, up to 3 years, on stored grains. But even so, given an absence of fruits, vegetables, and a steady supply of animal products, their situation would virtually guarantee severe malnutrition, owing particularly to the want of vitamins A, B<sub>2</sub>, B<sub>12</sub>, C, as well as the minerals iron and calcium. The eventual return to agriculture would improve conditions, but only



marginally. With reduced sunlight, low temperatures, and pollution, coupled with the loss of [TAPE LOSS--industrial support systems and a return to a labor intensive food system in the offing, it is highly doubtful North American farming could produce more than a bare subsistence for years into the future. This] projected inability to accumulate surpluses raises the specter of seasonal hunger. By that, I mean slow starvation and malnutrition through the late winter and early spring months [persisting] for perhaps, again, generations. The projection then is North American farmers living much, I think, as peasants in premodern Europe--fearing the short crop, the poor harvests, which would transform [the reality of] annual hunger into full-fledged famine.

Now as catastrophic as the situation might be in North America, elsewhere it could be as bad if not worse. Even if nuclear winter were to bring only minor ecological perturbances to the more prosperous nations of the southern hemisphere, anxious farmers might withhold their products from the market place. Panic and speculation could cause prices to soar beyond average means. Populations dependent on food imports or barely able to feed themselves under current conditions would in any event fall immediately under the reign of famine and, as in the northern countries, this initial round of famine would not be the last because again there is the lingering prospect of seasonal hunger. Now this phenomenon still exists of course in areas of Asia, Africa, and South America. It is a recent memory in many, many others. [I fear it] will once again prevail as transportation systems deteriorate and collapse and the movement of food from one region to another comes to a standstill. With communities left to their own devices, virtually any untoward event affecting local agriculture will once again mean that belt-tightening lean months have the potential to extend into killing famines. Given this prospect, it's not difficult to understand why it has been projected that the deaths due to starvation will in a relatively short period of time far surpass those resulting from blast and radiation combined. Even long after the last of those living at the onset of nuclear winter will have died, their progeny

will continue to suffer and die on account of the aftershocks reverberating through food systems. Unlike the present day, in which there exist in the world the well fed and the nutritionally impoverished, those of the post-nuclear-winter age will share the common experience of nutritional insecurity, hunger, and starvation. If my research is any indication, this means that the cultures of the world will experience together (and more or less simultaneously) a suite of alterations. These will affect social relations, most drastically in those societies which formerly were the more prosperous nations, bringing about a broad convergence that will transcend whatever other specific evolutions are set in motion by ecological degradation and technological and demographic collapse.

That hunger affects the nature of human interactions almost goes without saying. Indeed, I think most of us by looking at the undernourished communities in the world, [or reading] the ethnographies that exist on them, we can hardly avoid the feeling that much of what one sees in the realm of their social lives would be very different were only more food available. My research has been directed at firming up that impression. In order to solidify that idea and acquire a better grasp on what starvation actually entails socially and culturally--what one might say are the scars of hunger--I have undertaken a systematic study of a number of societies,\*\* some of them blessed with nutritional plenty, others plagued by want. For this particular research I have been using a sample taken from the HRAF files [Human Relations Area Files] consisting of 60 societies representing rural, nonindustrial societies worldwide.<sup>23</sup>

As a first step toward contrasting the cultures of the hungry from those of the well fed, I've sorted these societies into [two ranks, along several] ranks along two primary dimensions. The first of these is their experience with famine <<and Pam, I think we can look at the first of these transparencies (Fig. 8)>>. The first dimension is represented along here [the left axis]. We range from societies which have, in their ethnographies at least,

no record of famine [to] those where we find a famine trace in folklore, [to] general recollections or mentions of famine in the ethnographic material, and [finally,] here--highly specific historical references to famine. The second dimension, along which I rank these societies in our sample, is with regard to the constancy of yearly food supplies. We run here from the normally constant, to those that have changing diets throughout the year but no specific record of shortage, those that have lean months which occasionally result in starvation, to those societies on the far end that suffer annual hunger, pure and simple. So we run from high constancy to low. And then combining these, I have created yet a third division represented here: dividing societies into those that are relatively SECURE in their food supply (in the green area), those that suffer starvation in EPIDEMIC form (right here [yellow]; that is to say they have had the experiences with famine but not specifically with seasonal hunger), and finally those that seem to suffer ENDEMIC starvation [pink] as indicated by a high incidence of seasonal hunger (that is, occasional starvation or annual starvation at some particular season of the year). It is by using these divisions that I have taken [the sample] societies and contrasted them with respect to other cultural dimensions [believed to be dependent on food supply] to see what the impact of these [stress] conditions [is]. So let's see what [we] might project for societies which have undergone ecological change, have experienced a nuclear winter and therefore fall in the pink or yellow area of this chart--see what a few of the long-term effects might be.

I want to take first the situation of a child. <<Take that one off. Hold the next one for a moment.>> A striking, if not unexpected, finding with respect to children, is a positive relationship between the inconstancy of yearly food supply and infanticide. As seasonal shortage of food becomes increasingly salient, so does the practice of infanticide. Under such conditions, too, I found another noteworthy effect in that we find societies that suffer inconstancy or annual hunger have childhoods which are notably short in duration compared to the better-fed societies in the

world. Again, none of these findings are particularly surprising to anybody who has read ethnographic accounts such as Colin Turnbull's<sup>32</sup> study of the Ugandan Ik, where you see precisely that sort of thing in the short term. But what this is suggesting is that these sorts of things persist as a legacy of a history of food shortage and famine.

Not unrelated, perhaps, is the fact that amongst the food short--the endemically hungry--we find that parental indulgence tends to be significantly low--at least below that which is adjudged to be the world average. This negative relationship between childhood indulgence and nutrition is also seen when looking at famine experience. Among those groups with a history of famine, we also find a tendency among parents to exercise exceptionally strong control over their children. Conversely, parental permissiveness tends toward the low end of the cross-cultural spectrum. And so do displays of affection toward children. Seasonal hunger, also, tends to have a negative effect on displays of affection. So, in sum, with just these few traits, the only ones I've really [~~tested~~ tested] thus far, it appears fair to anticipate that the post-nuclear-winter society would feature a childhood of minimal length and parent-child relationships which, for want of better words I guess I'll simply say, appear more instrumental than affectionate.

What would the children of the post-nuclear-winter society be taught? Well, my research has hardly begun here, but a few noteworthy points have emerged as significant. First off, I found a positive relationship between famine experience and competitiveness training. This is also true (that is, the positive relationship) between famine and training in self-restraint: the more salient famines are in a people's history, the greater the emphasis on self-restraint training in children. Turning to the matter of annual food supply, here is a surprise. Contrary to my expectations, an inconstant food supply over the course of a year tends to discourage self-reliance training. There's a negative relationship there. Endemic hunger is negatively related to an emphasis on

making children self-reliant. Indeed, this finding is confirmed to some extent by the discovery of a negative relationship that pertains as well between the constancy of yearly food supply and the age at which children are allowed to begin his or her development autonomously. Hungry people in this sample tend to keep their--or I should say, people who have been hungry in the past--tend to keep their children close by the primary caretaker longer than well-nourished children. In the case of child training in generosity and trust, endemic hunger appears to discourage it.

[Now/this/is/congruent,/I/might/add]. This apparent de-emphasis on training in generosity and trust appears to be congruent with adult behavior in at least one area. Endemic hunger generally means that whenever large reserves of food are on hand, they are kept in, under, or around the house or locked in private storage rather than being left in [non-local or] communal facilities. Maybe we could take a look at the next graphic here in that connection (Fig. 9). Here we have the sample arranged along this hazard vector from starvation hazard absent, here we have epidemic hunger again (famine), and endemic hunger. Then we look at how people store their food in these societies. You'll see that we run from little or no storage to storage in government or commercial stores--that is, nonlocal storage; communal or unguarded stores in the village or town or whatever; to situations where some households keep reserves for emergencies; to cultures in which all households store food within, under, around the house, or within sight of the house under lock and key. And as you can see, there is a strong tendency there for societies endemically hungry to practice [~~that~~ a guarded] kind of storage. They aren't about to trust their food outside of the immediate vicinity of the house.

The inhabitants of the post-nuclear-winter earth may, as indicated previously, be enculturated with an ethic of self-restraint, but we will not see this in their attitudes toward food. Looking at the probability sample again with respect to hungry seasons, we find annual hunger appearing to encourage--I'm not real happy with these terms, but let me just say--intemperance toward



eating. <<Let's look at the next one.>> Maybe in the discussion you can help me out with terms here because I'm not at all pleased with what I've got there along the horizontal dimension (Fig. 10). But here we see societies sorted as to their experience with hungry seasons, and along the bottom row their attitudes in approaching food. [These] range from moderately indulgent--people who seem to enjoy eating, may have a few rules against gluttony, but nothing more. We [next] have people who appear to exhibit a highly controlled attitude toward food; that is, they have manners or etiquettes which give the impression of abstention, an abstemious attitude. One shouldn't take second helpings without being offered and this sort of thing. Then we have more inhibitive attitudes toward food, where in fact people do not like to be seen eating. They tend to be solitary eaters or cover themselves or hide themselves while eating. [This category includes some] societies in which people eating a great deal can be accused of sorcery or witchcraft--highly negative attitudes. And then, finally, highly intemperate eaters--these are the people who are described in ethnographies as eating like wolves or people who apparently have a great time racing each other and consuming as much as possible in as short as possible time. We notice that the relationship here is a rather interesting one because we move from moderate indulgence through some controlled attitudes to a kind of uncontrolled attitude as food supply becomes more and more tenuous throughout the year.

Let's look at the next transparency (Fig. 11) to see why, because this conforms exactly to the kind of prediction that is set up along the Laughlin-Brady curve.<sup>17</sup> [As we see] we run from low to high here on levels of social cooperation, and look at this in relationship to ecological stress--low to high. What Laughlin and Brady a few years back tried to show--predicted--is that when we are under low ecological stress, well, there is a kind of moderate amount of cooperation; this tends to...

\* \* \* \* \* Side 2 \* \* \* \* \*

[increase at first as stress increases but drop]...off very, very quickly as we move into high stress. And if you recall the business about attitudes toward eating, here's where [at the point of low stress] we found the moderately indulgent people, and then we saw people who might be said to have experienced moderate amounts of ecological stress having attitudes which I would argue are functionally related to a greater amount of cooperation or sharing; that is, when you are under certain controls at the table, your culture controls the amount of consumption; there is more left for other people; it's a more cooperative type of posture or attitude. And then as we move into the people that I called "intemperate," we have people more out for themselves--we might say more selfish in their eating habits--and levels of cooperation drop off. So I think this curve is predictive in more than this particular trait, but we can talk about that later. Let me hurry along here and finish up.

Competition as mentioned previously, is stressed in training children in environments of nutritional stress; however, further findings suggest that, within households, competitiveness will be mitigated by the amplification of male dominance and male/female distancing. In the probability sample, we find [that] a disproportionate number of cases amongst people exposed to famine in which the father or husband eats first, or is served first--indicating perhaps a stronger tendency to show deference to the adult male in the household. There is one last transparency--just take a quick look at this one (Fig. 12)--where we've put the starvation hazard against who eats first or who is served first at the table. As you can see, it's male first in societies, disproportionately, that have experienced epidemics of hunger; [it] runs rather evenish in those that have endemic experiences. And it's disproportionately the other way in societies where hunger has been absent. So, what seems to be the case there [in societies with a history of starvation] is that even though we have an emphasis in training children to be competitive, perhaps that competitiveness will be directed outside the household. [and that] Certain conventions, such as

what I would argue here is an indication of a dominant status, the male dominance, will mitigate that competition within the household. It is also noteworthy that within the household, societies which have experienced hunger tend to disproportionately separate the male and female while eating. That is to say, when food is served, males, females, and children tend to eat separately in households that have had histories of food shortage.

All of this begins to suggest that societies of the post-nuclear-winter age will suffer considerable atomism. The scourge of hunger promises to drive social relations worldwide toward what we see today as the least solidary, least cooperative extreme. Again, we've suspected this, but I think there is no reason in this data to deny that. The generosity, the trust, the affective warmth, the closeness that's generally valued in our culture will undergo serious erosion. The initial impetus for this evolution will be tight constraints [*of individuals*] on individuals, to survive. Inadequate time and energy budgets will afford little latitude for relationships and actions that are not closely calculated in terms of their instrumental value. Children growing up in this sort of social environment can be expected to replicate it. Ecological projections suggest that these replications will receive repeated reinforcement by virtue of the persistence of seasonal hunger and waves of epidemic starvation for perhaps several generations into the future. Thus, nuclear winter promises not only to compound the ruin of the earth and its habitats, but to degrade, in my opinion, the very qualities of relationships which we have come to realize as the fulfillment of our human potential. Thank you.

ARMELAGOS: Questions?

[AUDIENCE B out of microphone range]

AUDIENCE B: I'll make my point shorter. Point 1, I am very uncomfortable with the way our particular meeting is going right now.



When I go back to my classes, I have one quote from you, and I want to make sure I have it quoted correctly--that "food prices would soar beyond normal means after a nuclear war and in a nuclear winter." What the hell--what's going on here? I don't know what that means. As I said, I think we have a worldwide ethnography after a nuclear war here. What are we talking about?

Point No. 2, I was looking forward very much to hearing each one of the panel members speak for 5,6,7 minutes on a point of view. Either I'm not familiar with a change in the schedule or the schedule is wrong and then I thought we would open it up to discussion, both on the panel and [ØØYH] with people in the audience. Is that particular arrangement still present, or will we have 20- or 30-minute presentations by each panel member?

[Response that there will be audience-panel discussion.]

Let me go back to the first point, then. I reiterate with Prof. Lee as saying, I think there is a fait accompli in the minds of, at least, some of our panelists. "This has taken place, and now we will study what happens afterward." Why not study kinship systems or sexual positions people may take after nuclear winter? I find this tragic, at the same time incredibly humorous.

