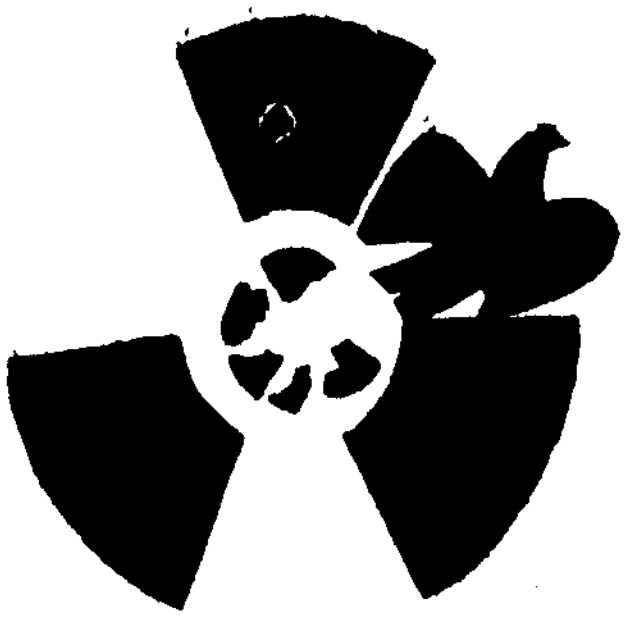

ANUMUKTI

A JOURNAL DEVOTED TO NON-NUCLEAR INDIA

Vol. 1 No. 6 **June 1988**

Some say the world will end in fire,
Some say in ice.
From what I've tasted of desire
J hold with those who favour fire.
But if it had to perish twice,
I think 1 know enough of hate
To say that for destruction ice
Is also great
And would suffice.

Fire and Ice. *Robert frost*

Dua, my daughter, is five years old. She radiates joy and the last five years have certainly been amongst the happiest of my life. But sometimes I feel it is a dream with the external world rudely knocking to shake me out of this idyllic state.

The reality outside is harsh. The horrors of nuclear holocaust are just a button-push away. But even without that ultimate fire, scientists estimate that more species of flora and fauna shall become extinct within our lifetimes than have done so in the last fifty million years toge her. The last great miss extinction was sixtyfive million years ago when dinosaurs and rainy other species made their exit. Even that mass extinction, which torn; speculate was caused by the impact of a large meteorite on earth which raised a lot of dust and completely changed weather patterns, did not bring such sudden death. The lifetime of a species ranges over hundreds of thousands to millions of years. A century is like the proverbial blinking of an eyelid. Yet we have managed to poison our planet to such an incredible extent in this short time that hundreds of species will be becoming extinct everyday. The much heralded dawn of the 21st century is a time of doom for a lot of our fellow beings. The Greenhouse effect, Acid rain, 'Ozone hole, Soil erosion, Deforestation and Desertification, Radioactive and Toxic waste are just a few signboards on this route to global catastrophe. Our own local hells - terrorism and (en)counter state repression,-Punjab and the northeast-hegemonistic adventurism in Srilanka, never ending violence against adivasis, harijans, minorities and women -endemic starvation ni Kalahandi and the deepening drought in Gujarat, etc seem like eddies In this flood towards doom.

Our very existence today depends on the products of modern industrial processes. All these processes have two common characteristics : they guzzle limited resources and they produce ever-growing wastes. Even if we confine ourselves to energy generation alone, all forms of bulk' production, coal oil, nuclear and large dams arc both hazardous and polluting. The coal versus nuclear controversy, so dear to energy planners, is akin to condemned prisoners on death row expressing a preferrence for the electric chair over the gas chamber. We need a way out which affirms life rather than death.

In *'A Study of History",* Toynbee noted that civilizations decine when they fail to find adequate responses to the challenges that face them. The recurrent and ever virulent problems that confront us only attest to the bankruptcy of the universally adopted modern materialism. The touching faith in the ability of SCIENCE to solve all the problems it has spawned needs to be recognised for the superstition it is. It is only when we realize that we have reached a dead end, that we can begin the search for a way out.

Wherein lie reasons for hope ? Hope lies in the spread of ecological consciousness in the young. It lies in the recognition that humans are not the "centre of all meaning and the source of all value"-that material consumption is not what being human is all about. Hope lies in the vision of Gandhi, of Tolstoy, of Thoreau and Emerson - a world in which all creation can live together in peace and respect.

As long as we remain convinced that we arc the measure of all that is, that the world is a mere store of resources for gratifying our whims, there is no alternative to fire and ice - a very apt metaphor for nuclear winter. All our Duas (an arabic word meaning both prayer and blessings) deserve better.

Surendra Gadekar

American Nuclear Resistance—1987

The number of arrests for anti-nuclear civil disobediance in the United States and Canada increased in 1987 by nearly 60 % over recent years to a total of over 5,300. Statistics compiled annually by the Nuclear Resister newsletter show that the current figure equals the record number of arrests reported in 1983, the year of Euromissile deployment and massive demonstrations in the United States and Europe.

Most of these arrests were weapons related and occurred at military facilities, war contractors and federal government offices. About 400 of the total were of people protesting nuclear power, uranium mining and related projects.

As a consequence of these arrests, over 120 people served or are serving prison sentences ranging from two weeks to 17 years. Hundreds more served lesser sentences.

Action groups all across the continent, some in loose coalition with others, but for the most part acting independently, engaged in over 180 separate actions in 1987 at more than 70 different sites. (Of the total arrests, 95 were reported from Canada, during nine actions at three sites.)

The Nuclear Resister newsletter, edited and published eight times each year in Tucson, Arizona, by Jack and Felice Cohen-Joppa, is a source for comprehensive information about anti-nuclear civil disobedience in the United States and Canada. Subscriptions are $15/10 *issues from the Nuclear Resister, P.O.Box* 43383, *Tucson, AZ* 85733 *U.S.A.*

ANUMUKTI DAY-1988

KARNATAKA

Chernobyl day was commemorated in Karnataka as 'Anumukti' day. The emphasis was on educational and cultural activities. A group of ten activists who had met for a preparatory meeting beforehand felt that an impasse had been reached with conventional forms of protest, especially marches to the chief mi listers residence and that something novel needed to be done to capture the imagination of youth.

