to beyond the midline on alternate faces, thus producing the rhomboidal cross section. There is little or no evidence of fine retouch on the lateral edges, although basal edges are usually thinned by the removal of small flakes longitudinally from the base toward the tip.

A third distinct type, the Frederick Point, newly discovered in a habitation location at the Hell Gap Site in eastern Wyoming, was discussed by Cynthia Irwin-Williams. This type, showing some affinities to the Angostura point, may represent regional variance of the Angostura type or a chronological development involving the Angostura, the Frederick, and the Jimmy Allen types. Since the Frederick Point, though distinct, bears more similarities to the Angostura than even the Agate Basin type, the diagnostic features of the Frederick point were carefully outlined.

The Frederick-type form is defined as large, wide, unstemmed, and lanceolate with a long slender tip and a wide concave base. Characteristically, the lateral edges run parallel at or above the midpoint. The blade is flat-lenticular in longitudinal section with a laterally asymmetrical "diamond" shape in cross section. The bifacial flaking is typically wide, shallow, oblique, and parallel, but with significant variation which includes both horizontal and oblique collateral orientation. The flaking runs from the lateral edges commonly beyond the midline from the same side and produces the common asymmetrical diamond cross section. There is frequent evidence of fine retouch on the lateral edges; basal edges are usually thinned by the removal of small flakes longitudinally from the base toward the tip. The base and proximal portions of the blade are commonly heavily ground.

Over 100 students and scientists attended the Paleo-Indian sessions, which consisted of 14 30-minute papers and three panel discussion periods. The panels were limited to discussion of the topics of Paleo-Indian problems in typology, terminology, and chronology. For the first time there seemed to be widespread agreement on most of the basic problems confronting early man research in the New World.

GEORGE A. AGOGINO
IRWIN ROVNER
*Paleo-Indian Institute, Eastern New Mexico University, Portales*
CYNTHIA IRWIN-WILLIAMS
*American Museum of Natural History*

## Radiation Accidents and Emergencies

Local emergencies, small accidents, and major catastrophes involving ionizing radiation were the main topics of discussion at a symposium on radiation accidents and emergencies in medicine, research, and industry held in Chicago, 19–20 December 1963.

All pertinent aspects of a pure emergency situation were covered—accident dosimetry, handling of spills, medical aspects, mass survey problems, control of post-accident exposures, psychological and legal considerations, public relations, and others.

In most accident or emergency situations (that is, incidents resulting from accidents where prompt action is necessary), the intelligent attention and full capacity of the emergency worker should be directed to the following sequence of action: (i) The saving of lives (rescue operations, protection from further injury, and directing the victims back to active, useful lives); (ii) containment measures and prevention of further injury or threat of injury; (iii) salvage of equipment and materials; and (iv) turning the disaster site over to persons interested in or responsible for restoration.

The type of emergency action taken in an area where radiation has been released will depend on whether or not there is a reasonable expectation that anyone is present and alive. In either case, the course of action to be pursued should be determined by the person designated as responsible for the emergency action (E. Vallario and R. Catlin, U.S. Atomic Energy Commission). The risk to the rescue workers should be weighed against the probable success of the rescue action. Attempts to rescue victims should be regarded in the same context as any other emergency action involving the rescue of victims, regardless of the type of hazard involved. Any rescue activity that may involve substantial personal risk should be performed by volunteers, and all emergency workers should be advised of such risks prior to their participation.

From the legal point of view, Forgotson (Walter E. Meyer Research Institute of Law, Washington, D.C.) pointed out that a particularly complicated situation is presented when, for the purpose of attempting or effecting a rescue of persons involved

in a disaster, or of preventing a disaster, it becomes necessary to expose individuals to doses of radiation in excess of 3 rem per quarter of a year and 25 rem for a single accidental exposure. He discussed the effect of these dose limitations and concluded that, on the basis of Federal Radiation Council publications, exceeding these doses does not constitute negligence per se and, in certain situations, even might not constitute evidence of negligence. (He further discussed a number of liability questions, including the potential liability of a manufacturer or seller of a source. In this connection, he called special attention to the recent product liability case of Goldberg versus Kallsman Instrument Corporation, a case which marked a departure from the way the New York Court of Appeals or any other court has previously handled one of these decisions. In this case, the majority of the court held that someone, namely, the ultimate manufacturer, is left in the role of a virtual insurer for the defective designs.)