DIRKS: Well, to respond to your first point in fact--do, in your quotation, please correct it--[YHAY] I was speaking of the far southern hemisphere, where we have seen that in the previous presentation that nuclear winter as a factor of lofted smoke may not be quite so serious. But secondly, I really object to your attitude in that we're treating nuclear winter as a fait accompli because I don't think that's the case. Do you see no value, sir, in speaking of these things for the education of a public, which in fact in this country is very blase about the fact of nuclear winter and doesn't realize the impact it will have on their lives? Do you see no value in educating them?

AUDIENCE B: [Unclear; perhaps, "I would prefer to hear what the other panelists have to say."]

ARMELAGOS: Give us a chance.

AUDIENCE C: I just have a very brief point, although maybe it's got a similar thing with regard to the suggestion that there is a sense of a fait accompli here. The first two speakers frequently refer to what will happen, and it's especially unsettling to me to hear from a representative of Los Alamos talking about what will happen because certainly just from the linguistic point of view that creates the sense of inevitability, which can contribute, I think, to resignation and passivity among the public.

BUMSTED: Let me go back--the assumption for this is an assumption for discussion. We need some point [from which] to start a discussion.

AUDIENCE C: It's just a very fine linguistic point is all I make; if you repeatedly refer to what will happen, and if that's true throughout the media to the extent that it is, I think it can kind of feed back in a small way into the probability of the event itself. People think, "Oh, this is what will happen." I'm not ready to throw in the towel by any means, and I think from the standpoint of representing Los Alamos, the possibility of creating the sense of inevitability is, I think, very dangerous.



ARMELAGOS: This presentation is co-authored with Elizabeth Schueler<sup>2</sup>. It's called Biological Consequences of Nuclear Winter, and I would like to just preface this: I don't see myself as someone dealing with the survival aspect. But what I am concerned with is a situation in which the public doesn't realize what the consequences are, and I think this will be clear from my presentation.

On November 26, 1985, New York Times reporter Peter Lewis states that the Compaq Computer Company announced that its model 286 Tempest is designed to withstand electromagnetic forces generated by a nuclear explosion while computing spreadsheets 30 percent faster than the IBM PC/AT. While it is difficult to determine what factors fuel the optimism of the Compaq Company, attitudes such as this may be influenced by the Reagan Administration's scenarios for our country's response to a nuclear attack. According to the Federal Emergency Management Agency [FEMA], adequate evacuation and shelter plans will result in the survival of 80 percent of the American population following a nuclear attack. The Crisis Relocation Plan [CRP], which is administered by the FEMA, is based on the evacuation to shelters in low-risk areas in anticipation of a 6559 megaton nuclear attack (the CRP-2B model). <<I should point out in terms of linguistics, it's....When you talk about 6559 megatons, what you have to realize is that this represents a yield comparable to 524,720 Hiroshima bombs.>> The plan argues that there will be 3 to 5 days of heightened tensions, giving the 150,000,000 Americans time to travel 50 to 300 miles to designated low-risk areas. The scenario assumes that following a nuclear attack, a large segment of this population will persist biologically and that the ecology will not be disrupted enough to constrain human survival. Recent criticisms of this plan (and there is a good book by Leaning and Keyes called The Counterfeit Ark<sup>18</sup> of the CRP plan) offer a bleak picture in which the health of the population is severely impaired and the ecology is seriously disrupted. Given these criticisms, we find it difficult to envision a post-nuclear population whose survival is[~~n/y~~] assured or a post-nuclear world in which survivors

will be concerned with the speed at which a computer can zip through a spreadsheet.

The devastating effects of a global nuclear war are numerous. Scientists who have been involved in the FEMA studies believe that those who survive a nuclear war will be free from the effects within a few years. <<This is the point I think that we're trying to address--[YMAZ] the lack of logic in any of this thinking.>> The studies use a CRP scenario which identifies four stages in preparation and response to a nuclear attack. The first is relocation. The second is reception of the relocated population and their stay in communities prior to the nuclear war. <<By the way, if you look at this plan, they have advice that says that if you are going to a host individual, that you are a guest, and [they] give you rules of etiquette on how to behave.>> The holding period during and following nuclear attack is the third stage, and the fourth is the post-nuclear world. While these studies calculate a 20 percent mortality, they assume that the post-nuclear disruption (the post-shelter period) would be minimal. Recent analyses have suggested that the immediate mortality during a nuclear attack may be greater than the CRP predictions and that the long-term consequences of a large-scale nuclear war are more severe and life threatening to those who do survive the blast itself. A nuclear exchange would threaten the health of the people both directly, from the impact of the blast and radioactive fallout, and indirectly, from the explosion's impact on the physical and biotic environment and on the economic and psycho-social well-being of the people.

Abrams and VonKaenel<sup>1</sup> have identified four periods during and after the nuclear attack, [WHERE when] specific deleterious health patterns are likely to occur. The first stage of their scenario is the "barrage period," with populations [WILL/Be] subjected to trauma from initial explosion and injuries due to radiation. The most affected will be those adjacent to the blast areas. They have calculated that, moments after attack, 86,000,000 people (40 percent of the population) will be dead; 34,000,000 will be

severely injured (and that's 27 percent of the survivors). The length of the "shelter period" will depend on the intensity of the attack but could range from one to many weeks. Survivors will be restricted to fallout shelters during this period, in which 50,000,000 additional fatalities can be anticipated, resulting in a total mortality of 133,000,000 deaths. In the post-nuclear period which follows, the radioactive fallout will eventually decrease, and survivors will be permitted to leave their shelters for limited periods of time. The survivors will find a world in which there is scarcity of food and shelter, a contaminated environment with an abundance of corpses, and an infrastructure in ruins. Abrams and VonKaenel estimate that 60,000,000 Americans will survive the first three stages of the attack (a figure significantly lower than [that prepared by] the FEMA studies). Those who do survive the recovery period will find only a rudimentary social structure [and] a non-existent food procurement system and [will] face short-term and long-term consequences to their health which will further challenge their ability to survive. Unfortunately, these effects will not be restricted to the northern hemisphere, for populations in the southern hemisphere will also face serious consequences. Harwell<sup>11</sup> provides an excellent summary of these short- and long-term effects in both the northern and southern hemispheres. We will examine the biocultural impacts of the post-shelter period in which a deteriorating environment will provide for a nuclear winter. <<And I think the point of this is that [in] the plans that have been proposed and which the public sees, [~~is/that~~] this aspect is not discussed, and I think that was the point of what we are trying to discuss today.>>

Many have argued that the climatic conditions after a large-scale nuclear attack will result in such deterioration of the environment that we will experience a "nuclear winter," a term which we have already discussed. Research in this hypothesis is based on a 5000-megaton exchange between superpowers and, for the purpose of this paper, this is what we are going to evaluate. While it is difficult to predict the extent and severity of nuclear

winter (due to unknown targets, doses, and so forth) realistic models of the biological impact have been produced.

There will be numerous [~~individuals/facing~~] immediate detrimental effects on the physical well-being of the people who survive the actual nuclear blast, the emitted ionizing radiation, and the thermal radiation. The blast will physically alter the environment from its tremendous force, which can be expected to cause buildings to fall, avalanches, dam bursts, and landslides, which obviously are going to have a high fatality.

Ionizing radiation would alter the immune systems of individuals. Coupled with difficult and extenuating living conditions the individuals will be faced with a post-attack period, the individual's immune system deficiencies would give rise to an increase in viral infections. Radioactive fallout (emitting gamma radiation) would produce vomiting and diarrhea. [~~Because~~] Water is likely to be contaminated from radioactive fallout [and] from a deterioration of the sanitary system; dehydration from this lack of water and an increase in diarrhea could pose serious problems. And these things are actually life threatening in these conditions.

Tremendous clouds of nuclear dust will be in the atmosphere and will have the greatest impact on the population, and as a result, the risk of respiratory troubles will be expected to be great. The dust will also result in the cooling of the earth's surface, and dramatic decreases in temperature will in turn cause frostbite, hypothermia, and perhaps death to those who are not protected from the harsh environments.

The short-term health effects on the surviving population will be further intensified by the destruction of an estimated 80 percent of the medical resources. (The FEMA report[s], by the way, suggests that there is going to be a minor impact on the health resources, and they even suggest that we can use allied health professionals such as chiropractors as primary health care individuals, and they point out that digging shelters is going to cause many backaches and so they will be able to be helped by these professionals.) Not only will there be fewer to care for the sick,



but it can be expected there will be little, if any, remaining pharmaceutical industry.

The availability of food will be problematical, and it's been estimated that 95 percent of the agricultural capacity, 60 percent of the US processing capacity, and 20 percent of the production capacity will be destroyed. Access to available food will be difficult, as transportation systems can be expected to be destroyed. Although malnutrition will not be an immediate threat, lack of food will cause an increase in tensions and panic amongst the survivors.

The long-term effects that a nuclear winter will have on the health of the population represent an even bleaker picture. Perhaps the biggest concern will be the ability to obtain food. The stored grain which will not be contaminated has been estimated to be available to sustain the population for 6 months. And I think that I have a little bit of a discussion in which we talk about that, but the previous individual [Dirks] had mentioned the impact of that.

There is also a high probability of an increase in infectious diseases during a nuclear winter because of decreased immunity of the population and unsanitary conditions. Dysentery, hepatitis, salmonella, and cholera have potential to being serious threats. Radiation will also cause genetic defects, cataracts, and, because it seriously harms cells responsible for the production of red and white blood cells and blood platelets, individuals will become more prone to fatal hemorrhaging and septicemic infection. Radiation will also injure the bone marrow and depreciate the cells of the gastrointestinal tract, which could lead to fatal infections and death.

We should be reminded that these unfavorable health conditions will be intensified by the fact that medical resources will be scarce. It is also important to attempt to understand the psychological state that the survivors will be experiencing, which will inevitably affect their physical response to pathogens. It is difficult to predict how a population may react to such trying



conditions, yet if they could act cooperatively in such a predicament, it would to some extent enhance their ability to survive. Predictions on the psychological states, however, cannot be too positive due to such devastating impacts on the social infrastructure and health of the people.

The potential for future populations would be slim. Radioactive exposure would impair genes, and beta-emitting fallout has the potential for causing temporary, if not permanent sterility. The fetus in utero at the time of the attack would be most likely to be given some aspects of retardation in growth, and the babies that are born after the attack will most likely be malnourished, and there will be an increase in the probability of sterility in the reproductive segment of the population. <<I should point out that in one of the scenarios they talk about the impact of such diseases as plague, and the FEMA report suggests that (and this is a quote from William Chipman, who is in charge of the FEMA civil defense)--he says, "The bubonic plague is a source of considerable optimism," (this is from Congressional testimony; it's a description<sup>28</sup>)--he says, "Bubonic plague is a source of considerable optimism to Chipman, who observed that it is horrifying at the time, and yet 6 to 8 years later, not only had the English society rebounded, but by God those people went out and had an expeditionary force to France." I hope it's not a model that the Government is following here.>>

The impact of nuclear winter on the southern hemisphere should not be overlooked or underestimated. Radioactive dust will travel to the southern hemisphere and cause a cooler and darker atmosphere, to which it will be difficult for the population to adjust. Perhaps, most importantly, all of the countries that are dependent on the United States and other areas for food and economic aid will face serious hardships. Famine would expect to flourish and the economic and political situation would be devastated.

In the event of a large-scale nuclear war, those who survived the blast would be faced with extremely marginal conditions. The ability for the remaining population to sustain their physical

health is highly unlikely and suggests that perhaps humans would not be able to maintain their population. Those not affected directly from the blast would hardly escape the impact. In fact, they, too, would probably face starvation due to a heavy reliance on food products from the Western and superpowers who would still essentially be incapacitated and unable to help themselves or others survive in the other hemisphere. It is instructive to remember President Dwight D. Eisenhower's comment on a 1957 report (the Gaither Panel) which recommended a massive shelter building program in response to nuclear threat. He cryptically stated, "You can't have that war--the living will envy the dead."<sup>34</sup>

ARMELAGOS: Yes?

AUDIENCE D: I'd like to comment on the previous two comments, and perhaps I speak for the minority here, although I don't think so. But I find the panelists' presentations extremely enlightening. It's new information to me and I very much appreciate this. I would encourage the panelists to present their evidence in full. I have not been to the AAA meetings in several years. I find it very exciting that suddenly the first evening that I was here that there is a discussion of international peace and the contributions that anthropologists can make in the formulation of foreign policy, and yesterday there was a discussion of terrorism and repression in Central or Latin America, and I think one of the contributors mentioned that the issue of terrorism was something that was absolutely not mentioned 5 years ago in these meetings. So I would encourage the panelists to continue and I appreciate what they are doing.

AUDIENCE C: In response to that response that included a comment on my comment, I guess, I think it is a very good idea to talk about what would happen if there were a nuclear war, but I greatly recommend the phrasing that way. "What would happen if there were"

instead of "what will happen when there is." Again, I think this is a good session. It's good to talk about this stuff. Hominid foresight, that's our hope. So we are talking about a disaster that could happen. Let's not talk about will happen when it does, but what would happen if it does. Thank you.

AUDIENCE E: I appreciate the investigations of the speakers, and I hope that as we get further into the discussion it will also address, I think, the critical problem. We're dealing with a collective insanity, a nation of cheerful robots, an insane ideology, and I would like to see anthropologists more concerned with that problem rather than with the after-effects of a nuclear winter.

ARMELAGOS: But I can't understand how this is being misunderstood. This is what we are talking about--that insanity. We are talking about a plan that the Administration has that talks about survival, and even though that plan is not going to be funded, that's the mentality that is out there, and that's what we are trying to address. We're not talking here as planning what is going to happen, but what would happen in that particular situation. I hope you understand that.