For the programme in Bangalore, a number of different groups cooperated and worked together as a unit. Amongst these were CIEDS collective, Prarambha, Samagra Vikas, and the Progressive Youth Centre. A number of activists observed a one day fast as an expression of commitment to the anti-nuclear cause. The programme was formally inaugurated at 8 AM at Minsk Square by the exhibition of black and white sketches of Shri B.K.S. Varma. A workshop was conducted by the group Media Exploration for Social and Cultural Advancement (MESCA). In the workshop, ways of fabricating Demon Heads were demonstrated. These demonheads were later used in a procession in the evening. Activists of Bingalore are specially thankful to Shri Shashi Adappa and Shri Rajendra of MESCA for their help.

About 4 PM in the evening, mask wearing and slogan shouting activists of the pro gressive Youth Centre (PYC) commenced a cycle rally. Taey went to different parts of the city and distributed anti-nuclear literature.

Throughout the day a group of three singers who had come specially from Raichur to participate in the programme, sang songs describing the damage done by the destruction of the Kaiga forest. The songs which were based on Kannada folk tunes were much appreciated. A lot of people cams forward and expressed their solidarity with the activists. A lot of posters were punted and exhibited. There was a magic show by Raaj the magician.

At 5.30 in the evening there was a protest march by about 250 protesters. The protesters were holding banners, posters, placards and demon-heads. Others formed a human chain, from Miask square to Cubbon Park Bandstand. Later in the evening the rally converted itself into a meeting. There was an impromptu performance of Yakshagana on the subject of Nuclear Demon. Besides there was a folk song and dance performance by the group from Raichur and some PYC activists. The meeting was addressed, among others by Shri H.S. Doreswamy, Dr.Ramachandra Guha, Dr.Nagaraja Rao and Shri Suresh Heblikar.

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ANDHRA PRADESH

Citizens against Pollution (CAP) has decided to launch a protest campaign against the siting of a nuclear power station near the Nagarjunasagar dam. The campaign will concentrate on the command area of the dam on the Krishna river.

Mr.K.Purushottam Reddy, a college professor in Hyderabad, and the president of CAP told a news conference that an anti-pollution 'Prachar Ratham' (propoganda chariot) would tour the area fron Nagarjunasagar to Khammam as well as Vijaywada and Guntur, to spread awareness amongst the people of the dangers of radioactive contamination.

At the same time a group of lawyers had come forward to file a public interest petition in the high court to prevent the nuclear power board from going ahead with the project.

Prof.T.Shivaji, of the Andhra university, told newsmen that atomic energy officials "are taking us all for a ride" and not following known safety rules including those laid down by the atomic energy commission itself.

Prof. Shivaji said that the Nagarjunasagar project did not men stipulated criterion. Vijaypuri, a township of 40,000 was within 16 Km, of the site. The tiger sanctury, the historical museum of ancient Buddhist monuments of Nagarjunakonda, tourist centre and the Sagar lake with abandant fish, all lay in close proximity of the reactor site. He said the nuclear plant would discharge 3000 million gallons of hot condensor cooling

water at a temperature ten degrees Celsius higher than the ambient temperature of the river water. Due to this massive discharge, there will be drastic reduction in the oxygen content of the river which would result in high mortality in the fish.

Times of India : April 28, 1988

GUJARAT

Kakrapar, in south Gujarat, is the site of two 235 MW reactors under construction. The construction began in 1980 and at present the authorities expect the reactors to become critical sometime in 1991. As regular readers of *Anumukti* would be well aware, a local agitation of somewhat sporadic character has been going on since 1985 opposing the construction of the reactors.

For quite sometime past activists had felt the lack of statewide support for the Kakrapar agitation. This lack was attributed to the fact that no campaign on a statewide basis had been conducted to educate the people about the hazards of and the inequity and the injustice involved in the nuclear enterprise.

At the last meeting of Gujarat Anu Urja Jagruti, it was decided to observe Chernobyl day by having a march from Kakrapar to the state capital at Gandhinagar - a distance of around 400 Km. (Sec *Anumukti* vol.I No.5) Originally the idea was to travel the whole distance in a bus with programmes of public meetings, poster exhibitions, video shows, etc on the way, but a suggestion from the students of Sampoorna Kranti Vidyalaya, made for a happy change in the programme. They concieved the idea of a cycle rally for the whole distance. There were some logistic problems in this, but in retrospect, the cycle rally turned out to be the major component in the success of the whole venture.

The march started from Kakrapar on the 19th of April and proceeded to Gandhinagar with halts at Bardoli, Surat, Ankaleshwar, Bharuch, Baroda, Anand, Nadiad and Ahemedabid. Besides eleven cyclists, there were eleven others who covered the distance using state transport buses, trains and in the latter part of the journey, a jeep.

Public response to the rally was very encouraging. The cyclists who carried posters and wrote slogans on the road-side were often cheered and received enthusiastic welcome in many villages. Some roadside cycle repairers even refused payment for the repairs carried out by them saying that they too wanted to be part of the march. During the march, thousands of handbills were distributed. A lot of copies of two antinuclear booklets in Gujarati were sold and *Anumukti* has 21 new subscribers.

The three press conferences held at Surat, Baroda and Ahemedabad were well attended and the issue was extensively reported in both the Gujarati as well as English newspapers. Most of the leading Gujarati papers had editorials which commented favourably both on the anti-nuclear stand as well as on the way the rally was conducted, contrasting it with the fake 'Dandi March' indulged in by the Prime minister just a few days previously. The march was also mentioned prominently in local radio and TV news bulletins.

