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The Concept of this Symposium

Definition of the subject, leading ideas and pursued objectives

By Serge B. Prêtre, Health Physicist, President of "Fachverband für Strahlenschutz", Director of this Symposium, and Hansheiri Brunner, Health Physicist, Scientific Secretary of this Symposium.

Choice of the subject and its definition

The subject chosen by us has already been qualified by adjectives such as: thorny, heretical, courageous, embarrassing and even heroic. However, we have generally felt that this subject meets a growing need in many countries because it corresponds to an ever increasing search for security, and we have received many testimonies of gratitude and encouragement. The title of this scientific meeting had to be short ("Radiological Protection of the Public in a Nuclear Mass Disaster"), therefore it is somewhat incomplete. It should have been formulated more exactly as follows: *"Critical Review of all Major Problems related to Survival of and Recovery from a Large-Scale Contamination by Radioactive Local Fallout due to either an Accidental or a Deliberate Nuclear Explosion at ground level"*.

The problems encountered in a nuclear catastrophe have already been approached in former international meetings, but only in a sort of timid way. Only some mini-catastrophies or accidents were considered, which could have endangered at the most some dozens or hundreds of persons. We think that it is indispensable to attack the problem from the other extreme: the maxi-catastrophy endangering many hundreds of thousands of human lives. The reason for this choice is very logical: in fact, if one can set up an emergency plan capable of keeping a maxi-catastrophy under control, then it will be all the more possible to control any kind of mini-catastrophy. Starting with this leading idea, we have decided to carry out a frontal attack on the whole list of problems which would arise from radioactive contamination due to a high-yield nuclear explosion at ground level. This is the maxi-catastrophy!

The subject which will be treated during this symposium belongs to the category of taboos which also includes biological warfare. It is high time that the irrational fear of being afraid be replaced by a rational fear properly derived from a knowledge of the realities.

Peaceful and military applications of nuclear energy

The development of peaceful applications of nuclear energy has been and still is being carried on very carefully, in a climate of high security. All builders of nuclear power plants claim, quite rightly, that their reactors cannot explode and are built in such a way that they can never explode, even during earthquakes, or from such unlikely accidents as the crashing of an aircraft directly onto the reactor. Despite these affirmations, a completely new science for the security of nuclear installations has been developed on an international level. Safety measures have been redoubled to such an extent that the security grade of a nuclear reactor is much higher than that of a bridge, an aircraft, a suspension railway or a dam.

On the other side of the medal are the military applications of nuclear energy. It is regrettable but understandable that for political and military reasons, the questions relative to the security of nuclear weapons cannot be discussed openly as it is done for reactors. However, we sincerely hope that the makers of nuclear weapons have devoted as much research as is necessary to establish as high a grade of security as the reactors have. We venture to believe that the probability of an accidental nuclear explosion is extremely low, but it is not zero. Therefore, it is still reasonable to prepare for such a catastrophe.

As for the accidents at Palomares and Thule, they have "experimentally" demonstrated three things:

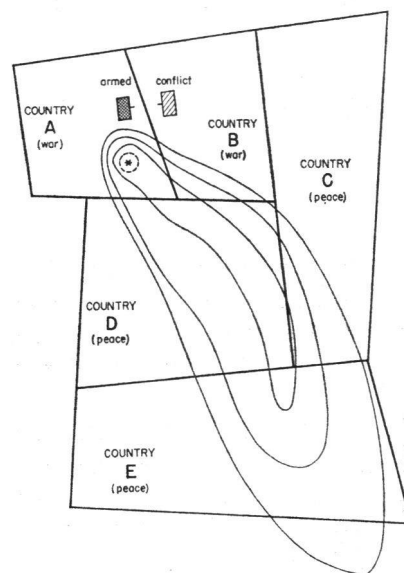
- It has been consoling to note that such accidents can occur without nuclear detonation, which proves that nuclear weapons are actually equipped with effective security devices.
- Although no nuclear detonation took place, these accidents have nevertheless caused serious radioactive contaminations which can represent a hazard to the local population.
- In order to control such a contamination it is necessary to dispose (even during peace-time) of an emergency organization much more sophisticated and important than those which are normally attached to nuclear reactor sites.