ARMELAGOS: The next paper is by Catherine Bateson on psychological anthropology.

BATESON: I've been very much troubled by the same matters that several of you have commented on. At one time, many of us felt, and I can see many of us still feel, that the aftermath of a nuclear war or the possibility of some number of human beings surviving should not be discussed at all because it raised the likelihood of all of this occurring. Now, interestingly enough, we've gone through one major shift of gears on that matter. There was a long period, it seems to me, when people thought, "Well, either I die or I don't die." And there has been a tremendous impact from people who began to say, "What if I survive, and I'm wounded or sick and I can't get treatment?" I think that that shift of gears was important in making people realize that nuclear war is something that must be prevented.

The nuclear winter hypothesis, which is new, has also had such an effect. By making people realize that the planet we call our home will be radically changed in the short term and in the long term; the kinds of starvation that will occur; the notion of darkness, of winter and summer, is a very frightening notion; and the working out of, the modeling of what nuclear winter could mean in physical terms, has I think, been very important and it's very important to make that knowledge available to the general public. Similarly, I think it is very important to discuss the terms of human life in the northern hemisphere following a nuclear war because I think that we can recognize that we are talking about something which we might not want to call human life. I don't think we are talking about survival. We're talking about populations which are minute, traumatized, vulnerable, broken down to minimal kinds of social relationships, and I think it may be helpful for us as anthropologists to display this fact. This is perhaps the only body where we can simultaneously discuss what's happening in bone chemistry and in mother/child relations and in religion and

law and crops. These are the range of subjects that have to be brought together when we want to discuss something we might want to call "human life." And it is absolutely our obligation to carry that discussion forward, and there is a great deal of work to be done because, of course, we can get some information from knowledge of societies where hunger has been recurrent, epidemic, annual, and so on, but that situation is only a shadow of the post-nuclear possibilities we are discussing.

Anthropologists have expanded the notion of the fully human: the range of behaviors that we would respect, that should be protected--respected as cultural adaptations of some human group somewhere. If we as a scientific community can say that conditions after a nuclear war do not meet those criteria, we'll be making a massive contribution. After all, there have been times when we have argued that infanticide, as part of the range of adaptations of a given community to a given ecological system, makes sense and must be respected. What would we argue about massive infanticide and abandonment of infants? This is the kind of question that is posed to us, and it's a question that is not uncomparable to the question of how we think about people being kept alive by life-support systems in hospitals, who are no longer capable of a human existence, of interpersonal relations. We have had in the last decades to look at situations in which life is technically present and say, "No, this is not human life; this is not someone who can function as a person." We have to distinguish biological survival from human survival. The same distinction needs to be made here.

If you look at the fantasies of life after nuclear war, they have a certain number of interesting characteristics. There have been a good many of them. It's interesting to notice, of course, that there is a certain appeal in the notion, particularly for Americans, of being thrown into a situation that requires individual heroic ingenuity. That kind of appeals to people. This is what they visualize themselves doing. They visualize themselves acting ingeniously and creatively finding solutions. They visualize themselves--even as death approaches--being loyal to families,

worrying about their children, holding them in their arms--as death approaches. Sometimes people visualize themselves committing suicide, as I think a great many people would, with a fidelity to their basic values and religious ideals intact: a noble stoicism. "Unto thy hands, I commend my spirit." "My personhood, my sense of values is unchanged, even as I imagine myself coming to death or choosing death in a difficult situation."

I think we have to ask whether those images are valid images. I think they are valid images for a short-term period, but I think we must consider the breakdown, not simply of civilization, but the breakdown of the mechanisms for the transmission of culture between generations. This is what we should be concerned about when we think, at least, about the northern hemisphere. The southern hemisphere--I think Prof. Dirks' picture probably is a very valid one: a harshening of relationships in various ways in places where survival might continue to be possible. I don't think we could imagine something like that for the northern hemisphere.

Now to examine this--to examine the possibility that those who survive would survive in a state where they were no longer able to feel that they exemplified their own values--we have to look at a great many kinds of available data. Many of us in our teaching use Theodora Kroeber's depiction of Ishi.<sup>16</sup> That's an interesting example. A tiny little group of people who suffered the loss of a world, although it was a local phenomenon, and remained loyal to each other and to their values, cared for each other. But of course, as I look at the Ishi case and the dignity that clearly was maintained there, the thing that strikes me is that even as the group became smaller and more isolated and more limited in its access to resources, the actual environment in which it was functioning remained intelligible. The individuals have the knowledge of how to exploit that environment, even as it became more and more difficult. This is not what we are talking about for the northern hemisphere. We are talking about an environment that first of all behaves differently, is radically changed, and second of all, we are talking about a population whose knowledge does not include how



to relate to that environment without massive technological support. The physical and natural environment in which human beings would be scrabbling for survival would be strange, hostile, and unpredictable, and furthermore would be irregular, would be shifting over time, as the aftermath of nuclear winter developed. It would not be an environment that would provide a basic sense of regularity and reassurance; certainly, the human environment would not be.

I think it would behoove anthropologists to not simply to look at data from a number of different areas but to begin to put it together. This is what the folk who are trying to confirm or disconfirm the nuclear winter hypothesis are doing. They are modeling a brand new situation which cannot be constructed experimentally and bringing in more and more information to be able to project what would happen. We obviously need to look at all available information about famine and natural disasters. We need to bear in mind that when there is an earthquake in Mexico, however horrifying it is when you are there, you've got relief workers coming in from the outside and assuring you that the world goes on--it is an immense reassurance--and someone in a uniform, preferably a Red Cross uniform. That wouldn't be there. Most of the information we have on famine, but not all of it, is on famine that may last a year, 2 years, [and] develops gradually, among people that know an awful lot about finding roots. It phases in and phases out. That would not be the situation. But I agree that we need to look at all of that data--the data of people managing to survive, the data of severe cultural breakdown such as that described by Colin Turnbull.<sup>32</sup> We would have to assume, I think, that adaptations that may make sense when famine is a temporary phenomenon--infanticide, cessation of lactation resulting in the death of infants, the death of infants and old people before the death of adults--would be, over time, for a population, disastrous--disastrous isn't a very good word, in this context--irreversible in the sense that [you] if for too long a period your effect on child rearing is too severe, you will not get the next generation.



We need to look at the evidence of various kinds of religious cults that arise under circumstances of cultural disorientation and disaster, paying especial attention to the fact that a good number of these cults involve cessation of adaptive activity. You don't plant this year because the ghosts, or the gods, or whoever it is are going to come. In other words, a new set of ideological structures may arise that justifies not planting, not building, not developing alternative resources, not reproducing, not caring for children. There is a great deal of psychiatric evidence that we need to look at. We need to look at all...

\* \* \* \* \* Side 3 \* \* \* \* \*

[the data we can find about circumstances that disrupt animal and] ...human mother[ing]--the effects of bereavement and hardship and anxiety on lactation. We need to look at depression. I think one rather has to assume a society nearly disabled by severe depression and the effects of survivor guilt.

We also need to look, I think, at the evidence on the cross-generational propagation of psychiatric problems. There's now a good deal of that--battered children grow up to batter; children of alcoholics grow up with severe disorders of many kinds. When we are asking the question of whether human survival (or survival that we would want to call human) would be possible, it must be the question of whether a generation who are infants or born shortly after a nuclear war could be raised and enculturated, in some sense, in such a way that they themselves would form pairs and rear children. It's that generation that's most in doubt, [*IN/THE/CASE* the children] of the traumatized survivor generation. So I think we are really talking--if we want to talk about the way culture functions as an adaptive mechanism--we are talking about a mechanism that has to be transmitted across the generations. And the test is not what people do a week after the blast, the test is whether 30 years later the society is--having gone through the experience of death on all sides, and loss--is able to do that caring for its members that is a minimal requirement for survival.

The need for intensive caring in an extended childhood and the characteristics of teaching and food sharing to some degree, in some mode, are part of what we mean by human life.

Lastly, I think we should examine ethological evidence, and there is a scattering here and there of evidence of ways in which caring for infants across the generations can be disrupted in animals. There's Harlow's famous experiments.<sup>10</sup> There are substantial experiments of animals in which infants raised under anomalous circumstances--traumatic circumstances--can fail [in] pair bonding and fail in caring for infants. They don't know how to do it.

I don't know that this kind of breakdown is what would happen. I listened to Dr. Dirks and I thought about some of our friends in the Administration who believe that self-control is good and permissiveness should go, and I thought, "My goodness, they might think that a society suffering starvation would be a better society rather than a depleted one." But you take it a step further than the discussion of self-control, perhaps with the image of [~~IN~~ ~~CONTINENCE/EATING~~] intemperate eating, [and perhaps that image is less attractive]. I don't think anyone in the United States would choose that image of human life as something that they would value if they understand what it means. It is not the model of heroics, service, survival, fidelity to family, and so on. It is probably a model of conflict, alienation, confusion, apathy, and rejection of, finally, of all important interpersonal ties.

I think [we need] the same kind of study--modeling the human relations that would follow a nuclear war--that the physical scientists have been giving the nuclear winter climatic model. Most of what I am saying is very speculative, would have to be modified, but such a picture would perhaps be as persuasive as the fear of medical suffering, as persuasive as the fear of climatic change. It would say, "Were this to happen, we would not know ourselves, we would not want to be ourselves."

ARMELAGOS: Questions?

ARMELAGOS: Our next speaker is Laura Nader, who will talk about law and complex societies. <<Oh, I'm sorry; go ahead.>>

AUDIENCE E: I have a comment and I would maybe like to suggest that [~~is~~] one alternative for us, maybe, [is] to question our political conditioning where we can believe that winning is so all important, where surrender may not have anywhere near the disastrous effects.



ARMELAGOS: Laura Nader.

NADER: I just have a few brief comments. They won't be about law in complex societies. I agree with Eric Wolf<sup>36</sup> that we subdivide too much.

What you've been listening to this morning is a piece of a ritual that has become institutionalized in the United States--part of a reflection of our inability to discuss the present and the battles of values that is happening in our country and in the wider world. Our inability [to discuss the present] has been projected into the future and so we discuss things like nuclear winter--the pros and the cons. It reminds me of the work that I did on the CONAES group<sup>22</sup> as part of the National Academy of Sciences a few years ago; my reaction in the beginning was very much like the reaction on some of your faces that I saw. I couldn't comprehend people talking about the year 2010 as if it were real, and arguing about whether it's .5 or .4 when they're projecting forward, and using the verbs that they used as if it would happen. And then I realized that this was a way of talking about things that we couldn't talk about any other way.

In the CONAES report, which had to do with nuclear power, the anthropological input was very much rejected and never made it to the final report (although [it] did get published), and it was said at the time publicly that the report was irresponsible because what we had said couldn't possibly happen by the year 2010--and in fact it had already happened before my report was published. It's interesting when you get physical sciences in the business of predicting [they do no better than less qualified people, usually]. I think that Catherine Bateson is absolutely right that somewhere we have to make our input in this as we see fit. But the fact that they can talk about a nuclear winter--even those who know the horror or who feel that it will be a less than human situation--that they can talk about communities or that they can talk about nuclear families [as if things will return to 'normal' after

a nuclear war. ~~they can talk about in and around the house, male dominance, and~~ It gives you some understanding of why we need to participate. They are doing the very best that they can often, and [some of] the circumstances [or context for their work ~~maybe~~] will be revealed in my comments.

I saw a book advertised called Nuclear Winter--the Human and Environmental Consequences of Nuclear War.<sup>11</sup> And, in the same powerful sort of sense of being able to talk about the future as if you knew, <<We are uncomfortable with that because we study societies that are here or were here.>> the advertisement said this was "an authoritative account of the consequences of nuclear war for humans and the environment." It is the "first comprehensive description of the world after war that includes both effects on humans and the phenomena of nuclear winter"--an authoritative account. I think it's important to take a look at the fantasies and the way in which we envision the after-nuclear situation. And if anthropologists begin (or maybe some of us have) to examine these fantasies that Catherine Bateson spoke about or [if we examine] the survivalist literature, [we will] get a really interesting sense of what is going on in people's heads when they read the newspaper or when they think about the future. I mean, one perspective that you get from the survivalist literature is of a society that's intact except that there are fewer people; that you're going to have--after nuclear war, once the dust settles down--a situation where it will be easier to park. There will be shorter lines at the bank and no lines at the supermarket. It's the same idea of, somehow, of a society that's intact but just thinner.

A former colleague of mine, Bob Heizer, an archaeologist at the University of California, thought a lot about questions having to do with nuclear; he thought a lot about Ishi, and he put together a book about the destruction of California Indians.<sup>13</sup> He did his archaeology in Nevada and he was part of the environment that must have had some of the fallout effects of the testing in Nevada. He wrote, before his death, "Cultures of the past have

handled internal strains without collapsing, but present-day culture and its problems are not only unique, but involve all humanity so that the magnitude of the difficulties is something never before faced by man. There is no precedent to look back upon, and no certain guide to the future, except the knowledge that sooner or later all cultures lose their momentum and decline."<sup>14</sup> So on the one hand, we have really nothing to say about after nuclear winter. On the other hand, if you see it as a ritual whereby we have to talk about things that we are denying talking about, we have to participate.

I commented to a professor, not an anthropologist, at the University of California, on the literature on nuclear winter and my horror about the same things that you feel horrified about, and his response gave me another perspective--and this is from a full-fledged professional. He said, "My God, it would put us back a thousand years." A thousand years would be pretty good.

We should listen to children because I think in a way the most spirited among them say that there's no way to talk intelligently about nuclear winter. Survival equals prevention and, interestingly enough, their view comes closer to that of the archaeologist, Robert Heizer. To focus on the question of how people would cope with nuclear winter, in a sense a strategic analysis in a dream world, pseudo-science operating in the realm of data-free analysis--there is no society that we know about that can cope with what is being talked about. And maybe one of our jobs, apart from participating in that ritual, is to bring it back to the present and look at how people react in our society with minor catastrophes, in comparison to nuclear winter.