On the 26th of April the march concluded by submitting a memorandum to both the governer and the chief minister of Gujarat at Gandhinagar. The demands in the memorandum were : 1) That a national debate be conducted at various levels so that a national consensus can be established on nuclear activities in the country, 2) Till such a consensus was established, there be a moratorium on new plant construction and 3) Information regarding nuclear activities be made freely available to citizens and the cloak of secrecy surrounding them be lifted. The chief minister expressed his inability to do anything about the demands since atomic policy was decided in Delhi but agreed to convey the demands to the Prime minister.

As part of the next phase of the programme, a necessity was felt of preparing a number of small (32 pages) booklets highlighting different aspects of the nuclear issue in Gujarati and Hindi. Also special efforts need to be made to contact different amateur theatretical groups to stage plays on anti-nuclear themes.

Surendra Gadekar

An Appeal

A large part of the milk distributed by the urban dairies in Bombay, Calcutta, Delhi and other cities in India is likely to be radioactively polluted. Our National Dairy Development Board, a Government of India organisation, has contracted for imports of 75,000 tonnes of milk powder and 2$,ooo tonnes of butter oil from European Economic Community (EEC) countries and a part of this consignment is expected during the ensucing months. The EEC exports of dairy products, since Chernobyl atomic disaster in April 1986 were found radioactively polluted and millions of kilos of milk powder, butter oil, etc were rejected by Afro-Asian Countries including Phillipines, Malaysis, Singapure, Sri Lanka, Bangladesh, Pakistan, Nepal, Angola, Ethiopia, Ghana, Mozambique, Somalia and others. But India has been a sole exception. India does not have a compulsory statutory check for detecting radioactivity in foodstuffs at its ports of entry, though our Bhabha Atomic Research Centre (BARC) carries out such tests if and when a sample is sent to them. However, BARC has failed to enforce any scientific statistical design of sampling and in most instances the representative character of the sample vis-a-vis the imported consignment is in serious doubt. Nevertheless BARC have issued certificates regarding its fitness for human consumption.

We therefore approached the Supreme Court and petitioned for a restraint and ban on imports of such dairy products from EEC countries. But Government institutions and Government Scientists opposed our petition and Supreme Court rejected our plea despite advice and warnings about genetic damage and cancer from Nebel Laureates, Dr. Linus Pauling and Dr. Geroge Wald. The conscience of the nation has been shocked by this callous attitude of the Government towards public health hazards. Numerous consumer associations have requested the Supreme Court to reconsider its decision and we have filed a Review Petition. We have also requested the Prime Minister to intervene and stop imports immediately. The former Chief Justice of India, Mr. Y. V. Chandrachud has called the Supreme Court verdict a monumental error. In the British Parliament, fiftynine oposition MPs have given a Notice of Motion for investigation to ensure that no radioactive foodstuff will be shipped from UK to the Third World countries or from European countries to UK. In Khatmandu, Nepal, widespread consumer resistance has disrupted the distribution of recombined milk by government dairies.

Consumers health is in danger. Infants, children and pregnant women will be the worst sufferers. Future generations too may suffer from genetic damage and higher risk of cancer. We, therefore, urge upon you to act now and force the Government to ban imports of all milk products from EEC countries. People must raise their voice and assert at all public forums to stop the import and distribution of radioactively polluted milk products in India.

Maharashtra State Government Employces' Confederation.

Chernobyl in PM's Kitchen

Rumours claim that Motilal Nehru, our present Prime minister's great grand father used to get his laundry done in Paris. I never gave credence to these rumours till I read the following story in the Indian Post of April 26th, 1988. *We are reproducing it for its surreal quality and the light it throws on the extravagance of our rulers.*

A few hand-picked ' scientists in the employ of the Department of Atomic Energy have been entrusted the special responsibility of testing for radioactivity, the food consumed by Rajiv Gandhi and other VVIPs.

Armed with a string of university degrees and gamma spectrometers, they probe deeply into the Prime Minister's food to ward off nasty maladies that could arise from Chernobyl's malignant isotopes.

The list of people they protect is select, an exclusive club which includes the Prime

Minister, the President and the Vice-President and their immediate families. Any morsel in their list of edibles that originates from countries affected., even remotely with the Chernobyl fallout, is scanned by powerful radioactivity monitors at the Bhabha Atomic Research Centre here.

For the last 18 months, they have seen, inspected and passed every edible item consumed by the Prime Minister originating from Europe. And in the instances when they have not been able to cart the food to their laboratories, the scientists have jet-hopped continents chasing VIP food.

The exercise began shortly after the Chernobyl nuclear disaster when the Director-Gsicral of Health Services in New Delhi sensed dinger to the PM's health and issued a directive that all food coming from Europe and reaching Rajiv Gandhi's plate be first tested for radioactive isotope Cesium-137.

Since then, the PM's food has been taking a long and winding route. After its flight from the West to New Delhi, a portion is selected as the Prime Minister's feed for the next week to fit a menu attested to by his kitchen staff. The food, comprising meat, bread, select vegetables and even chocolate and cookies, is then packed into 500-gm pickets and flown to Bombay, and from the airport here, brought by special escort to BARC's testing laboratories for priority analysis.

The samples are checked, cross-checked and then verified by a head of department before a copy of the report is sent to the Director General of Health Services, and the food returned to New Delhi.

And when the PM leaves the country, the food leaves with him. In fact, for every kilometre he travels out of India, his food would have traversed more than twice that distance.

For the BARC laboratory, which receives about 2-3 kg every 15 days while the PM is in the country, the real task begins when he is set to tour the world. The Director-General's office had initially toyed with the idea of testing only the PM and his family's food, but decided against it because of the possibility of the untested portion landing on his plate, and the 'safe' special meal going to some inconsequential bureaucrat or journalist.

So the lab has to test all the food that enters Gandhi's special Jumbo aircraft. Which means that about 12-15 kg of samples arrive in Bombay about 3-5 days prior to the journey for Cesium-137 testing.