The cause of the maxi-catastrophy

During this symposium we will consider a nuclear catastrophe due to a nuclear explosion at ground level. It

is absolutely immaterial for us to know whether this explosion was accidental or deliberate. It is important to specify that the primary effects of the explosion will be deliberately left out. We will focalize our attention on the early or "local" radioactive fallout, and we will also speak about the less dangerous cases of tropospheric and global fallout.

There is a category of participants in this symposium who, on the one hand, do not want to discuss military problems or war situations, considering rightly that this is not our business, and who, on the other hand, do not believe in the possibility of accidental nuclear explosions. We propose to these participants to assume the following situation as being the cause of the maxi-catastrophy (fig. 1). Let us consider a local armed conflict



between two small countries A and B. A nuclear weapon action suddenly takes place, producing a catastrophic contamination for the countries C, D and E which are not involved in this war. The problems of survival for these populations take on an international character and have to be solved on the basis of emergency organizations already in existence during peace time.

The foregoing has been said in order to pinpoint the ideas and to give a plausible context to this symposium. However, we want to state that the questions relating to the cause of such a nuclear catastrophe (under what circumstances?, where?, with what probability?, possibilities to avoid it? ... etc.) will be neither submitted nor discussed, not even approached in this symposium.

The organigram of this symposium (fig. 2)

The whole of our problem can be dissected diagrammatically in the way shown by the following organigram (fig. 2).

At first there are 4 main groups:

- the source of the hazard (= radioactive particles),
- its transport and propagation
- the "barriers" which can protect man,
- the sensitivity and vulnerability of man.

In order to investigate these 4 main groups, all sorts of measurements are necessary (indicated by M on the diagram).

The step of measurements is then followed by the next 3 steps:

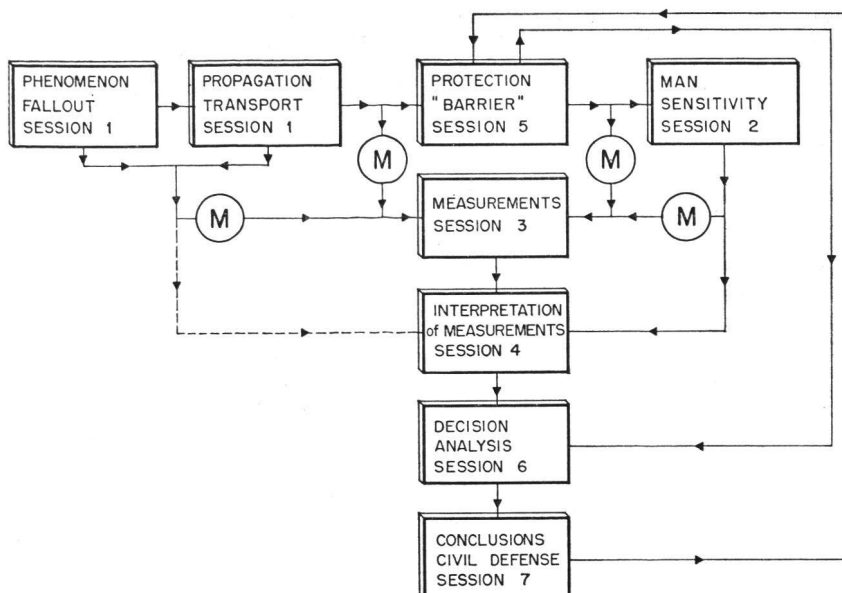
- interpretation of the results of these measurements,
- decision analysis (the weighing of risks associated with radiation against the risks associated with various possible remedial and protective measures),
- conclusions—choice of the most appropriate protective measures; their execution—civil defense.

Therefore the whole of our problem splits into 4 groups and its solution spreads out into 4 phases. The course of this symposium will follow the same diagram for, as a rule, each session will correspond to a group and a phase (fig. 2).