We can't even deal with toxic disasters. It's been said that in New York, hospitals are totally inadequately prepared to deal with any toxic disasters. And somewhere along the line we have to plug in to the literature that is being generated what [it is] we are capable of coping with. In the nuclear power question, we found scientists who had said that we could clean up New York or



evacuate New York in the case of a nuclear disaster in anywhere between 2 to 4 hours. That's how out of touch....

It's up to us to say to the world that there are certainly important changes in the history of warfare here. We have moved from war as homicide to war as omnicide, suicide. An unanswered first strike destroys the striker as well as the struck, never mind whether it is an exchange or not.

This brings me to two points that I'd like to leave you with. The present war directions--whether you're a good guy or a bad guy--have been the product of a very few people; a small number: military and civilian people, private and public people, people who have provided the main source of legitimacy for the war business. Yet we say we're a democracy. Perhaps the most ubiquitous inequity in democratic societies has been the inability of people to participate in decisions about that ultimate equity instance--the likelihood of survival. And we're in no better position than the Soviets, the Soviet people. One of the dangers of the modern world is that the general public is not aware of the risks and uncertainties. And one of the findings of anthropologists has been that people practice more magic in "unknown and dangerous waters," as Malinowski put it for the Trobrianders of the western Pacific.<sup>19</sup> And for this reason, we might conclude that scientists, military scientists, are less competent than most people believe to be charged with the responsibility for policies that lead to the ultimate equity instance.

The second point has to do with the question of what I've called "institutionalized insanity" or "collective insanity." The result of living and working in insulated laboratories, whether it's Los Alamos, or universities, whether it's the University of California at Berkeley: populations of experts and specialists that are isolated from life [WHO] now come to talk about nuclear warheads as "weapons of life," some of them. We need to contribute to the studies of major actors in the so-called nuclear scenario. Not in an arrogant way. We need to help test the assumptions they are working with. We need to "de-isolate" them. We need to write

down but not laugh when they say things like, "Dr. Nader, you don't understand the beauty in destruction." We need to disseminate widely knowledge about the principles which allowed the so-called simpler societies, like those that Heizer studied in Nevada, to survive beyond the duration of civilizations. In Malinowski's study of the Trobrianders you will recall he found that the Trobrianders were able to distinguish between empirical and rational knowledge as compared to ideas operating under the influence of desire or fear. We need to point out when our scientists are unable to make those distinctions.

When I was a Fellow here in Washington at the Woodrow Wilson Center for International Scholars, I heard a luncheon talk by the then-Congressman Brademas. I didn't understand why he was giving this talk on Civics 1A, on the three branches of government, on the checks-and-balance system. But my wondering was answered by a question from a general in the front row. "How do you think we could possibly fight the Russians with a democratic form of government?" We are increasingly imitating the Soviet system--a military and scientific bureaucratic system out of control and a population behaving like lemmings. Democracy means popular participation in the decisions that shape our society and affect our lives. Along with being anthropologists we are also Americans. And as anthropologists and as citizens it is up to us to question the normalizing of nuclear war, even by debating whether we should discuss things such as nuclear winter. Along with this we have to explain the herd instinct that is pushing us either to follow blindly or to deny [that] what is happening is very real. Thank you.



AUDIENCE F: I think that anthropologists know more about the destruction of culture and its effect on human species than any other profession, but I think it's also the point that anthropologists may have talked less about it than almost any other professionals because, as we all used to know, it was dangerous to talk about these things if you ever wanted to go back into the field again. That's no longer true. And it seems to me that our biggest contribution, perhaps, to this field is to tell about the disappearance of the human horizons that all of us have been witness to. The destruction of human culture by loss of land, by imported diseases, by slaughter, by conversion to foreign religions, and all the rest of the things, that we've all known about [in *WIKI*] all the nonmercantile and nonindustrial nations of the world that we have encountered, and we have destroyed our civilization in the last 200 or 300 years. It seems to me our first duty is to write the black book of our own destructiveness, because I think the book of our own destructiveness is a part of the insensitivity of this society which now can contemplate the destructiveness of the whole human species. I think we are all so full of--this whole society is so full of guilt--an unadmitted guilt, which can move populations around into inappropriate circumstances (as the blacks have been moved into the city with no preparation) can cause every kind of possible social ill because [ØØØ] of simple greed, simple carelessness for the human values that we care about and that we study. I think a big first step would be that the society of American anthropology [American Anthropological Association] would begin now to join in with the efforts that only a few people in the society have done, to talk about the disasters that we have already caused--the destruction of the honor, the destruction of the people, and the actual brutalization of tens and tens of thousands of the great creations of human beings which are everything we've got, the cultural accumulation of the past. I think this is very pertinent to this discussion and it ought to become a part of our social program here in the society. Thank you.

AUDIENCE B (?): I'm glad you made that point. I think that we have to be aware of our potential for destructiveness, but up to the present time our destructiveness has always been, from a sense, on the part of some group [YMAZ for whom] there is a chance of gain. And this is true of war as well. War has been described as the final stage of diplomacy. It's an instrument for political gain on the part of the country that goes to war, and what we can do, and the benefit that I see this session as having, is to direct our efforts towards making it absolutely clear and absolutely convincing that there is no opportunity for gain for anybody in a nuclear war.

AUDIENCE G: I agree with Alan's point, absolutely. However, I think we need a real creative--not act--but way of thinking, ourselves. Because what we need is a vocabulary and a grammar and a form of statement and metaphor that people can hear and will respond to. I've spent 40 years of my life as an anthropologist, almost, talking to people who say, "Ah, but..." and you don't get anywhere at all. Now I may not be a very good arguer, but I've listened to others, and they are not listening to anyone who professes to be an intellectual, an anthropologist, a scientist who knows something--no. We need to find the vocabulary that will approach people--that they can hear.

AUDIENCE H: It seems to me that [when] we are talking about, when we question a normalization of nuclear war, we also have to question what kind--we have to ask some basic questions about the nature of a system that could bring us to this position in the first place. I think that's what Laura Nader was starting to do. I think that's the direction to go. We as anthropologists know that war is not in our genes, that it's a product of a system, that nuclear war isn't something that inevitably [happens *we/góZ/Yó*]. Certain kinds of social and political systems have created this condition. And so our discussion has to not only, I think, talk about what society would look like after nuclear war, but what is

fundamental to these societies (the United States and the Soviet Union) that could put us in this position, and do we want those kinds of societies? It takes us to some very basic and, for many people, uncomfortable questions. We have to question the very premises of these societies and ask, "Since these societies are bringing us to the very brink of destruction, can we go on in this way?" Is our only alternative to wait to see who and if people, who survives, and try to construct something different then, or can we say, "The time to construct something different is now." In the 1980s it's gotten impolite or not within our vocabulary to talk about revolution... [We]...possibly because in the '60s there were a lot of [people] who thought it was very easy. But it seems to me that nuclear war brings that question up very directly. If a handful of people who have military and economic power are bringing us to the brink of destruction, don't we have to say, "What right do these people have to rule the world in our name?" And don't we have to say we have the necessity to take that power back.

ARMELAGOS: Could we get some response and then we'll open it up again?

BATESON: I would like to respond to Dr. Metraux's [Audience G] comment about vocabulary. I have found Alan Lomax's use of the word "brutalization" a very helpful one [Audience F]. And I have been realizing that we have no term that we could use to characterize the social world after a nuclear war that is comparable to nuclear winter. And I think that in order to focus concern and to mobilize people, it is important to have a term that represents a given idea. The difficulty, just sitting here thinking about it--I wouldn't be very happy as an anthropologist with a term that suggests that men were behaving like animals. I know that the picture of a loveless world or an uncaring world would simply seem sentimental. I can't find a term that would encapsulate the fact that mutual caring is fundamental, some degree of mutual caring is fundamental, to human adaptation. Without it, if you don't care for

infants, your society doesn't continue. And I would like to find a way to talk about the brutalization that threatens that--that might get across to people.

AUDIENCE I (?): Just a quick observation on that metaphor--I think to point out the obvious--that winter is followed by spring. That's my objection to that.

NADER: I just wanted to add that--without belaboring too much--the people, the small number of people, that are involved in this--all good and they are not evil people--they are people caught in systems for the most part, with one or two exceptions that we could mention here (Edward Teller, and so forth). But you know airline pilots have to be licensed, and they have to be because they have in their hands the people in the airplanes; and they have to pass certain tests to be licensed. Nuclear scientists, people working in the defense industry, don't have to be licensed. They have the whole world in the palm of their hands--these few people--and they don't have to pass the same kind of screening that an airline pilot has to pass. [~~I think that we have~~] At the same time as I am willing to put our efforts to complementing the kind of work that's being done by the physical scientists on questions of nuclear winter and the inhumanity or the nonhuman world that would follow--I think it's absolutely important (because of right now, what [it] is possible to say in this country that's had a bloodless revolution in the last 5 years, where things are taboo to say) it's very important since credentialism is in--to talk about credentialing the people who are leading us into this future or who are deciding this future.

DIRKS: I'd like to comment again on verbs and the terms and concepts of myth (ritual) used in various contexts here. I certainly do not agree that nuclear winter should not be imagined, nor that we imagine it in romantic terms. One of the great generators of myth, purveyors of myth, of course, is the American movie industry, and it's rather interesting to note how things nuclear appear in a



darkened room and on a screen that somebody can imagine and identify with, and of course the way these myths are purveyed, nobody starts off by coming onto the screen and saying, "Let's pretend this is going to happen or maybe this will happen." "This will happen," is what's said on the screen. And this is what gets to people, not some way of backing off and putting it in a particular kind of "perhaps" frame, "maybe" frame--this will happen. What we see in those films--some of the most powerful and popular these days are the Living Dead\*\*\* series, and the Living Dead series features individuals who have dead bodies that have been resurrected by some kind of nuclear catastrophe. Or else we see mutated individuals, behaviorally mutated, physically mutated; but the crucial thing is--and the real destructive aspect I think of these myths tends to be--is that the audience is made to identify with normal human beings who are fighting off these nuclear monsters in one form or another. And I think what we gain by talking about this and not prefacing it with let's pretend language is that we will be the living dead, the audience will be the living dead. We need to make a film and a statement in which people can imagine themselves not as fighting off the living dead, but as being them. And that's what I would hope a discussion like this can eventually generate.

BUMSTED: I'd like to point out that the physicists as well as the policy people show up in our classrooms, and I think we have an opportunity there to explain to them what is the context of their own particular science or their own particular activity. The business majors, the accountants, the pre-law students, and so forth. We have a chance at least to remind them of what the context of their activity is, and this is a very strong impact--or can be.

JONES: The thing that strikes me this morning is encouraging in that what I have heard is a willingness on the part of the people at the table, and many of you, to look at this as something worth discussing. I run into people on both extremes who say in essence,

"Don't tell me the facts; I'm not interested." That would include people who have been so immersed in planning, in war gaming, that new physical phenomena would force them to change the way they behave and think. And there are people at the other extreme who have particular points of view, particular world views, who don't want to hear what the real effects are, to think about what the aftermath of a nuclear war might be for fear that it will encourage someone to do the unthinkable. There are many people in the defense establishment, many people particularly at Los Alamos, who are very conscious of the fact that there are moral and political decisions that we all have to make every day. What I try to do in my career is to provide the best information I can to the decision-making process so that we have a credible deterrent. Nuclear weapons exist. We cannot wish them away. Whether we continue to have nuclear weapons and what directions the arsenals go is a political decision that we all have to be involved in, and I would hope that the decisions that are made are informed decisions. The social science community by and large has not been involved in those discussions, and I think this is a welcome opportunity to do some of that. And I hope that social scientists would become involved in discussions of reality so that we can have an informed political choice.

NADER: This raises a question that--since you bring up the question of your contributions in the National Lab at Los Alamos--there are a lot of good people in our national laboratories, but I think it has been my experience that LBL [Lawrence-Berkeley Laboratory], Oak Ridge, and Lawrence Livermore, that those laboratories are for the most part run like dictatorships. You have to understand that. We can talk about whether science is free in the Soviet Union, but we never talk about whether science is free in the United States. The shape, the social structural shape of those laboratories was set during World War II, and it is pyramidal and not run like departments where you can decide what to do, and so forth. The problem is very often set in the amount of movement allowed a

scientist, no matter how good their intentions or how wonderful they are, is very narrow. So narrow that at Livermore Lab there's a group of scientists who have been lobbying for the right to decide what kinds of questions they should work on. And I think when we talk with people from the labs you have to understand they are not coming out of departments, and there is a kind of restriction on the way they think no matter what their values are, and even many of them are not aware of the kinds of restrictions that they are having to work under.

AUDIENCE J: I'd like to ask a question of the panel in general, of a much longer range perspective and that is--we know ourselves to have been in existence as a cultural species for a million years or so, and most of this discussion has been about what would happen next year or the year after if there were a nuclear war today. And I'd just like to know what people think the future might be 1,000 years or 10,000 years from now. We have as archaeologists, as prehistorians--we have that kind of a perspective and it seems to me we are looking at a yes or no, on or off kind of question. Either we get through a nuclear war and the consequences for next year and 10 years are terrible, but the species goes on and evolves something else, or we don't get through it. So when we talk about the question of nuclear weapons are with us and we'll never get rid of them, I find that very hard to imagine--a world 1,000 years or 10,000 years from now that still has nuclear weapons. It seems to me we are in an incredibly critical and unstable situation in a world that does have them and it is only a matter of time--it may not be next year but I can't imagine 10,000 years of a stable balance of terror. So I wondered if I could get a reading from any members of the panel on that.

NADER: Well, Bob Heizer had something to say about this. He said if there were survivors that you couldn't even imagine re-creating what we [have], starting all over again and re-creating, because you wouldn't have the seed and animal species that you had to begin

with. So the idea that somehow we go to zero and we start up again is not a possibility in his terms.