Incidentally, BARC has seldom performed similar tests for general consumer products, the one exception being that for the imported butter. Other items purchased from Europe, including meat, special seasonal vegetables and even the assortment of chocolates available here for general consumption, do not go through any isotope-test.

DAE scientists say the tests arc not necessary any m>rc as radioactivity levels are dropping. Now they stand at 3 becquerels per kg against the permissible limit of 40 becquerels. And how long would they continue the test ? "Till he Director-General issues a fresh directive."

Courtsey : R.S. Venkatesh, Indian Post.

Heavy Water Theft

Norway has confirmed persistent reports in the press that in 1983 consignments of Norwegian heavy water were diverted and sold in the international black market. Investigations arc still continuing but reports speak of at least two separate consignments of 15 tonnes each which were hijacked from W. Germany and Roumania. India has been mentioned as one of the possible recipients of these stolen goods. It is difficult for the Indian Atomic Energy establishment to deny these allegations since in 1983 India was desperately searching for heavy water to start the first unit of the Kalpakkam reactor (MAPS-I) near Madras.

The Kalpakkam reactor had been completed in 1980 and was not being started mainly due to a shortage of heavy water. The requirement tor a plant of its type and size is around 250 tons for start-up and about 20 tons per

year thereafter. India does have a number of heavy water plants of its own but their performance has never been anything other than poor. (See the story on the Tuticorin heavy water plant in this issue). The Tuticorin (67 tons/year) and Baroda (70 tons/year) plants were then (and have been since) in constant trouble. (Only recently the Baroda plant had a big fire). The Talcher (67 tons/ year) has never got off the ground. The old Nangal (14 tons/year) plant was at the time not producing up to capacity due to frequent power cuts in the region.

Thus, the main question remains : how did India manage to get the 250 tons of heavy water to start MAPS-I reactor when all its heavy water units were non-performers ? The establishments answer to the question has been to ignore the question altogether, put up a bold front by claiming that India used its own heavy water. The annual reports of the establishment which used to be more open on the performance of the heavy water plants, suddenly became more restrained and less communicative. This was also the time when, within the establishment, the heavy water directorate under Dr.N.Srinivasan was facing rough weather and a running battle between Dr. H. Sethna, Dr. Raja Ramanna and Dr. N.Srinivasan ultimately led to the latter's exit. The only answer the establishment has given to the charges is that it had adequate heavy water from the small levels of output of the Tuticorin and Baroda plants over the years 1978-1982 to build up enough stocks to run the MAPP-I unit. However the quantity has not been disclosed beyond saying that the unit needed 250 tons. Outside observers have speculated that India bought heavy water clandestinely on the international black market since this commodity was very much for sale following a glut in its production abroad. Others have alleged that India diverted heavy water from the non-working RAPS-I unit in Rajasthan, without anyone coming to know about it, under the guise of upgrading the heavy water.

One option which was open to India at the time, was to openly import heavy water from the Soviet Union as was done in the case of RAPS-2 unit. However, any open import would have meant full cope inspections by inspectors of the International Atomic Energy Agency (IAEA). This would have meant very close tabs being kept on the Plutonium produced at the reactor. To a country engaged in "keeping the nuclear option open" this was totally unacceptable. Smuggling and stealing was considered preferable.

The nuclear power target of 10,000 M\V by the year 2000 also depends heavily on the success of the new set of heavy water plants coming up. Tuticorin and Baroda plants were set up with forign technology. The subsequent plants have been based on indigenous developments. The hydrogen sulphide water exchange process demonstrated successfully at Kota has provided a method of setting up heavy water plants without depending upon the uncertain supplies of synthetic gas from fertiliser plants. The only drawback at Kota was the poor supply of process steam from the nuclear power plant. This is being corrected in the subsequent design of such plants like the one at Manuguru.

The capacity of the new plants is also somewhat highcr-130 to 200 tons per year. To fulfil this targer of 10,000 Mw a capacity of 13000 tons of heavy water would need to be built up. The establishment own feeling is that all the 'teething' troubles of heavy water production are now over and the country is well on its way to self suffiency. In case this confidence turns out to be unjustifed, well, the international black market beckons.

Sources : Heavy Water Politics Runs Deep- Rajendra Prabhu Hindustan Tunes 15.5/88

New York Times : 8.5/88

Nobody Wrote

LETTER BOX

The Perils of Tritium

Tritium is an extremely' paradoxical and dangerous material. On the one hand, it is a key material in hydrogen bombs and is produced in highly concentrated forms in special military reactors; on the other hand, tritium is generated as a waste product in nuclear power plants and is released to the environment as there are no financially viable techniques for separating it from effluents.

The nuclear establishment has always propagated the view that Tritium is one of the least hazardous forms of radioactive waste, thus justifying massive releases to the enviro-ment. The truth of the matter though, is that the retrieval of tritium from waste streams is costly and would cripple the nuclear industry financially. As a consequence, the enormous body of scientific evidence disproving low toxicity claims for tritium is callously brushed aside.

Tritium (T) is the heaviest isotope of hydrogen. It is formed naturally in the atmosphere by the action of cosmic rays. About 1.8 to 2 million Curies (MCi) are formed every year, (a Curie (ci) is an unit to measure radioactivity. It is the activity of 1 gm. of radium and corresponds to 3.7 x 10^{10} disintegrations every second). The total glogal inventry due to natural causes is around 36 MCi. Tritium is a 'beta emitter with a half-life of 12.35 years. As an isotope of the lightest element, gaseous tritium reality diffuses through most materials, including steel and rock.

Today natural production of tritium is vastly overshadowed by nun's nuclear activi-ties. On a worldwide scale, the atmospheric testing of nuclear weapons between 1945 and 1962 is still probably the predominant source of environmental tritium. During this period between 6800 to 8000 MCi were released into the biosphere. It will take until the middle of the next century before this tritium has decayed to a level equal to the natural global inventory.