The screening of persons exposed to radioactivity for medical attention, decontamination, or release is only a passing phase of the emergency situation although a most important one. Some controversy exists in the case of a contaminated person who requires medical treatment—which should come first, medical aid or decontamination? This question, of course, does not have a simple answer.

Speaking on medical effects, G. Voelz (U.S. Atomic Energy Commission, Idaho) stated that "The atomic energy industries to date have not experienced acute accidental exposures from internal emitters (any radioactive chemical entering the body either through the skin, pulmonary, or gastrointestinal tract) resulting in an acute or dramatic radiation injury similar to the direct external radiation exposures which produce the dramatic acute radiation syndrome." The concern regarding internal emitters is related more to the continuing radiation dose which may produce late pathological effects.

Inhalation of radioactive particulates or aerosols by workers has been the most common and important source of internal deposition in atomic energy installations. In the case of contaminated wounds, excision has been practiced most frequently when plutonium-239 was the contaminant. To evaluate the nature and amount of internally deposited radioactive material, G. V. LeRoy (University of Chicago) remarked that, at the outset, it is most important to collect all urine passed by each person from the time he escapes—or is removed—from the site of the accident. Depending on the circumstances, radioassay of the first urine voided may be of great value in estimating the accidental burden of radioactive material.

The art and science of methods for decontaminating equipment and materials have been vigorously pursued for the last two decades. L. Gemmell (Brookhaven) reviewed older as well as some new techniques, such as shot blasting. Speaking on maximum permissible levels of surface contamination, W. R. Bush (Chalk River, Canada) pointed out that these levels varied by a factor of 1000 for alphas and 100 for betas among the various countries that use radioactive isotopes. He also developed data showing that, for a given surface contamination of a material, the inhalation hazard varied by a factor of 1,000,000, with carbon-14 at the lowest limit and plutonium-239 at the upper limit. J. Maloney (Edgewood Arsenal, Edgewood, Maryland) reported on new effective procedures of major outdoor decontamination under cold weather and winter conditions. (Many portable radiation measuring instruments fail to operate while at low temperatures.)

The spread of alpha contamination, which is caused by a nonnuclear explosion (chemical part) of atomic weapons, has been a subject of concern for many years. The most extensive measurements ever made in this field were reported on for the first time by W. Johnson, Sr. (Eberline Instrument Company). The detonations were designed to simulate conditions of storage, transportation, and handling of plutonium-bearing weapons. Surveys were performed with both alpha and gamma instruments at distances up to 16 kilometers. As one might expect, drastic changes in the contamination patterns were observed from one test shot to another.

The generation and disposal of waste in emergency decontamination is of little consequence in most accidents involving radioactivity (R. O'Brien, General Electric Company, Idaho). This is due in part to the well-established waste disposal channels. In unusual situations such as the

SL-1 reactor incident where, after 5 months' decay, about 3500 curies of fission products were distributed as contamination throughout the reactor building and its environs, the use of a local waste disposal site saved more than 300 man-rem of exposure. It is estimated that the cumulative total whole-body dose of 1000 rem was received by those who were involved in the cleanup. The cost of cleanup was $1 million, not counting the cost of volunteer and Army workers.

R. Gallaghar (Applied Health Physics, Pittsburgh) reported a wide range of restoration effort for the decontamination of radium spills in medical situations. In one situation an entire building had to be demolished. There is on the average one radium contamination incident a week in the United States.

Unlike many types of accidents, those involving radiation can go undetected for an extended period of time. Such delays can lead to considerable spread of the contamination.

The topic of public relations was assigned to the well-known science reporter, Robert S. Kleckner (*Sun-Times*, Chicago), rather than to an institutional public relations person. Kleckner stated that the first step in reporting an accident is to avoid any type of censorship and to get the facts to the people as quickly and simply as possible. If there is a hazard beyond the confines of an installation, it should be stated that this is so and how great it is. The public should be informed about the precautions to be taken. There should be a steady flow of information to the news media until the story has been covered from all angles. There are reassurances even in bad radiation mishaps; the good as well as the bad should be brought out. The American public has never panicked when it knew the truth immediately.