AUDIENCE K: First, I want to thank the panelists for giving me some new food for thought. It's simply true that the anthropological community has not been heard from in the nuclear winter debate, as I've followed it. It's only the last year or so that we've begun to hear from the community of agriculturists and biologists in general about the probable effects within the uncertain.....

\* \* \* \* \* Side 4 \* \* \* \* \*

...half actually, that I followed the debate closely. I've heard a number of physical scientists talk about their difficulties in getting across to the general population the notion of uncertainty. Now, in that year and a half, the bounds of the uncertainties and the peaks of the uncertainties within those bounds (probabilities within the bounds of uncertainties) have changed considerably and we now believe [YMe], as I said at the very beginning, that the biological uncertainties are much smaller than the climatic uncertainties, but which lead toward a situation where in the event of a major nuclear war we would expect major climatic effects which would then, in turn, have major effects on the biology as we have heard. My question is, "How can the anthropologists help the general public, and the policy makers, especially, think about this problem and factor in the uncertainties that are inherent in the models that the physical and biological scientists construct?"

BUMSTED: It is a good question and I think it's one that we have been trying to grapple with. I don't have an answer.

DIRKS: I don't have an answer either. Of course, anyone who attended to the things that I put on the screen would see there's a great deal of uncertainty in every one of those cultural projections, which I'm sure are much broader in their uncertainties than

the biological. I guess I would turn it back to you, though, and I wonder if you would care to re-respond as to why do you think the general public needs to be aware of the uncertainty? Maybe that would help us respond.

AUDIENCE K: Well, the policy makers are faced very simply with making decisions in the face of tremendous uncertainty. The physical scientists will say, "Well, look, I can't tell you that a nuclear war will produce a given result." And so they give them the result within the bounds, which is perfectly acceptable in the laboratory. We've got a certain sigma variation around a mean and here's where the mean is--if we can do that. It's a problem in being able to articulate what that might mean for the policy maker who's got to make the decision. The public needs to know about that because in fact there is a certain amount of interaction between the public and its perceptions and the policy makers and their decisions.

NADER: Well, a lot of people in the general public and in the policy area believe that when it has to do with life-shaping forces and you've got uncertainties--when in doubt, throw it out.

AUDIENCE K: But, I guess what I'm saying is that I would agree with that point. It seems to me that the anthropological community could address that problem. You are in a unique position to do that.

BUMSTED: I think there is a way in which you can begin to make some rectification or resolution of the uncertainties and give an idea of what might happen. There would be two ways--one is to specify what it is you do know and what it is you do not know, and this I don't think we often do. It's difficult to do that to an audience that is not familiar with the work that we ourselves do, or [that] the particular scientist does. And we need to be more skilled at getting across, "I know this; I do not know that."

Secondly, I think we need to help other scientists (and I'm referring here to the scientific community but I imply all communities) to think about what it is they themselves do because--and this has been pointed out to me by people who're closer to the nuclear war scenarios than I certainly am--[Is/Um] you cannot tell a policy maker what your science means for them to make the decision unless you yourself know what it means and unless you yourself know the context of your science; unless you have thought about why you do the things you're doing; and we don't normally train our scientists--we don't train our plumbers for that matter, or our electricians--to think about ethics, and this needs to be done. You cannot tell someone else until you know yourself.

AUDIENCE L: I think it would be useful in these discussions to wherever possible ascend to some kind of a meta level. Some of the difficulty at the beginning was due to the fact that some of us were more concerned with theoretical anthropological concerns and others more concerned with how we are going to educate the public or the policy makers. I have benefited from this tremendously in the sense that there's lots of arguments and facts that I can bring out to my students, but what I'm concerned about is the fact that this room is relatively empty when you consider the number of anthropologists that are here. We have to think of ways to mobilize anthropological thinking. And I think maybe the way to do that is to move into the area where people are actively doing research. Clearly, we need to do research to provide input to these models, but I would like to see us ascend to another level--a theoretical level--where we are taking a lot of the concerns--I mean, look at social theory, critical theory today and how much that's captured the imagination. A lot of assumptions are made there; they don't get into chapter and verse, but a lot of assumptions are made there that we need to address. But the whole question of relativism, whether anthropology is a science--all of these questions could in one way or another be brought to bear on the things that are coming out today. In other words, I think if we



ascended some kind of meta level in our discussion, we might be able to come to grips with theoretical means to mobilize the research interests of a larger segment of the anthropological profession.

NADER: Just to comment on that, Dick, I think that I did a section in my Anthropology 3, which is over 700 students, on science--the ethnography of science--it didn't have to be, I mean we always get our theoretical insights from our ethnography. It was probably the most stimulating aspect of the whole Anthro 3 course that covered the gamut. And that's what we need to get: [~~is~~] some good ethnography on, in this case, the organization of science in the West. And I mean the cultural and social organization of science. And the students, especially the physical science students, are very fascinated with that because most of them go into these laboratories--actually, if you read the book, Nuclear Warriors, [Star Warriors],<sup>4</sup> they are seduced into these laboratories almost not knowing anything about what they are getting into in terms of culture and structure. So let's get theoretical after we get ethnographic and critical.

BATESON: Just an addendum on the question of what we know and what we don't know and the nature of uncertainty. There's been a significant slippage in the public usage of the word hypothesis. Maybe it's not slippage; maybe it's bringing it into the public with a distorted understanding. I missed a session on creationism, but we are in a situation where people say you cannot teach evolution because it is "just a hypothesis" and, similarly, nuclear winter is "a hypothesis." And from that point of view, of course, it will stay a hypothesis until it happens, which is not desirable. So, these notions turn up in multiple debates, and things that I think as scientists we believe are firmly established tend to be dismissed by the use of such terms as hypothesis and uncertainty. I don't think there's any doubt anymore that if there were a major nuclear war the phenomenon described as nuclear winter would occur.



The exact details--many of them still need to be worked out. But drastic climatic effects and drops in temperature would occur. Similarly, I think we feel [a] certain confidence in the basic outlines of the theory of evolution, [a] certain confidence in our understanding of the role of culture in human life. And we've gotten ourselves into a position where people feel that they can treat these ideas as "up to grabs."

AUDIENCE L: I think there is another way that we as a profession can bring ourselves to looking at nuclear issues as well. We are so aware as anthropologists of how asking a question can influence the answer to a question. And so I'm thinking of what is nuclear war and we talk about it as if it hasn't happened yet. And so, what if we talk about it in terms of it is happening: that there are people experiencing devastating effects from the processes that go into nuclear militarism. You talk about uranium mining, weapons testing, weapons assembly, and sales, and you draw out the whole process, and I think we as anthropologists are in a prime position to look at these people because they are [in] locations where we've been. You look at native American populations in the Southwest and uranium mining, or in Australia, you look at populations that have been affected by testing in the Pacific; [YNAZ] there are people experiencing nuclear war right now and I think we are in a good position to address that.

DIRKS: I think that's a very important point that needs to be underlined--[IS/YNAZ] wars do not start at a moment. As Naroll's<sup>23</sup> research showed a long time ago, wars begin or wars are the fulfillment of a long period of tooling up and armament. So maybe it's not a question of projecting a nuclear winter because we [YNAZ] really [ON/OR] seem to be on the road right now and at war.

AUDIENCE H: I think that this panel and this discussion has been excellent, and I also am disturbed by the [small] number of people

who are here. Some of us in Anthropologists for Human Survival have tried to make this a central question for the American Anthropological Association, feeling that since the survival of humans should be central to anthropology and because we are on the brink of actual war and in the stage, as you just said, of preparing feverishly for war, and [because] there are many populations all over the world, as was just mentioned, [who] have already experienced the effects of this preparation--we should be able to say something about it. It seems to me that doing that--as an association in the realm of public speaking, and the realm of people speaking for the association, in the realm of speaking to the press and press conferences, and the realm of participating in a public way as an association around these issues in the sense that talking about things in the way that this panel has--[we] would have an impact in the realm of public opinion. And so I would call on people to continue the struggle to make this question more central to the work of this association. It's not just one other question among hundreds which we discuss each year at a convention; it seems to me at this time in history [that] it is the central question we should be discussing.

AUDIENCE C (?): I'd like to ask Dr. Nader in particular, but maybe other panelists have opinions--given that [the ~~about~~] so-called balance of terror seems so precarious, we indeed can't contemplate that being maintained 10,000 years down the road or perhaps even decades down the road. Are there any realistic prospects for the development of a world system capable of monitoring the production and deployment and use of weapons of this scale under the auspices of the UN and international law in particular or in some other format? Can you conceive of it?

NADER: There are a lot of people who have thought about this. There is particularly a very interesting book called The Trintab Factor by Willens<sup>35</sup> and I think his point gives hope because when you have a really centralized system you can see it as negative and you can see it as positive, because if it's really centralized

then, his suggestion is, it's like the trimtab on a ship, you just move it a little bit that way and the ship will head in a different direction. That's one thought that's being explored in the business world. He's a businessman and he wrote that book for business people. Then there's the other, the balance of power question and the role of the nonsuperpowers in monitoring and allowing this to happen. These are directions that are being explored by people and I think they should be as highlighted as nuclear winter. I think one of the problems is that there is this "lemmings phenomena," is that an absence of hope--I think a lot of people aren't here for that reason: not because they don't think it's an important problem but because they feel totally powerless and they don't have a view of a future that's otherwise. So I think when we talk about the nuclear winter question we also ought to talk about "spring" (whoever said that).

AUDIENCE K: I want to second that point. I spent some time last year discussing with a number of [BOYD] officials and ordinary people in London about this very issue. And I was struck with a major difference in their view from what was true at that time in the United States, as far as I could see; and that is, that there was a hopelessness in Great Britain and still continues to be [ABOUT/THE/NOPE]--they say, "Why bother about nuclear winter because we'll die anyway?" And so it seems superfluous to even consider that issue. That was less, in my observations, less true of opinion here in this country where the survivalists, and so forth, see a bit more hope than others. But it does seem to me that, again, the anthropologist has something to add to that discussion, and [YOU/ALL] I want to thank you again--because you all have helped us think about some of those issues today. I should also add as a postscript that I spoke at some length with two Harvard professors, who will go unnamed, who have spent a long time in the business of trying to get disarmament controls on armaments, and so forth, who simply told me flat out that the discussion of nuclear winter will have no effect on the policy made.

NADER: On this business of hopelessness, I might add that the year I was at the Wilson Center was the year that the Soviets went into Afghanistan, and the Wilson Center had a number of military personnel there--generals and otherwise--and they struck me as being very depressed people. This is a problem that we should be concerned with, middle-aged, white, depressed people in positions of power. <<AUDIENCE K: Men.>> Men. There's an anthropologist who spent many years in the Pentagon and when he was on the West Coast I invited him to speak to my seminar. And I asked him if the Pentagon was concerned with this depression problem among white, middle-class males in, presumably, positions of power, and he didn't answer, but he said, "who are being advised by white, middle-class, depressed males." There is some concern apparently with this, and I know of some anthropologists who've been asked to give advice and to consult on the problem. But again, the image that somehow the people that are running the show, or that are responsible, feel powerful--I think it's quite the reverse, it's probably dangerous that they are not powerful.

ARMELAGOS: Pam, do you want to say anything in closing?

BUMSTED: I would like to thank the audience for coming and for participating and to thank the panel members. Thank you.

---

---

<<These were questions from the audience regarding transcripts or summaries of the presentations and discussion.>>

AUDIENCE M: When we began, we were told that at the end of the session there would be some summing up, some kind of report, perhaps, that might come from this session to the organization which sponsored this. I am concerned that we have become a society who sits and listens. And we listen to the most important things. And we never do a damn thing about all these things.

I'd be happy enough to turn to the panel and let the panel come up with some kind of statement, to make some kind of recommendation to the AAA.

BUMSTED: We're arranging and we'll get at least a concise summary...

NADER: This has been recorded?

BUMSTED: Yes, it has been recorded. I'm saying "if" because we haven't made a decision as a total panel whether this would be available publicly or not, but there is a recording and we do intend to get this discussion out in a format that is not only for anthropologists but for a larger audience as well.

## NOTES

\* The "Peace Shield" ad, run on Washington, DC, television stations in early November 1985 portrays the complexities of the scientific and policy issues involved in the Strategic Defense Initiative ("Star Wars") in a 30-second animated child's drawing. The commercial is summarized in Ellen Goodman's column ("The Crayola Defense," Boston Globe, November 5, 1985), described by Lloyd Grove ("The 'Star Wars' Soft Sell," Washington Post, November 4, 1985) and by John J. Fialka ("Combative General is a Political Godfather of 'Star Wars' Plan," Wall Street Journal, November 12, 1985), and parodied by Herblock (Washington Post, November 8, 1985) and Gary Trudeau ("Doonesbury," November 22, 1985).

\*\*The statistical associations here are the outcome of a pilot study. Because they are preliminary to further work, the findings ought to be regarded as indicative of promising lines for further investigation rather than as conclusive.

\*\*\*George A. Romero (director) series--1968 Night of the Living Dead and 1979 Dawn of the Dead.