The scale of, the present day tritium dis-charges is a cause for still greater concern, however, in the sense that we have no say over history. The amount of tritium being released to the environment today on a routine basis greatly exceeds natural produc-tion and is increasing every year. Discharges are mainly in the form of tritiated water (HTO) or tritium gas (HT_2 or T_2). Because tritiated water is of chemically identical to 'normal' water (H_2O), tritium constitutes a unique environmental contaminant : unlike other radioactive and chemical pollutants, suspended or dissolved in the water body, tritium contaminates the actual water molecule. There arc no financially viable means of removing tritium from effluents - or drinking water-ana the radioactive HTO streams into exactly the same bilolgical pathways as H_20, entering all living organisms and thus gaining access to metabolic and genetic processes.

The main sources of environmental tritium today can be summerized as follows : the civilian nuclear fuel 'cycle', involving power reactors, waste storage and reprocessing facilities; the military fuel 'cycle' of the five permanent members of the UN security council, involving specialized reactors for plutonium and tritium production, propulsion reactors for nuclear submarines and surface vessels, reprocessing plants, weapons plants and waste dumps; nuclear R&D establishments, comprising laboratories, test reactors and fusion research centres; miscellaneous civil applications, for example, luminous paints, 'starters' for fluorescent lighting, gas chromatographs, tracing materials (oil and gas exploration, hydrological studies) and medical applications as well as current nuclear weapons testing programmes and weapons sites.

Editors comment :We in India need to take special notice of tritium since the Indian nuclear programme is based primarily on CANDU type of reactors. Generating just 1000 MW of electricity in a CANDU also means producing 2.4 MCi of tritium. Thus, if our current plans of producing 10,000 MW by the year 2000 do materialize, we would usher in the new century producing 12 to 13 times the total 'natural tritium production. Around 400,000 Ci of this huge pile would be discharged to the atmosphere in the natural (no accidents) course, every year after a few years of reactor operation. In case of any accident; massive amounts of tritium would comaounatc the environment and produce a substantial impact.

Besides the tritium released by the reactors, reprocessing of the fuel elements to recover plutonium would mean additional substantial releases.)

Tritium Toxicology

An overwhelming body of evidence reported in scientific journals deals specifically with the perils of tritium. However, ICRP (International Commision for Radiological Protection) recommendations 26 and 30, (the latter dealing specifically with tritium) are in contradiction to this evidence. As has often been said, legislation on radiological protection serves to protect the nuclear industry rather than its victims.

In the following we shall briefly summarize the evidence on tritium.

1) Tritium intake by the human organism is not limited to HTO. Because tritium is also assimilated in various forms by plants and animals, human food is also contaminated. (Gi 76, Ki 82)

2) Tritium assimilated from HTO by plants and animals is not only retained in cell fluids but is also, in the course of metabolic processing, assimilated in all sorts of biochemic molecules. This organically bound tritium (OBT) has the capacity to cause much greater biological damage than HTO. For instance, in their tritiated forms, luccine (a protein precursor), uridine (RNA precursor)and thymidine (DNA precursor) are; respectivly, approximately 10, 100, and 1000 times more toxic than HTO (Ry 79). In the case of newly formed cmoroyos, T-thymidine is 5000 times as damaging as HTO (Ya 94.). This *is* because OBT is better 'embedded' biochemically in the organism and hence has a far longer biological half-life, than HTO : between 400 and 600 days, as compared with 10 days for HTO (C_2 8_4). ICRP 30 chooses to neglect the effects of OBT and bases its recommenations on a biological halflife of 10 days for all 'tritium. "(Biological half-life is the time elapsed before half the absorbed tritium is eliminated from the body by natural processes).

3) In the tissues of animals consuming tritiated water, the ratio of hydrogen to tritium atoms in . OBT is two to eight times higher than that in body water (K_2 77. Za 79). This is extremely relevent when considering contamination of food with tritium, and also when assessing incorporation of tritium into our own bodies.

4) Tritium accumulates on an organ specific basis, especially in the ovaries and the testics. This effect is reinforced if tritium intake is in the form of OBT, i. c. tritiated food (Pi 82). ICRP 30 assumes that tritium is uniformly distributed in among the soft tissue.

5) Tritiated molecules are passed on to growing embroyos across the placental barrier. Experiments have demonstrated that, from generation to generation, the specific activity of OBT in various organs increases, especially in the ovaries (Pi 82). The highest specific activity is observed in the DNA fraction, and the weight of the brain and the genital tract organs is decreased (Za 79). Offspring arc found to have a decreased number of primary oocytes (Do 79a) (Oocytes are ovary 'Preamers'. At birth, all female mammals have a limited but sufficient store of such cells, which develop into fully fledged ovaries later in life. Primary oocytes are formed only during embryonic development.)

6) Virtually all the experimental work on radiotoxicology of tritium has been performed on rodents. However, Dobson (Do 79a) has shown that monkeys arc considerably more sensitive than mice - particularly as regards damage to primary oocytes.

7) Experimental microdosimetry of such low energy beta-emitters as T is difficult. Mathematical models are being used to perform dose calculations (Co 82, Jo 84). These models locus only on the energetic aspects and miss many biological effects. in the case of tritium decay at least three factors are involved : a) transmutation to a helium-3 nucleus, whereby T incorporated in OBT leaves behind a 'gap' (destruction of hydrogen bridges in DNA; (LW 79); decay of T incorporated in the 5 position of certain DNA precursors produces mutations during DNA replication at

a rate approaching 100% (Kr 76), b) the recoil momentum of the nucleus in beta dcay is sufficient to break other C-H bonds and allows substitution of T in any position occupied by a hydrogen (NC_{79}); and (!) ionization of cellular water, with the formation of hydrogen peroxide, a cell toxin (Re 85).

8) As is the case with most environmental contaminants, virtually all the discussion of tritium focusses on human health, plants and animals being included in so far as they serve food for man. Many of the above mechanisms play an equally important role in the rest of the biosphere, however, with biological damage being recorded following surprisingly low concentrations of tritium contamination (Ab 79).

