Chernobyl:

The Chernobyl nuclear accident is the worst nuclear power plant catastrophy to have occurred. Radioactivity was released into the air for nine days comprised of 100 million curies of radioactive elements corresponding to 3.5 per cent of the reactor's total inventory. An area of approximately 1000 square kilometers around the reactor site including the towns of Pripyat and Chernobyl were seriously contaminated and necessitated the evacuation of 135,000 inhabitants. The plume of radioactivity released from the Chernobyl reactor spread over half of the Soviet Union and covered most countries in Europe within five to six days of the accident. By May 6,

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detectable amounts of Chernobyl fallout were also measured in rainwater and milk samples in Canada and Japan. In Edmonton, the Public Health Service operated a hotline to allay public fears about the radiation.

On Wednesday, October 8, Dr. Walter Huda, a radiation medical physicist from the Department of Medical Physics of the Manitoba Cancer Treatment and Research Foundation in Winnipeg, gave a lecture entitled the "Medical Consequences of Chernobyl". Dr. Huda defined the technical terms required

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in assessing the Chernobyl aftermath lucidly and in an understandable perspective. For example, the radiation dosage unit rem takes into account the amount of radiation absorbed by an individual and the effectiveness of the radiation type in causing biological harm. Everyone is exposed to natural background radiation amounting to an annual dose of around 0.1 to 0.2 rem. Regulating dose limits for the public are currently set at 0.5 rem per year. The acute effects of large radiation doses are ghastly. Doses in excess of 1,000 rem result in the rapid onset of severe nausea, vomiting followed by convulsions and tremors. States of stupor alternate with hyperexcitability and death follows in a few days. The effects of smaller doses are even more grisly. In excess of about 700 rem nausea, vomiting and hemorrhagic diarrhea prevail followed by exhaustion, delerium, dehydration, the circulation fails, and coma and death follow in about one week after exposure. It can be said that death is just too kind for these individuals, for in the dosage range of 200 - 600 rem, in addition to nausea and vomiting, there is a loss of appetite, diarrhea and apathy. The victim's bone marrow stops producing cells and the agony continues for three to four weeks after exposure as fatigue, chills, shortness of breath develop, gums and tonsils become ulcerated and bleeding accompanied by hair loss. About 50 per cent of victims exposed to this level of radiation, are expected to die within 25 to 35 days of exposure. Should they survive this acute stage, they will have an elevated life-time risk of dying from a radiation induced cancer of about 1 per cent per 100 rem radiation dose.

A nuclear reactor can be thought of as a controlled atomic bomb so it is a simple device in principle. Reactors generate heat from uranium 235 fuel which undergoes a breaking process termed fission which releases energy. The attraction of nuclear power is self-evident. A single train carload of fissionable fuel suffices to supply a 1000 megawatt