FIGURES

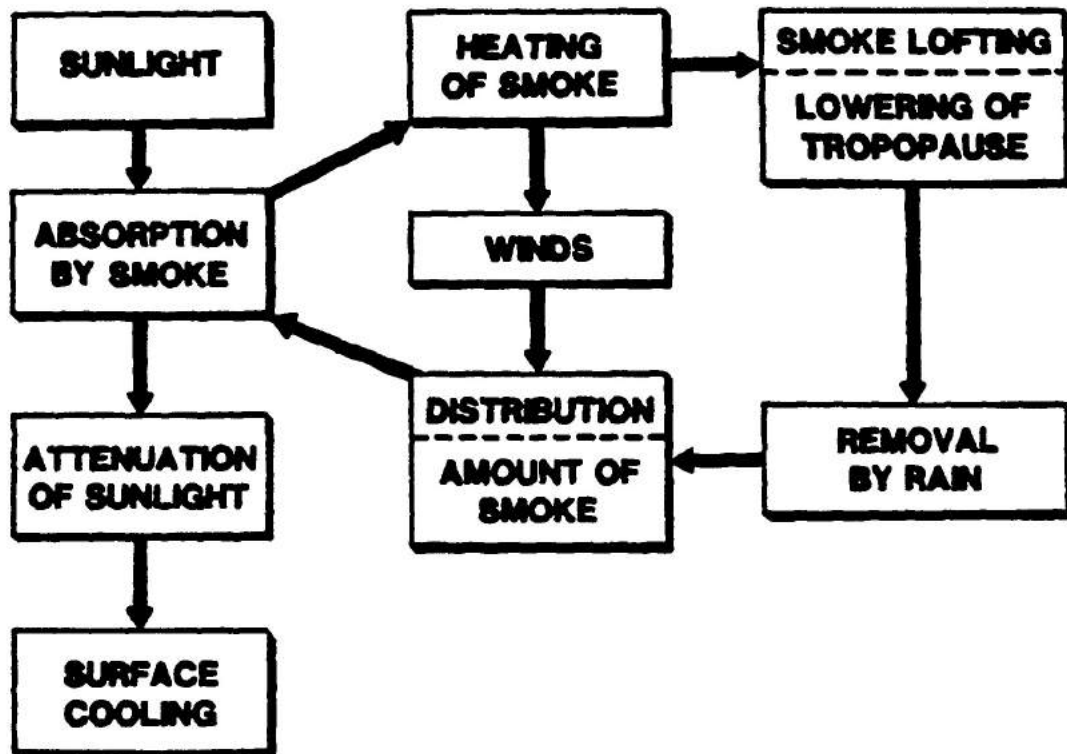


Figure 1a

## **KEY ISSUES**

---

**HOW MUCH SMOKE SURVIVES AND  
FOR HOW LONG?**

**COMPETITION BETWEEN**

● **PRECIPITATION SCAVENGING**

**AND**

● **TRANSPORT AND HEATING  
OF SMOKE**

● **RESULTANT MODIFICATION OF  
ATMOSPHERIC STRUCTURE**

Figure 1b

Fig. 2. Longitudinally averaged mass mixing ratios for July conditions at day 20. The dashed contours apply to a passive tracer, while the solid contours apply to interactive smoke. In each case 170 Tg (1 Tg =  $10^{12}$  g = 1 million metric tons) of material was injected over the northern-hemisphere continents with a "low" injection profile (see text). The contours of mixing ratio are labeled in units of  $10^{-9}$  g material/g air.

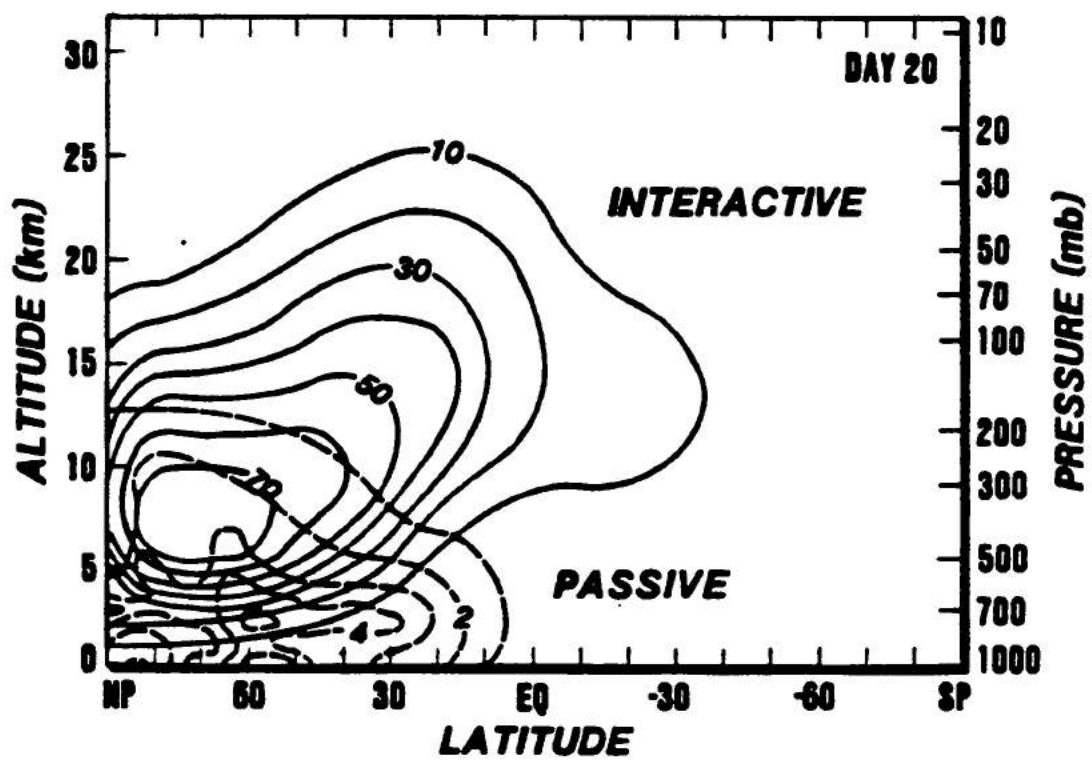


Figure 2

Fig. 3. The longitudinally averaged temperature (K) in the simulated unperturbed (a) and perturbed (b) atmospheres, for July conditions. The perturbed distribution is a 5-day average beginning 15 days after the initiation of injection of 170 Tg of smoke with the "NAS" vertical injection profile. The unperturbed distribution in (a) is a long-term average. In each figure the approximate position of the tropopause is indicated by the heavy dashed line.

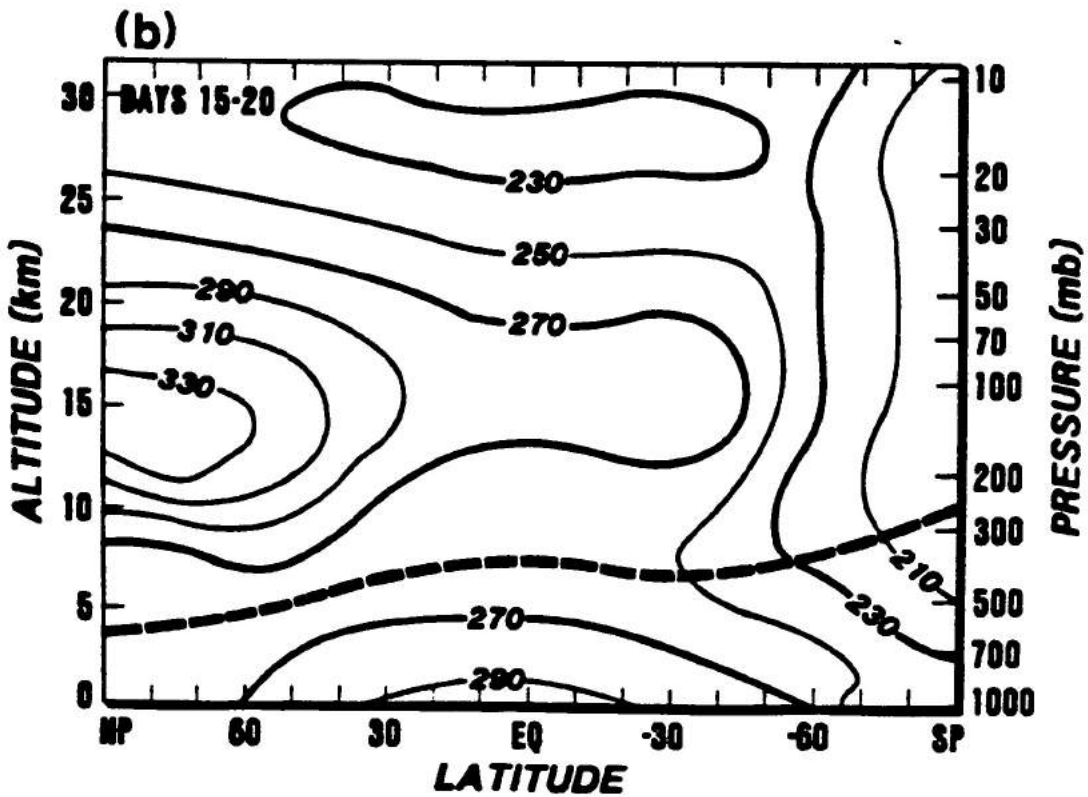
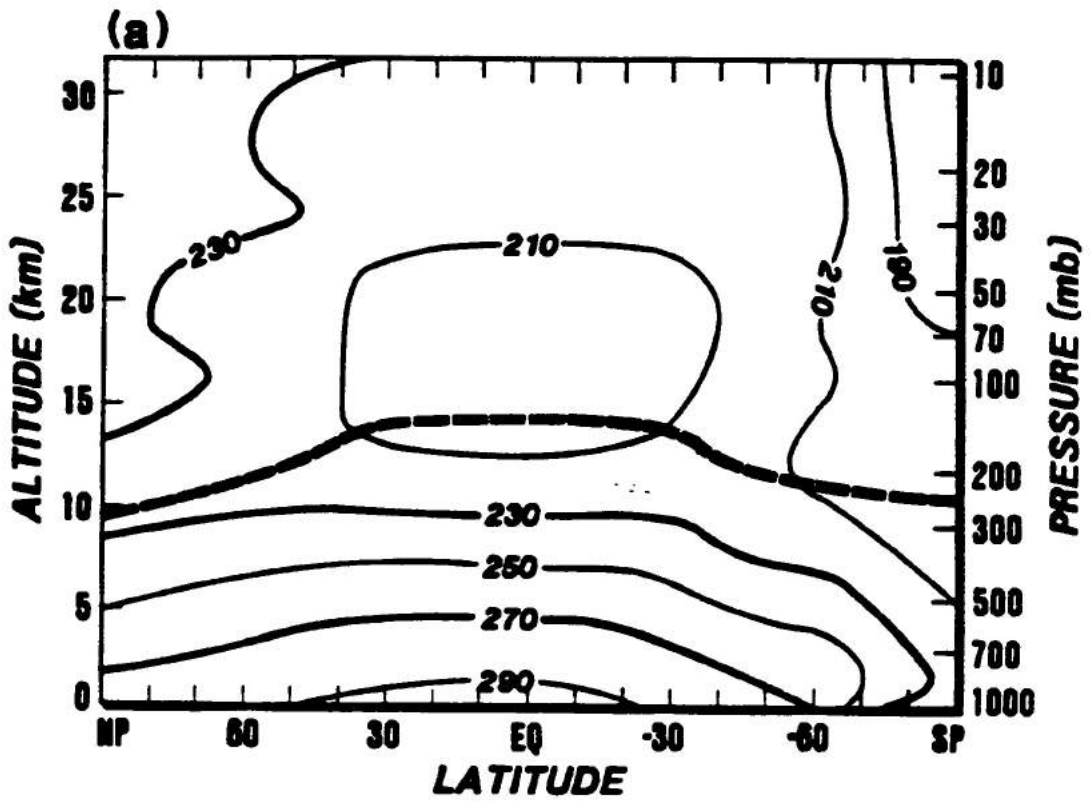


Figure 3



Fig. 4. The relative positions of the modified tropopause (heavy dashed line) and the precipitation distribution (cross-hatched region below the tropopause), both averaged over days 15-20, and the smoke distribution at day 20 (stippled area above the tropopause) for the 170 Tg "NAS" case portrayed in Fig. 3b. Darker stippling indicates greater smoke loading; the smoke contour intervals correspond to mixing ratios of 10, 40, and  $70 \times 10^{-9}$  g smoke/g air. These may be compared with the solid contours in Fig. 2, which apply to a "low" injection July case, also at day 20.

Fig. 5. The mass of material remaining in the global atmosphere as a function of time. The upper four curves apply to smoke, the lower pair to passive tracer. Solid and dashed curves indicate January and July conditions, respectively. Labels indicate "low" and "NAS" injections. The slopes of the passive tracer curves at late times yield  $1/e$ -residence times of 5 to 6 days, which agree well with observed residence times of aerosols in the lower troposphere.