9) A problem deserving special attention is that of the passible connection between discharges of tritium on the vitality of forests. Reichelt has found a correlation between forest die-back and plumes from nuclear facility stacks (Re 85) Mist droplets containing hydrogen peroxide arc considered by some investigators to constitute a major cause of forest die-back,, possibly even more significant than SO_2 and NOx (S1 86).

10) A recent detailed epidemiological study (Be 85), has revealed a clear link between prolonged exposure to low levels of tritium and the occurence of the cancer of the prostrate. The study analysed the records of more than 39,000 people of both sexes who had been employed since 1946 at British atomic energy facilities. Some 3400 of these had died, of whom 38 of prostatic cancer while between the ages of 15 and 74. In those men who had been exposed to tritium, mortality from this form of cancer was 8.89 times the national average.

Within a 65 Km radius of the U. S. Savannah River Plant, where massive amounts of tritium arc released to the environment, doctors identified in 1983 at least 25 cases of the incurable and extremely rare blood disease polycythemia vera, a number significantly higher than the U.S. average. The disease involves an abnormal growth of all types of blood cells, and Can lead to leukemia, cardiac diseases and brain haemorrhage.

In summary, tritium contamination of the biosphere as a whole constitutes a far greater problem than is commonly supposed. From a wide variety of sources, tritium is released to the environment in extremely large quantities, on a routine basis. It gets incorporated in all biochemic molecules and has been shown to have deletrious biological effect at low levels of exposure. We must address the problem of radioactive contamination seriously, on a worldwide basis. Clearly, the ICRP recommendations are very unrealistic, even given only the specific research concerning tritium.

It should be added the same basic biological hazards arc associated with carbon-14, another radionuclide routinely discharged by the nuclear fuel cycle. Although the quantities released are far smiller - though still considerable - the long half-life of C-14 (5730 years) means that the consequences of the lack of management today will be felt for many milennia to come.

Unless serious measures are taken to phase out nuclear power and weapons, the whole biosphere will become seriously tritiated besides getting contaminated with numerous other persistent radionuclides. The problem is not being taken seriously anywhere in the world. One of the solutions considered by Canada is to extract tritium by cryogenic techniques from the tritiated heavy water moderator in CANDU reactors. This solution (which would appeal greatly to Indian nucleocrats - Ed.) is worse than the original problem since the major use of large amounts of tritium is in thermonuclear weapons.

Thus, the military-industrial complex continues to poison the earth and to threaten us with ever more weapons of mass destruction. It is time for a change, while there is yet time.

Nigel Hark

Nigel Harle is a Dutch antinuclear activist. An autodidact,' who follows his common sense, reads the literature and unencumbered by considerations of career, speaks out where others remain silent. He has compiled 'Tritium fact sheet' from which this article has been extracted

to

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Victory at Shoreham

New York State and Long Island Lighting Company (Lilco) have reached agreement that is likely to result in the abandonment of the Shorcham nuclear power plant in Long Island near New York City. It would be the first time in the United States that a fully completed nuclear plant was shut down before it began operating. With this the U.S. has joined Austria and the Phillipincs - nations which have drawn back from the brink by abandoning completed nuclear plants before they became critical .

Expenditure on the Shorcham plant now exceeds $5.3 billion and the interest and other financial charges are accumulating at the rate of $35 million per month. In dollars pec kilowatt, no U.S. power plant has cost as much as Shorcham, and no generating capacity of any kind has taken as much time to complete.

Moreover, the Shorcham plant is at the centre of a controversy that has ramifications- for all the 103 nuclear power plants operating in the United States as well as the 21 under construction. For example, the $4.5 billion Scabrook nuclear plant, on the New Hampshire coast near Massachusetts, is in - much the same situation as Shoreham; it too has been completed but has yet to obtain an operating license.

It was in 1968 that Lilco formally applied to the U.S. Atomic Energy Commission for a construction permit to build a nuclear power station on Long Island. The plant was expected to cost between $65 to $75 million and to be on line by 1973.

Enormous opposition to the plant developed because of the concern that Long bland could not be safely evacuated in case of 2 nuclear emergency. Fears of an accident have been dominant in the minds of the residents of Long bland ever since the Three Mile bland accident in 1979. It was only after that accident that the Nuclear Regulatory Commission (NRC) formally incorporated emergency planning into the process for granting operating license. Suffolk County (*in* which Shorcham is located) and' New York State have both maintained that evacuating the area around Shorcham is impossible for geographic reasons. Thus, inspite of the fact that Shoreham was the most inspected plant in the United States and had many additional safety devices over and above

those required by the NRC, it was unable to obtain a license. To the opponents, the real issue was one of local control Over local affairs - whether local communities have the right to decide to have an enormously hazardous plant in their midst. As Wayne Prospect, chaiman of the energy committee of the Suffolk County legislature, said, "How we will turn our lights on - that's a question we will solve".

Editors Note : The Shorcham saga is an inspiring tale for the antinuclear activists everywhere. It demonstrates the power of an awakened public opinion. The issue, which began as a purely local issue escalated first into a statewide and then into a national issue. Its denouement has long term implications for the future of nuclear industry everywhere. A lot of litrature is available on the full story of Shorcham including a book, *Power Crazy* : *Is Lilco Turning Shoreham into America's Clicmobyl* by **Karl Grossman.** Another, and probably easier to obtain referrence for Indian readers is a scries of 3 articles in IEEE Spectrum (See Sources Below).

Sources : *The Shoreham Saga, IEEE Spectrum November* 1987.
New York Times, May 12, **1988.**

Heavy loss instead of heavy water

A welcome feature of the present government is that unlike it's predecessors it has allowed the office of the Comptroller and Auditor General of India (CAG) to audit atomic energy programmes and to publish findings. Here is what the ***CAG*** *has to say about the Tuticorin Heavy Water Plant.*

• The Tuticorin Heavy Water Plant (THWP) of the Department of Atomic Energy worked only at one-fifth (20.6 per cent) of the installed capacity during eight years after it was commissioned in 1978 resulting in a production loss of Rs. 123.97 crore.