The topics of each session

Viewed more closely, the subject of each session can be recapitulated approximately as follows:

- *Introductory Session*: generalities; definition of the subject; concepts; description of actual instructive incidents.
- *Session 1*: Nature, behaviour and characteristics of fallout; formation of particles; fractionation; physical, chemical and radiological properties of fallout particles; meteorological aspects; speed of deposition; fallout prediction; radiation field; natural decay; weathering; influence of topography, vegetation, ground roughness, buildings; contamination of the biosphere; etc.
- *Session 2*: Hazards for man; irradiation from external sources; irradiation of the skin; internal contamination caused by inhalation and ingestion; superposition of these different types of irradiation; bearable levels; recovery of irradiated tissues, combined lesions (synergistic effects from concurrent insults: [blast injury + burn injury + radiation injury]); dose-effect relationships; relative importance of different types of irradiation; etc.
- *Session 3*: What should be measured, how and why?; activity of air,



water and food; external contamination of soil, clothing, body and material; personal dosimetry; whole body counting; measuring techniques; specifications for measuring instruments; relative importance of different measurements; suggestions for standardized methods of measurements; etc.

— *Session 4*: Interpretation of the results of measurements; relations between activities of air, soil, plants, milk, etc.; relative importance of particular nuclides; relations between activity and dose at different stages of the biological cycle; relations between activity and exposure rate; distinction between surface dose and depth dose; multiplicative factors transforming the absorbed dose (rad) into the dose equivalent (rem); extrapolations and predictions; isodose contours; methods for the quantitative examination of the situation; etc.

— *Session 5*: Protective and remedial measures; the wearing of a gas mask or a dust mask; protective clothing; behaviour in shelters; shelter stay time; addition of calcium to bread; drugs enhancing the body resistance to irradiation and drugs to shorten the biological half-life of internal contaminants; intake of stable iodine; ban on different types of food; restrictions of the duration of the daily stay out-doors; evacuation; decontamination; principles for planning a large scale decontamination; distinction between short term, medium term and long term countermeasures; etc.

— *Session 6*: The process of decision-making; the weighing of risks associated with radiation against the risks associated with various possible defensive measures; the relative efficiency of these defensive measures; actuarial approach; definition of

degrees of seriousness of a mass disaster; list of possible countermeasures adapted to each degree of seriousness; a system for predicting the outcome of any action that may be recommended; criteria for choosing the appropriate countermeasures adapted to a particular situation; etc.

— *Session 7*: Preparatory measures; planning survival and recovery; preparing everything that could not be improvised at the last minute; shielding against radiation; construction of shelters; inner equipment of shelters; planning evacuation; preparation of remedial measures; instructions to the population; training of measuring teams; storage of reserve food; the survival not simply as an individual but as an organized nation; etc.

— *Closing Session*: Presentation of the final reports from the seven working groups (see below); final discussion and conclusions.

Scientific discussion basis

The basic reference document for our symposium is the following brochure:

"Exposure to Radiation in an Emergency" NCRP Report No. 29; August 1962

The scientific sources referred to in this brochure are actually 7 years old, which perhaps justifies a re-evaluation of this work and its adaptation to present knowledge. Several of the fathers of this excellent report are participating in our present symposium, so we will get first-hand comments on this work.

As a second basic reference document we suggest the more recent report:

"Introduction to Long-Term Biological Effects of Nuclear War" by Carl F.

Miller and Philip D. LaRiviere; April 1966, SRI Project no. MU-5779, which will also be discussed directly by its author.

These two documents, as well as some others, have been sent in advance to all registered participants in the hope to meet a well prepared audience in Interlaken. We wish to express our thanks to the authors and institutions who have so generously placed these documents at our disposal.

Speeches and other contributions

With the purpose of covering best the topics of every session, we have invited more than twenty specialists renowned internationally for their competence in these matters. They will read the main papers which will place the accent mostly on the general view of the situation and will avoid going too far into details. Each speaker will try to present a well-balanced speech so that the time devoted to a particular chapter of his paper will be approximately proportional to the relative importance of that chapter. In other words, he will devote more time to matters which he considers important and will skip over rapidly things of lesser importance. We also expressly request the speakers to formulate their papers in a realistic and practical way. As the subject of this symposium is typically interdisciplinary, it is necessary that the physicist understand the language of the physician or biologist, and vice versa.