Preplanning and preparedness are the keys to reducing the deleterious effects of accidents. R. Landauer (Cook County Hospital, Chicago) and G. V. LeRoy (University of Chicago) spoke on hospital preparedness but differed greatly on the approach. LeRoy stressed preplanning between a given radiation installation and a nearby hospital for the care of injuries that may occur. Landauer, on the other hand, stressed the need for a simple plan for all hospitals because accidents, especially transport accidents, may occur anywhere.

Emergency situations produce anxieties in those who are directly involved. D. Oken (Chicago), a psychiatrist, talked on mental preparedness of emergency personnel, both as individuals and as groups. Emergency teams must be suffused with a strong *esprit de corps*; members of a group with high morale become capable of carrying out tasks that are personally unappealing or even severely stressful. The group may admit to a certain degree of internal fear, but disparagement of the group itself or self-protective avoidance of responsibilities to one's co-workers is intolerable. Individuals who transgress these limits must be excluded. Panic, however, is rare. Little was seen at Hiroshima or Nagasaki. Emergency teams should be supplied with a maximum of correct information and be trained in the most helpful methods of communicating this to victims. The antidote to scare stories and rumors is information. Even if the news is bad, it is always reassuring to know that you know the worst. On the question of prevention, Oken pointed out that accidents tend to occur in clusters during periods in which other signs of psychological stress are evident—the accident syndrome. Subtle changes in the behavior pattern of an individual may be precursors to a major accident.

In the event of a radiation accident that cannot be handled by the organization in which it occurs, there are some private organizations that might be called in. In addition to these, the U.S. Atomic Energy Commission has a Radiological Assistance Program. Zintz (U.S. Atomic Energy Commission, Washington) and Brobst (U.S. Atomic Energy Commission, Chicago) reported on the program which is capable of responding to a radiological emergency upon request 24 hours a day anywhere in the United States. During the last 3 years 223 responses to requests for radiological assistance were made. Most of these (40 percent) involved transportation incidents.

The Radiological Health Division, U.S. Public Health Service, has a somewhat broader program, although it too has Radiological Assistance Teams. R. Moore (U.S. Public Health Service, Dallas) and L. Thomas (U.S. Public Health Service, Chicago) outlined the role of the U.S. Public Health Service in the radiation area along with its traditional role of pro-

tection of public health. An Interagency Radiological Assistance Plan involving 12 federal agencies has been formed. The members of the symposium were gratified to learn of the wide interest shown by the federal government.

The 350 individuals who attended the symposium came mainly from the midwestern states. The geographical location of the visitors included 28 continental states, Hawaii, Puerto Rico, Canada, and Austria. The percentage of institutional representation was 28 percent industrial or commercial, 17 percent U.S. Atomic Energy Commission or contractors, 14 percent public health, 12 percent space and defense, 11 percent university, and 7 percent hospital. The remainder included attendance from insurance companies, labor unions, research institutions, and private individuals.

The symposium was sponsored by the Midwest Chapter of the Health Physics Society, the Radiation and Medical Physics Society of Illinois, and the Chicago Section of the American Industrial Hygiene Association. Robert V. Wheeler (Argonne National Laboratory) served as chairman. The symposium was supported in part by the Division of Radiological Health, U.S. Public Health Service.

LAWRENCE H. LANZL
*Department of Radiology and Argonne Cancer Research Hospital, University of Chicago, Chicago, Illinois*

JOHN H. PINGEL
*Argonne National Laboratory, Argonne, Illinois*

## Forthcoming Events

### March

*27–28.* **Seismological** Soc. of America, annual, Seattle, Wash. (K. V. Steinbrugge, SSA, 465 California St., San Francisco 4, Calif.)

*27–28.* **Pennsylvania Acad. of Science**, University Park, Pa. (P. C. Martin, Point Park Junior College, Pittsburgh, Pa.)