At- the time of setting up of the plant, the cost of indigenous production of heavy water was estimated to be Rs. 500 per kg which compared favourably with the then landed cost of Rs. 670 per kg. It was now expected to go up to Rs. 13800 per kg 'on the basis of actual average annual production." The plant has operated only for 1284 days as against 2550 available days.

These startling revelations have been made in the latest report of the Comptroller and Auditor General of India on Scientific Departments presented in Parliament. The Tuticorin Heavy Water Plane was set up as part of the Indian Nuclear Power Programme aiming at an installed capacity of 10,000 Megawatt by 2000 A.D. through the establishment of a chain of natural uranium fuelled thermal reactors with pressurised heavy water used as moderator and coolant.

The report has observed that "scries of repairs, replacement and modifications at additional cost" coupled with "low production" has changed the "economic profile" of the plant. It says 'due note" has been taken of the view point that conventional methods of financial propriety and procedure should not be the yardstick in the case of scientific departments striving for self-reliance in hi-tech processes 'as a certain amount of hit and miss could happen in attempting to catch up with fast changing technology" and has left it for 'Parliament to judge how much of the scarce resources could be diverted to such ventures,"

Ironically, the plant is considered to be the "most successful" of operational heavy water plants in the country, having produced about 60 per cent of the indigenous heavy water the total requirement of which is estimated at 13,000 tonnes.

The plant was originally scheduled to be commusioned by January, 1975, after a technical collaboration agreement was entered into with a French consortium in April 1971. The plant, instead was commissined in July 1978, marking a delay of 42 months. However, the foreign collaborator—M/s Gelpra—was 'absolved of all their contractual obligations, guarantees, warranties etc., because "the. plant could not be run and tested on sustained basis due to power shut-down etc."

"In sum', the report remarks, "the imported technology had not. been successful but **the** foreign collaborator had been absolved of **all** contractual obligations." The technology transfer was incomplete at the time of **the** termination of the contract, the report says.

Citing technical reasons for the shortfall in production, the report notes that several modifications were carried out to overcome the identified problems. "This resulted in additional financial burden. The report observes: "In the light of the actual average annual production, the technology absorption and stabilisation of operational procedures seem doubtful."

The cost of production was first revised in 1979. It worked out to be Rs. 1145 per kg 'but many instalments of additional investment and shortfall in production have considerably escalated the cost of production. "The Department of Atomic Energy stated in September, 1987 that the cost of production at the achievable capacity worked out to be Rs. 4120 per kg but, according to the report, "this is only notional because the actual average production is much less than the achievable (derated) capacity taken tor the purposes of calculation by the department."

The report estimated the cost of production to be Rs. 13800 per kg. The factors which had contributed to high cost were, apart from low production levels, "increased capital deployment and increased consumption of utilities and spares". The maintenance cost was Rs. 1301 per kg, the consumption of power "was more than twice the limits indicated in the project report", the cost of utilities was Rs. 4000 per kg and the number of persons employed rose to 457 against only 35 persons who were to be given employment in accordance with the original agreement with the French consortium.

Courtsey : *Pushp Saraf Express News Service*
Indian Express : 29.4/88.

Ideological plurality is good for the movement

The recently concluded 'Save the Western Ghats' march has been a major milestone in the growth of the Indian environmental movement. For the first time, as many as 160 groups participated in the six-month long march.

More significantly, the march was not built around a single leader—indeed, the organisers worked hard to hold to the original idea of a movement composed of a decentralised and informal network of organisations.

This lack of ideological unity and charismatic leadership, deplored by some participants, can actually be viewed as a sign of the movement's muturity. The debates at the concluding session of the march were reported to be fierce: two of the more contentious issues being the utilisation of a religious idiom in spreading the message of environmentalism and the role of the government in ecological destruction and restoration.

The Western Ghats march provides an appropriate point of departure for an interim assessment of the problems and possibilities of the Indian environmental movement. We have corns a long way since the 1972 Stockholm conference, when the Third World dismissed - environmental protection at a Western fad. This growing consciouness is reflected at the popular level by the mushrooming of voluntary groups working in the field of environmental action and ecorestoration; and at an official level by the formal enactment of comprehensive legislation for controlling air and water pollution and protecting biological diversity.

During the last 15 years—that is, since the inception of the Chipko movement in 1073—the environmental movement in India has grown to such an extent that it may justifiably be viewed as perhaps the most effective in the Third world. While this spurt in environmental consciousness has been widely commented upon, what is less visible is the emergence of three distinct ideological perspectives within the movement.

The first strand, which we may call symbolic Gandhian, relies heavily on a religious idiom in its rejection of the modern way of life. It upholds the precolonial and pre-capitalist village community as the exemplar of ecological and social harmony. 'The methods of action favoured by this group are squarely in the Gandhian tradition—or at least of one tendency within it—fasts, *padayatras*, and *poojas* in which a traditional cultural idiom is invoked to further the strictly modern cause of environmentalism. The second, and perhaps most vigorous strand, can be termed a*ppropriate technology*.

Less strident in its opposition to industrial society, it strives for a working synthesis of agriculture and industry, big and small units, and Western and Eastern technological traditions. Both in its ambivalence about religion and in its unequivocal criticisms of hierarchy in modern and traditional society, it is markedly influenced by Western socialism. In its emphasis on constructive work, it also taps a somewhat different vein in the Gandhian tradition. This strand has done pioneering work in the creation and diffusion of appropriate technologies which use natural resources.

The third and most eclectic strand embraces a variety of groups who have arrived at environmentalism only after a protracted engagement with conventional political philosophies, notably Marxism. These include the so-called Peoples Science Movements—for example, the Kerala Sastra Sahitya Parishad—whose initial interest in "taking science to the masses" has widened to include environmental protection. The People Science Movements can be distinguished from the Gandhian elements in two major ways : in their unremitting hostility to tradition, and in the relatively greater emphasis on confrontational movements.