The main papers will then be followed by short papers related to more particular topics, but remaining within the precise frame of this symposium.

As for contributions which we considered to be too specific, or which do not fit too well in the symposium's framework, or which were announced too late, they will be distributed to all participants and will be subject to discussion, but without being submitted orally, due to lack of time.

Participants

They will be recruited from the following classes:

- specialists in radiation protection (health physicists), dosimetry, nuclear medicine, radiobiology, radiochemistry, etc.,
- staff members of military, civil defense, public health and agricultural authorities, etc.,
- representatives of expert committees on radiation protection, emergency planning, etc.,
- manufacturers of measuring instruments and protective materials for civil defense and radiation protection,
- press representatives.

From registrations filed up to the middle of April 1968, we can expect

approximately 200 participants originating from about 20 countries and several international organizations. Reciprocal understanding will be provided for by a simultaneous translation system in 3 languages: German—English—French.

Discussions and working groups

For each session, the discussions will begin in plenum and will then be pursued within the working groups which will meet separately during the whole day of Friday, 31 May, 1968. The discussions will neither be recorded nor published, in order to assure their free and unhampered course. We hope the participants in these discussions will also express their personal views (even if they are somewhat heretical!) and not merely repeat official and impersonal doctrines of an organization. Each working group will be lead by the vice-chairman of the corresponding session, who will be assisted by a secretary.

After discussion, the working group will draw up a written conclusion dealing approximately with some of the following matters:

- short description of the subject—weighing up—classification,
- "state of the art"—trend—topics sufficiently known—gaps,
- where to put the main accent in the future?—what should be done?—suggestions,
- provisional solution of a problem of particular importance but which is yet unsolved,
- relative importance of one problem as against another—topics which have up to now gained either too much or too little importance,
- lists of problems or characteristics or phenomena by order of importance on the one hand and by order of urgency on the other hand,
- realistic recommendations and practical advices to the civil defense authorities or to specialists—suggestions on adequate measuring methods and interpretation criteria—suggestion for adequate protective measures,
- proposition of specifications for the search of information and the desires precision of this information,
- which characteristics of this session are essential to some other session and vice versa?
- criticism and improvements suggested for the NCRP Report 29 "Exposure to Radiation in an Emergency",
- mention of unsolved controversies with a short statement of each point of view,
- mention of a selected list of literature in this field.

The written conclusions of the working groups will be presented orally

during the final session and will be published in the final report of the proceedings.

The distant objective

There is a distant objective which will be reached only after many years of active work. It is the setting up of precise, concrete, realistic and practical recommendations for civil defense organizations, telling them:

- how and what to prepare for before the nuclear disaster;
- how to react at the beginning of the catastrophe;
- how, what and where to measure; by whom;
- how to interpret the results of these measurements;
- how to select the most adequate countermeasures.

The objectives aimed at by this symposium

With the collaboration of every participant it will certainly be possible to reach some of the following objectives:

- to advance a few steps along the way leading to the distant objective mentioned above,
- to facilitate the reciprocal understanding and the exchange of opinions between different branches of science such as physics, chemistry, biology, medicine, etc.,
- to make scientists, military experts and public opinion aware of the large gap existing between the high degree of development of mass exterminating weapons and the still modest degree of development of the corresponding means of protection,
- to interest young health physicists in this particular field dealing with survival to nuclear disaster, in the hope of gaining a few disciples who, gradually, will replace us,
- in certain countries, to convince the authorities of civil defense of the necessity and urgency to continue the tasks presented during this symposium, by investing financial, personal and material means to a much greater extent than has been done until now,
- perhaps to encourage the publication of a new edition of the NCRP Report 29 "Exposure to Radiation in an Emergency". This new edition could be inspired by the positive criticisms expressed during this symposium.

In conclusion

This is the conception of our symposium. By accepting and applying it, the participants will help us keep within the given framework, give to our efforts a converging tendency and to our symposium a certain unity.