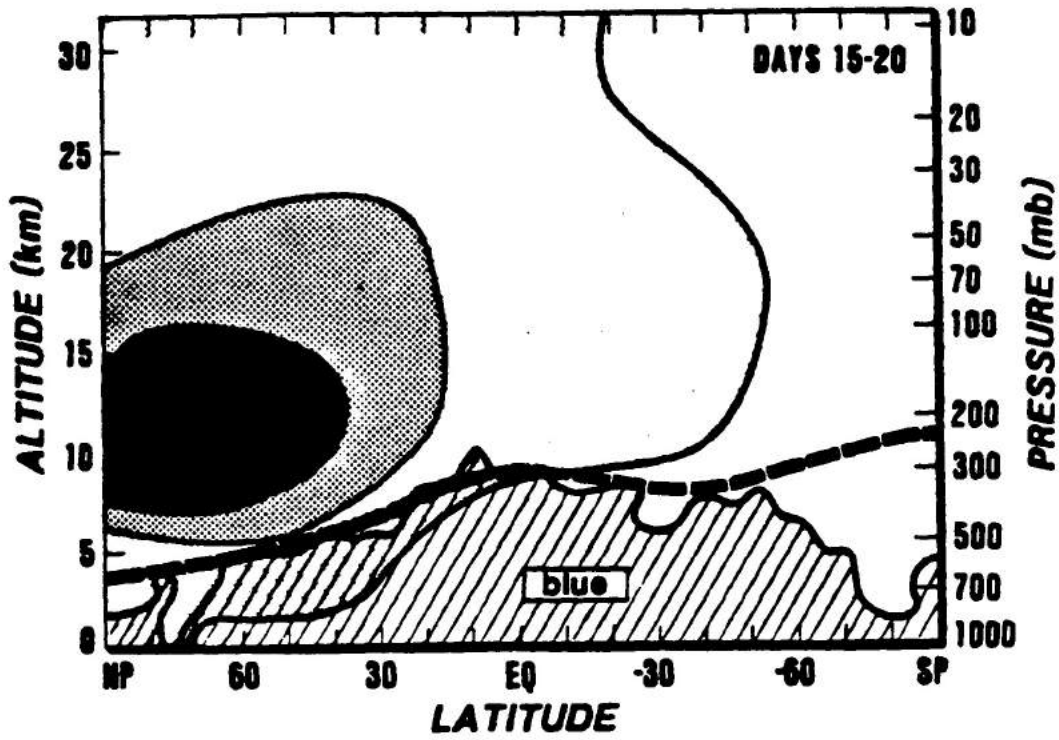


Figure 4

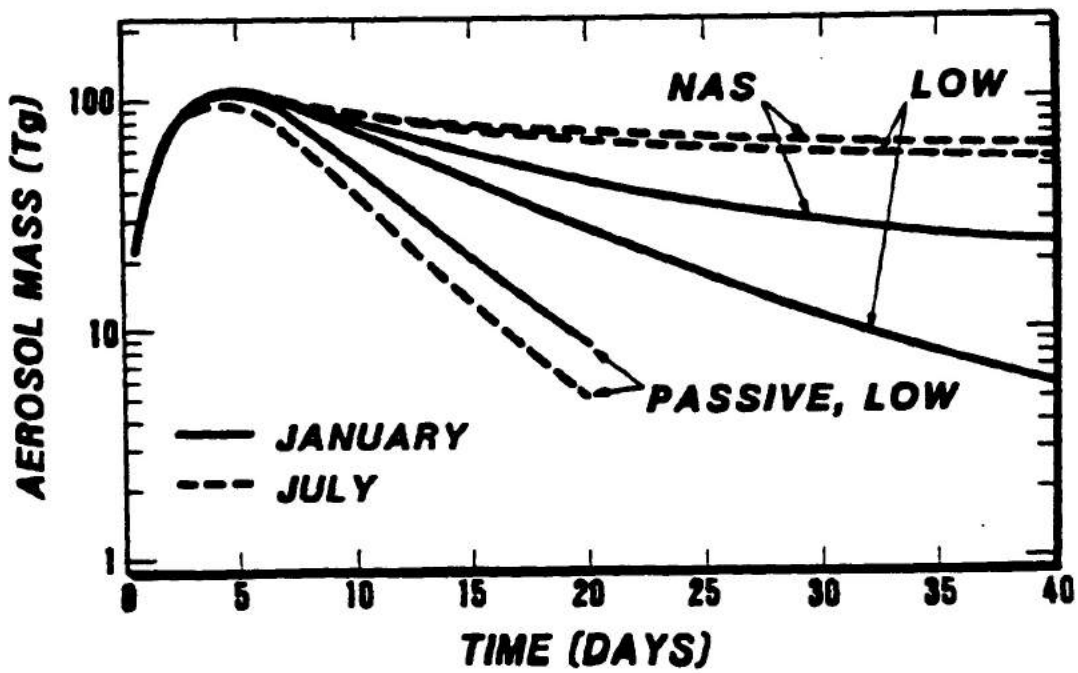


Figure 5

Fig. 6. The change in surface air temperature relative to the unperturbed atmosphere in July for 170 Tg of smoke injected with the "NAS" profile. Five-day averages of the perturbed case, minus the long-term average of the unperturbed case, are shown: (a) days 5-10, (b) days 35-40. Only changes larger in magnitude than 5°C are shown. Values are indicated in the legend at the bottom of the figure; the designation "<-15" refers to temperature reductions in excess of 15°C below normal. Note that the warm and cool regions near Antarctica are simply manifestations of storms which occur naturally in the wintertime circumpolar flow; they have no connection with the changes occurring in the northern hemisphere.

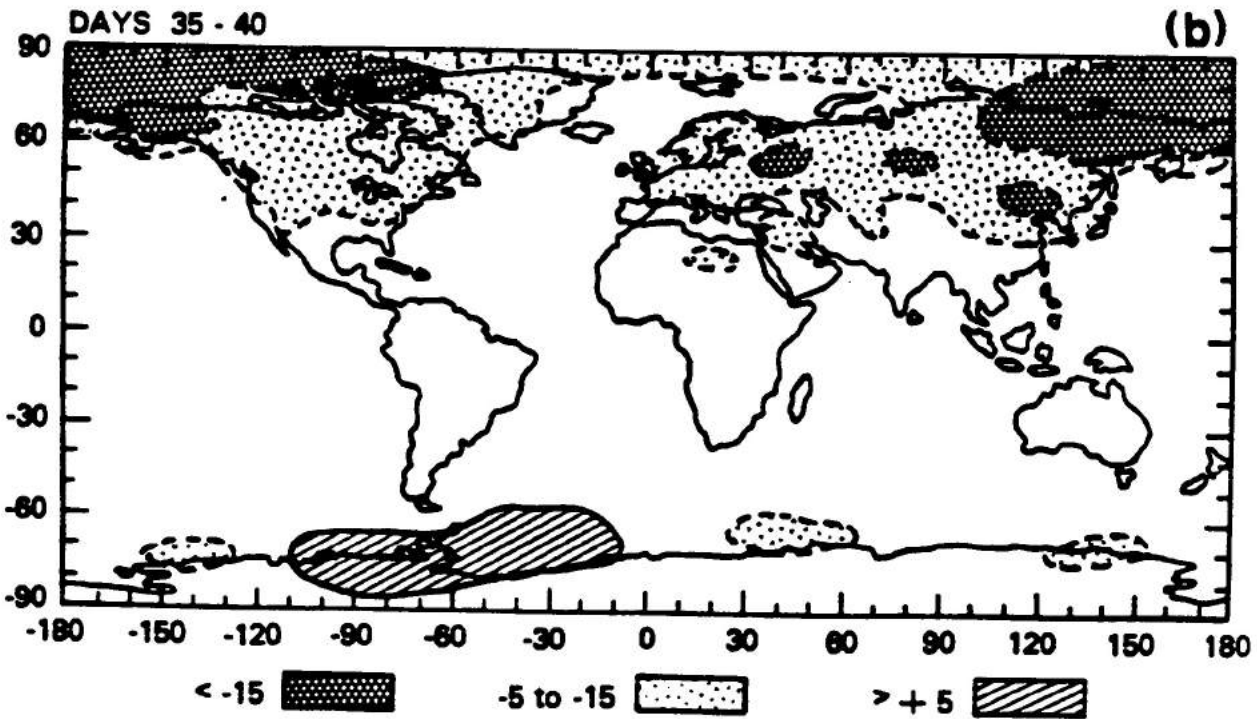
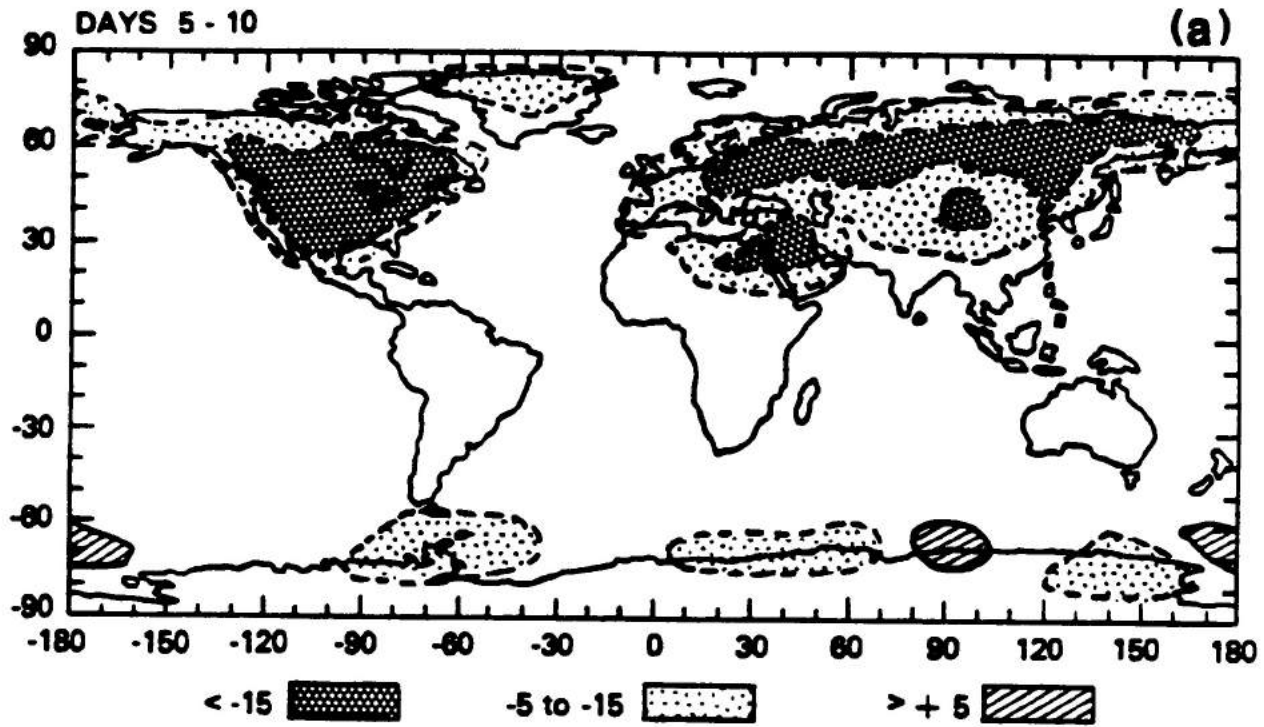


Figure 6

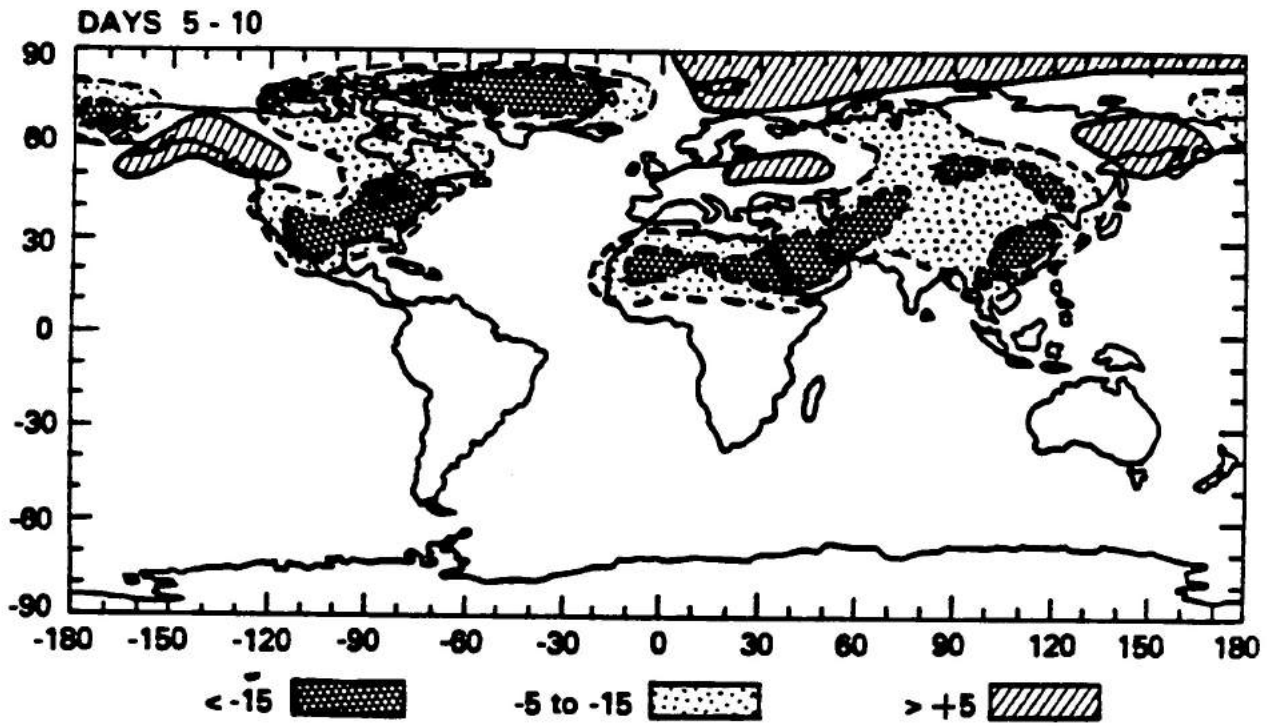
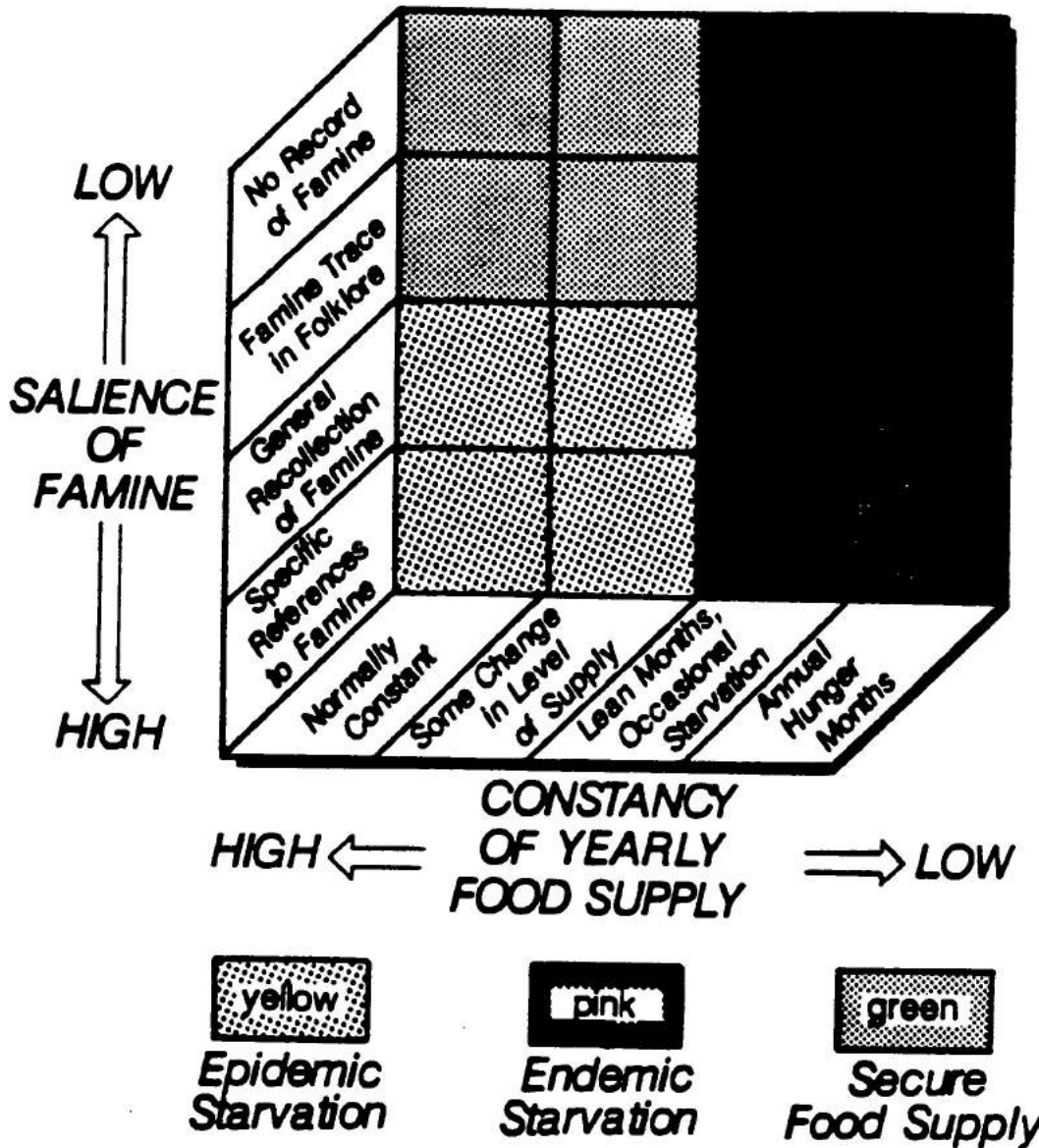