Interestingly, these disparate trends are reflected in the trajectory of India's most famous environmental initiative, Chipko. Whereas the group working with Sunderlal Bahuguna opposes industrial civilisation in its entirety, the group associated with Chandi Prasad Bhatt is closer to the appropriate technology strand. Finally, the wing of Chipko active in Kumaon is composed largely of Marxists who favour militant struggle.

Not withstanding these differences, one way in which all these strands within Indian environmentalism differ from the dominant thrust of the Western environmental movement is in their focus on equity and sustainability. Taking the industrial economy and consumer society for granted, Western environmentalists are far more concerned with "quality of life" issues such as the retention of biological diversity as a temporary haven from the workaday world, By contrast, environmental degradation in India is undermining the process of economic development itself-as the mismanagement of natural resources is both the cause and consequence of poverty and an inequitous social structure. The environmental movement has no choice but to emphasise the importance of nature as a resource for survival and subsistence as well as the imperatives of economic redistribution.

While symbolic Gandhians, appropriate technologists and ecological Marxists represent the three most forceful strands in the environment-development debate in the country, two additional points of view should be considered. One looks to protect the environment while excluding development from its horizons—this is the wildlife protection movement, votaries of which have tended to value certain animal species (for example, the tiger) higher than the less privileged members of their own species. Then we have the incurable optimists who view development in isolation from the environment, in the naive belief that there arc no physical limits to economic growth and that rapid industrialisation on the Western model can be brought about in a matter of decades.

The environment debate in India is as yet in its very early stages. The emergence of three clearly defined groups augurs well for the future development of the movement. While the moral critique of the symbolic Gandhians is combelling, their total rejection of modernity is problematic. As for the Marxists, while they arc especially strong in mobilising action, they are some what confused and disoriented in the long periods of social quiescence. Perhaps the most promising group at present are the appropriate technologists. Their perspective is most consistent with reality, whereas their political orientation is a balanced mix of activism and reconstruction.

However, both symbolic Gandhians and ecological Marxists play a critical role in widening the horizons of the movement. Too easily dismissed as ideological and political "extremists" respectively, they have helped greatly in sharpening the terms of the debate and in creating a public space for the activities of the appropriate technology strand.

In the interests of a continuing play of democratic forces-both within the movement and in society—this ideological plurality is to be welcomed.

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Courtsey : Times pf Mia : 31.5.1988.

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THE MALADY AND THE CURE

Today there is pervasive discontent all over the country. It results in inactivity and frustration and breeds irresponsibility all around. How do we channelise this discontent to create something positive is the prime question of today.

To expect the powers that be to redress people's grievances and bring about a fundamental transformation is to expect the impossible because today's office-bearers have a vested interest in this system. These problems have been created by the self-seeking politicians, plutocrats and beaurocrats.

This state of affairs is giving rise to different people's movements. There is the kisan movement, the antinuclear movement, the ecological movement like chipko and appiko, the womens movement for liberation, the anti-cow slaughter movement, the prohibition movement, movement for the decentralisation of power, the Jharkhand movement so on and so forth. All these movements have arisen and gained momentum outside the fold of political parties in these two decades thereby making parties irrelevant.

Even though some of these movements may appear to achieve their limited objective, as days pass by their very objective will be found to have receded further. It will be discerned that the state or the juggernaut of industrialization has created many more problems than the movement has solved.

Therefore unless all these unite on one platform and create a broad front for changing the whole anti-people system, not much headway seems to be possible for any one cause. The sooner this grim realization dawns on all concerned the better. This does not mean giving up movements for particular causes. Instead it means to pursue these more vigorously with a view to bring about a holistic conscientisation of the people, as well as to unite on the programme *to* change the politico-economic social system.

To attain this objective, we shall have to examine the methodologies of these movements affresh. Cessation of work, blockade of roads, bandhs, rallies, gheraos, jail bharo etc. are all right to generate confidence and boost the morale of participants by a massive show of strength. But these programmes have ceased to be novel anymore and have reached their saturation point,. Though these have not become counter productive. The establishment allows these to take place knowing full well that bandhs or rallies cannot last long. Persons participating in these militant actions will get exhausted. This will end in the status quo remaining unchanged. If any specific law is broken as part of jail bharo, government does not arrest satyagrahis or arrests them for a couple of hours and lets them off. This has become a routine affair, both with the satyagrahis and the authorities. How can millions of people march from their homes to the capital or district headquarters for rallies etc. every now and then, leaving their homes and workplaces

So a realisation is dawning as to why should we fight our battles on the field of the adversary Why not fight it out on our own field i.e. in villages and towns where we stay? Why not change methods and tactics? Why not opt out of the system as far as possible by boycotting it, by ignoring it and carrying on our work by creating a new system instead ?
For instance, if supplies of raw materials are stopped to towns and factories or if courts and police stations are not resorted to for the settlement of disputes and these arc settled by the old Panchayati system, can the present inequitous system be carried one Additionally, if goods manufactured in the centralised system like mill-cloth, soap or footwear are boycotted and instead village made cloth, soap and footwear are used, what will happen If ministers who represent this system are not invited for inauguration or for presiding over social functions and if their public meetings are boycotted how long can they hold out against this political, economic

and social non-cooperation movement ? Along with this negative aspect, in the very course of fighting out this system, we are creating a new system based on self-reliance, mutual sharing, decentralisation etc. If voters, instead of lying scattered, come together to constitute voter's councils and set up peoples' candidates based on certain criteria at election-times are we not utilising the ballot box-fruitfully to create a political apparatus responsive to people's aspirations, thereby making democracy participatory and meaningful?

All these ideas need widespread experimentation. More and more innovations on these lines is the need of the day. All these must become an integral part of the new life movements. This and such other kindred matters need serious consideration and community action so as to bring about a fundamental systemic transformation that is total revolution.

Thakurdas Bang

Gopuri, Wardha

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