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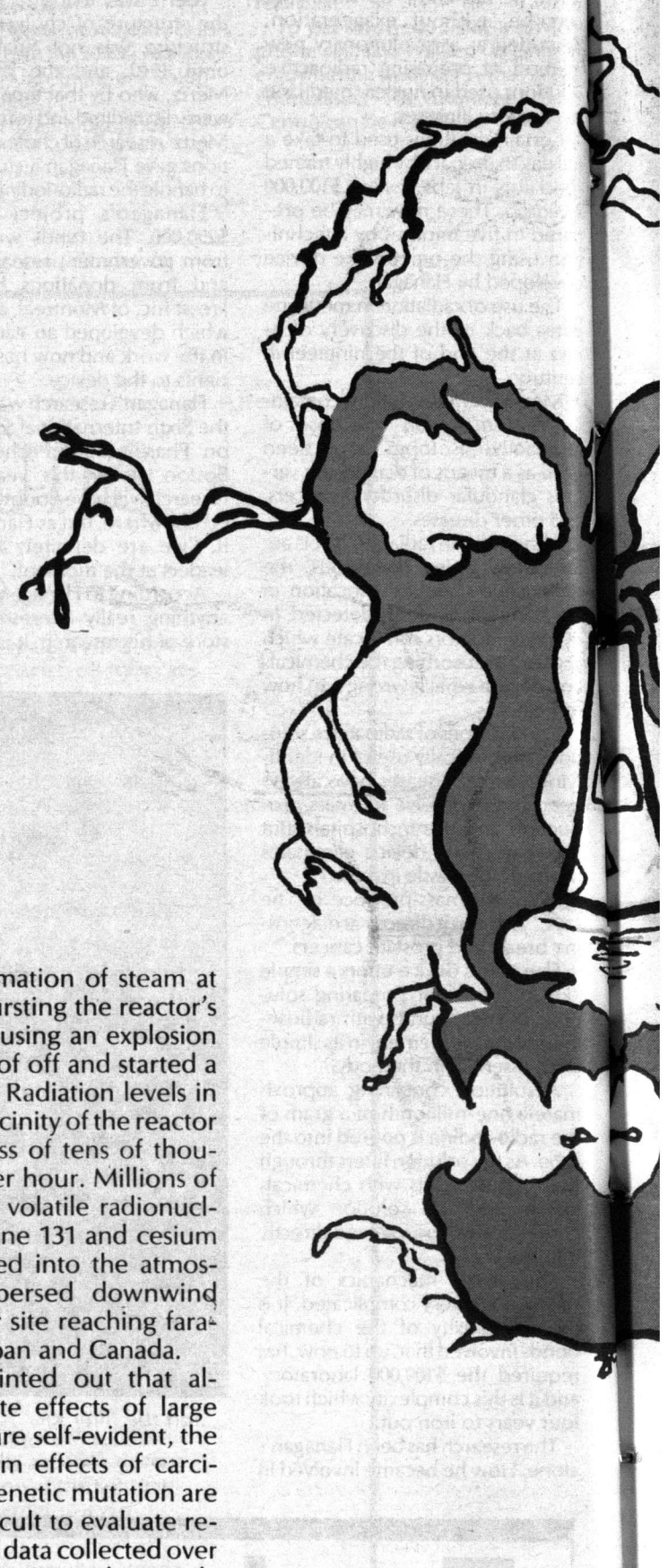
nuclear power plant for a year compared to about 10,000 equivalent carloads of coal or oil to generate the same power. The heat in a nuclear reactor is produced at a controlled rate via "control rods" and is extracted from the core of the reactor by water cooling. The heated water passes through a heat exchanger, and energy extracted in this fashion is used to generate steam which subsequently drives a turbine generator.

This sounds simple enough, however, what happens if the steam supply to the generators were to be cut off for some reason? One would immediately think that there would be a heat accumulation and something would more than likely melt, explode or blow up. It would seem strange to think that it would be necessary to do an experiment to verify this notion, but that is precisely what happened on April 25, 1986 at Unit 4 of the RMBK-1000 nuclear power plant at Chernobyl in the Ukraine. Engineers were intent on performing experiments to test the effectiveness of a number of safety features of the reactor in the event of a steam supply shut-off. However, several grave errors were committed including the removal of too many control rods, shutting off the automatic controls, bypassing the automatic shutdown mechanisms, and switching on too many coolant pumps. These errors resulted in a sudden surge of power which led to rapid formation of steam at high pressure bursting the reactor's cooling tubes causing an explosion that blew the roof off and started a number of fires. Radiation levels in the immediate vicinity of the reactor reached in excess of tens of thousands of rems per hour. Millions of curies of deadly volatile radionuclides such as iodine 131 and cesium 137 were released into the atmosphere and dispersed downwind from the reactor site reaching faraway places as Japan and Canada.

Dr. Huda pointed out that although the acute effects of large radiation doses are self-evident, the chronic long-term effects of carcinogenesis and genetic mutation are much more difficult to evaluate requiring statistical data collected over many decades. For example, a study of Japanese survivors of the atomic bomb attack is still being undertaken to this day to assess the long term effects of radiation. Particularly difficult is the assessment of chronic radiation exposure due to the ab-



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