Fig. 7. The same as Fig 6a, except for January conditions.



# FAMINES, HUNGRY SEASONS AND EXPOSURE TO STARVATION HAZARD

Figure 8

STARVATION HAZARD

Absent	4	2	1	0	1
Epidemic	4	2	0	1	9
Endemic	2	1	2	1	25
	Little or None	Mostly in Government or Commercial Stores	Communal or Unguarded Stores	Some Households Keep Reserves	Household Primary Storage Site

## FOOD STORAGE PATTERN

N = 55

TAU-B = +0.442

P &lt; 0.0005

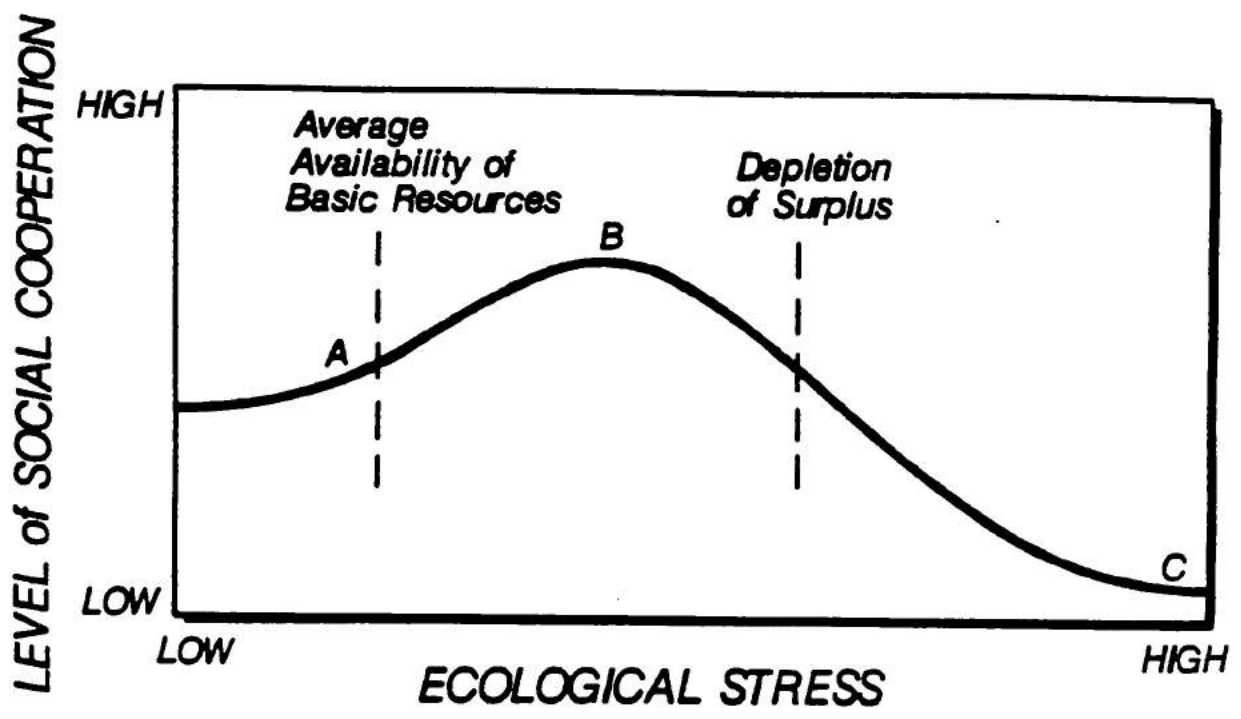
Figure 9



<b>HUNGRY SEASON</b>	None	5	7	2	2
	Seasonal Change in Supply	2	3	0	1
	Starvation Some Years	0	9	2	0
	Annual	1	3	3	7
		Moderately Indulgent	Controlled	Inhibited	Intemperate

**ATTITUDE TOWARD EATING** **$N = 47$**  **$TAU-B = +0.378$**  **$P < 0.005$** 

Figure 10



**RELATION OF SOCIAL COOPERATION TO ECOLOGICAL STRESS IN A SOCIAL ACTION SYSTEM**

Figure 11

<b>STARVATION HAZARD</b>	<b>ABSENT</b>	<b>1</b>	<b>5</b>
	<b>ENDEMIC</b>	<b>9</b>	<b>10</b>
	<b>EPIDEMIC</b>	<b>8</b>	<b>3</b>
		<b>FIRST</b>	<b>OTHER</b>

**ORDER OF SERVICE ACCORDED MALE HEAD  
OF HOUSEHOLD AT FAMILY MEALTIME**

**$N = 36$**

**$\text{TAU-B} = +0.352$**

**$P < 0.05$**

Figure 12



## References Cited and Recommended Reading

- 1) Abrams, H. L. and W. E. VonKaenel  
1981 Medical Problems of Survivors of Nuclear War.  
New England Journal of Medicine 305:1226-1332.
- 2) Armelagos, George J. and Elizabeth Schueler  
1985 Biological Consequences of Nuclear Winter. Amherst:  
University of Massachusetts. [Copies of the complete  
paper are available from the authors.]
- 3) Bee, Ronald J., Carl B. Feldbaum, Banning N. Garrett, and  
Bonnie S. Glaser  
1985 Implications of the "Nuclear Winter" Thesis. Prepared  
by the Palomar Corporation for the Defense Nuclear Agency  
Contract #001-84-C-0257 (June 24). [Contains an extensive  
bibliography of scientific and general news media litera-  
ture. The Defense Nuclear Agency (DNA) is a go-between  
for Department of Energy and Department of Defense on  
research aspects of nuclear defense.]
- 4) Broad, William J.  
1985 Star Warriors. NY: Simon and Schuster.
- 5) Carrier, George F.  
1985 The State of the Science. In Nuclear Winter. Issues  
in Science and Technology Winter:114-117.
- 6) Crutzen, P. J. and J. W. Birks  
1982 The Atmosphere After a Nuclear War: Twilight at Noon.  
AMBIO 11(June):114-125. [Also in Peterson 1983.]
- 7) Dirks, Robert  
1980 Social Responses During Severe Food Shortages and  
Famine. Current Anthropology 21:21-32.
- 8) Emergency Planning Digest  
1985 Nuclear Winter and Associated Effects: The Royal  
Society Report. Response of the Government of Canada.  
Emergency Planning Digest (of Emergency Planning Canada,  
Ottawa, Ontario) 12(3):2-11.
- 9) Fried, Morton, Marvin Harris, and Robert Murphy, eds.  
1968 War: The Anthropology of Armed Conflict and Aggres-  
sion. Garden City, NY: The Natural History Press.  
[Based upon the plenary session, 66th annual meeting,  
American Anthropological Association, November 30, 1967,  
Washington, DC.]

REFERENCES 82

- 10) Harlow, Harry F.  
1959 Love in Infant Monkeys. *Scientific American* 200(6):  
68-74.
- 11) Harwell, Mark A.  
1984 *Nuclear Winter: The Human and Environmental Consequences of Nuclear War*. NY: Springer-Verlag.
- 12) Harwell, Mark A., Thomas C. Hutchinson, Wendell P. Cropper, Jr.  
Christine C. Harwell, and Herbert D. Grover  
1986 *Environmental Consequences of Nuclear War: Vol. II. Ecological, Agricultural, and Human Effects*. NY: John Wiley & Sons. [Harwell et al. 1986 and Pittock et al. 1986 are known as the SCOPE Report (Scientific Committee on Problems of the Environment) of the International Council of Scientific Unions (ICSU).]
- 13) Heizer, Robert F.  
1974 *The Destruction of the California Indians*. Santa Barbara, CA: Pregrine Smith.
- 14) Heizer, Robert F.  
n.d. *The New Orleans Paper*. unpublished ms.
- 15) Jones, Eric M. and Robert C. Malone  
1985 *An Overview of Climatic Effects of Nuclear Winter*. Los Alamos National Laboratory document LA-UR-85-2686. [Available from the authors.]
- 16) Kroeber, Theodora  
1961 *Ishi in Two Worlds: A Biography of the Last Wild Indian in North America*. Berkeley: University of California Press.
- 17) Laughlin, C. and I. Brady  
1978 *Extinction and Survival in Human Populations*. NY: Columbia University Press.
- 18) Leaning, J. and L. Keys  
1984 *The Counterfeit Ark*. Cambridge: Ballinger.
- 19) Malinowski, Bronislaw  
1922 *Argonauts of the Western Pacific*. (1984 Prospect Heights, IL: Waveland Press, Inc.)
- 20) Malone, Robert C., Lawrence H. Auer, Gary A. Glatzmaier, Michael C. Wood, and Owen B. Toon  
1985 *Influence of Solar Heating and Precipitation Scavenging on the Simulated Lifetime of Post-Nuclear War Smoke*. *Science* 230:317-319.  
  
1986 *Nuclear Winter: Three-Dimensional Simulations Including Interactive Transport, Scavenging, and Solar Heating of Smoke*. *Journal of Geophysical Research* 9(D1):1039-1053.

- 21) May, Michael M., Albert Gore, Jr., George W. Rathjens, Ronald H. Siegel, Theodore A. Postol, and Richard L. Wagner, Jr.  
1985 Strategic Significance: Commentaries. In Nuclear Winter. Issues in Science and Technology Winter: 118-133.
- 22) Nader, Laura, et al.  
1980 Energy Choices in a Democratic Society. Washington, DC: National Academy Press.
- 23) Naroll, R., G. Michik, and F. Naroll  
1976 Worldwide Theory Testing. New Haven, CT: Human Relations Area Files.
- 24) National Research Council  
1985 The Effects on the Atmosphere of a Major Nuclear Exchange. Washington, DC: National Academy Press. [Also known as the Carrier committee report.]
- 25) Peterson, Jeannie, ed.  
1983 The Aftermath: The Human and Ecological Consequences of Nuclear War. NY: Pantheon Books. [Based on a special issue of AMBIO 1982 11(2-3), published by the Royal Swedish Academy of Sciences.]
- 26) Pittock, A. Barrie, Thomas P. Ackerman, Paul J. Crutzen, Michael C. MacCracken, Charles S. Shapiro, and Richard P. Turco  
1986 Environmental Consequences of Nuclear War: Vol. I. Physical and Atmospheric Effects. NY: John Wiley & Sons.
- 27) Powers, Thomas  
1984 Nuclear Winter and Nuclear Strategy. Atlantic November:53-64.
- 28) Scheer, Robert  
1982 Americans Would Not Be Helpless--U.S. Could Survive War in Administration's View. Los Angeles Times, January 16. Reprinted in Hearings Before the Subcommittee on Arms Control, Oceans, International Operations and Environment of the Committee on Foreign Relations, United States Senate, Ninety-Seventh Congress, Second Session, March 16 and 31, 1982. Washington, DC: Government Printing Office.
- 29) Sparks, Brad  
1985 The Scandal of Nuclear Winter. National Review November 15:28ff.
- 30) Turco, Richard P., Owen B. Toon, Thomas P. Ackerman, James B. Pollack, and Carl Sagan  
1983 Nuclear Winter: Global Consequences of Multiple Nuclear Explosions. Science 222:1283-1292. [Also known as the TTAPS Report.]