*27–29.* Society for the Study of **Evolution**, annual, Chapel Hill, N.C. (H. H. Ross, Illinois Natural History Survey, Urbana)

*28–30.* American Assoc. of Colleges of **Pharmacy**, Detroit, Mich. (C. W. Bliven, 1507 M St., NW, Washington, D.C. 20005)

*29–2.* Association of American **Geographers**, annual, Syracuse, N.Y. (AAG 1201 16th St., NW, Washington, D.C.)

*30–2.* American Assoc. of **Junior Colleges**, Bal Harbour, Fla. (W. G. Shannon, AAJC, 1777 Massachusetts Ave., NW, Washington, D.C. 20036)

*30–4.* **Estuaries** Conf., Sapelo Island, Ga. (G. H. Lauff, Sapelo Island Research Foundation, Sapelo Island)

*31–3.* American Assoc. of **Anatomists**, Denver, Colo. (L. B. Flexner, Dept. of Anatomy, Univ. of Pennsylvania, Philadelphia 4)

### April

*1.* **Thermoplastic Materials**, conf., Soc. of Plastics Engineers, Akron, Ohio. (W. H. Nicol, RETEC, Goodyear Tire and Rubber Co., Akron 16)

*1–2.* **Engineering Aspects of Magnetohydrodynamics**, symp., Cambridge, Mass. (G. S. Janes, Avco Everett Research Laboratories, Everett 49, Mass.)

*1–2.* Methods for Measurement of **Weak Beta-Emitters**, Karlsruhe-Leopoldshaven, Germany. (Gesellschaft Deutscher Chimiker, Gesellschaftsstelle, Postfach 9075, Frankfurt/Main, Germany)

*1–3.* **Structures and Materials**, American Inst. of Aeronautics and Astronautics, 5th annual conf., Palm Springs, Calif. (R. R. Dexter, AIAA, 2 E. 64 St., New York.

*1–3.* **Optical** Soc. of America, spring meeting, Washington, D.C. (M. E. Warga, OSA, 1155 16th St., NW, Washington, D.C. 20036)

*1–4.* National Soc. for **Programmed Instruction**, annual, San Antonio, Tex. (NSPI Program Committee, Trinity Univ., 715 Stadium Dr., San Antonio, Tex.)

*1–5.* Latin **Oto-Rhino-Laryngology** Soc., 15th congr., Bologna, Italy. (G. Motta, Via Modica 6, Milan, Italy)

*2–3.* American Soc. of **Civil Engineers**, Engineering Mechanics Div., spring conf., Boston, Mass. (ASCE, 33 W. 39 St., New York 18)

*2–3.* Alexander Graham Bell Assoc. for the **Deaf**, southeastern meeting, New Orleans, La. (R. Tegeder, Utah School for the Deaf, 846 20th St., Ogden)

*2–3.* **Obstetrics and Gynecology**, seminar, Gainesville, Fla. (Mrs. D. Miller, Div. of Postgraduate Education, College of Medicine, Univ. of Florida, Gainesville)

*2–3.* Industrial Applications of New **Technology**, conf., Atlanta, Ga. (Director, Short Courses and Conferences, Georgia Inst. of Technology, Atlanta, Ga. 30332)

*2–4.* American Acad. of **Oral Pathology**, Bethesda, Md. (R. J. Gorlin, Univ. of Minnesota, Minneapolis)

*2–4.* Association of **Surgeons** of Great Britain and Ireland, annual, St. Andrews, Scotland (Secretariat, 47 Lincoln's Inn Fields, London, W.C.2, England)

*2–5.* British **Medical** Assoc., clinical meeting, Northampton, England. (D. Gullick, Tavistock Sq., London, W.C.1)

*3–4.* **Biology** colloquium, Corvallis, Ore. (C. M. Gilmour, School of Science, Oregon State Univ., Corvallis)

*3–4.* Society for **Industrial and Applied Mathematics**, midwest regional meeting, Cedar Rapids, Iowa. (W. J. Jameson, Collins Radio Co., 120–11, Cedar Rapids)

*3–5.* **Fleming's Lysozyme**, 3rd intern. symp., Milan, Italy. (G. Podio, Museo della Scienza e della Tecnica, Via Modica, 6, Milan)

*3–5.* American Soc. of **Internal Medicine**, annual, Atlantic City, N.J. (A. V.