eastern seaboard states still stand at between 0.10 and 0.56 parts per million, although in orchard soils they have been found to reach 52 ppm, and DDT is still found in rivers and lakes at concentrations approaching the limits of its solubility.

What seems to be happening is that run-off from agricultural soils has pumped DDT into the rivers to the extent that it has settled in bottom sediments. This creates a pool of DDT which is stirred up and released into the atmosphere by storms, and the rivers are continually being recharged by run-off from the soil. The upshot is that there is no prospect of marked decrease in water contamination until levels in soils and sediments are decreased—a process that will take years even if no more DDT is pumped into the ecosystem of the United States.

The chief cause of concern over the continuing contamination of the marine environment by DDT is that its high solubility in body fats causes it to accumulate in the tissues of animals in the higher levels of the food chain, sometimes with devastating consequences for animal populations. Evidence that the decline in populations of the peregrine falcon and bald eagle is linked to the build-up of DDT or its metabolites in their tissues is already well documented, and a committee of the National Academy of Sciences concluded earlier this year that marine fish are almost universally contaminated by chlorinated hydrocarbon residues. What happens is that phytoplankton accumulate DDT from water, and the pesticide then finds its way into the tissues of fish, and so on up the food chain. An example of how the levels of DDT become magnified in living tissue is the fact that half of the fish caught in Lake Michigan in 1966, for example, had at least five parts per million of DDT in their tissues, compared with 0.0012 parts per million in the water.

Although that sequence of contamination has been drummed into the public through the protestations of environmentalists for the best part of a decade, the committee nevertheless complains of a lack of hard evidence on which to base predictions of the body burden of DDT in future years. Present evidence indicates that a man consumes about 0.01 mg of DDT or its metabolites a day, and has about 6 ppm of DDT and DDE in his adipose tissue, but while DDT intake has been more than halved since 1966, tissue concentrations have declined by less than 25 per cent.

The committee believes that levels of DDT in food are now in equilibrium with levels in the environment, and since the environmental burden is unlikely to decline very rapidly, even if no more DDT is used in the United States, food levels will probably remain fairly constant over the next few years. Moreover, since average concentrations of DDT in human tissue have not yet reached equilibrium with the concentrations in food, they will continue to remain high for some time to come. These predictions are, however, necessarily hand waving extrapolations from incomplete data, and the committee decided to explore the possibility of devising a simple systems model to predict the level of DDT metabolites in man up to the end of the decade.

A study carried out by R. V. O'Neill and O. W. Burke of the Oak Ridge National Laboratory concluded that even if no more DDT is used in the United States, the adipose tissue of Americans would still contain 0.36 ppm by the year 2022. Moreover, tissue levels of DDT will decline at almost identical rates if DDT usage continues to decline at its present rate, or if the pesticide is removed completely from the US market. A small use of DDT will, however, have a marked effect on tissue concentrations at the end of the century (see Table 1).

Is the alarm engendered by the build up of DDT in human tissue matched by evidence of its chronic toxicity? The advisory committee believes not, and it bases its *sang froid* on the fact that there is more information on the toxicity of DDT than on any other pesticide, and yet there have been no well documented reports of fatal uncomplicated DDT poisoning and there is little evidence of carcinogenicity at the levels encountered by man—although the committee is quick to point out that firm conclusions cannot be drawn.

The committee cites studies carried out in 1956 which showed that rats fed DDT in doses of 15 ppm produced hypertrophy, inclusion bodies and cytoplasmic granulation in the liver, but that these changes were reversible after withdrawal of the diet. A later study by the Bionetics Research Institute, and studies carried out under the auspices of the International Agency for Research on Cancer, both showed a statistically significant increase in the incidence of hepatomas, and a study carried out in 1967 produced evidence of hepatic cell tumour in trout fed relatively low doses of DDT. These results have led the advisory committee to conclude that "the evidence to date clearly shows that DDT induces hepatomas and suggests it may be carcinogenic", but studies of workers in DDT factories, where average daily intake of the pesticide probably reaches about 18 mg, have produced "no clinical or laboratory effects attributable to exposure to DDT". Nevertheless, the committee suggests that long-term studies of occupational exposure to DDT are urgently needed, and that in spite of the evidence that there is little cause for alarm from health hazards, the possibility of carcinogenicity cannot be dismissed.

As for toxicity to animals and birds, however, the committee points out that data are incomplete and further research is needed to support definite conclusions. Nevertheless, there is sufficient circumstantial evidence to link build up of DDT levels in some species with their decline in numbers, and "there is sufficient toxicological information on DDT in aquatic species to indicate that reduction and prevention of contamination of water sources is a problem of major concern".

Materials Regrouped

by our Washington Correspondent

REPERCUSSIONS of the so-called Mansfield Amendment, directing the Department of Defense to keep its nose out of research not directly related to weapons development, are still being felt in the National Science Foundation. Apart from being given an extra $40 million in its budget to pick up projects dropped by the Defense Department, the NSF has inherited responsibility for so much materials science that it has decided to regroup its support programmes. A new division of materials science has been set up to look after the twelve interdisciplinary research laboratories acquired from the Advanced Research Projects Agency—a defence department agency designed to get advanced projects moving (it was at one time responsible for the Arecibo telescope)—and the National Magnets Laboratory that was once the responsibility of the Air Force. The new division will also take charge of the materials science activities that were funded by the other divisions of the NSF. The foundation last year distributed grants worth about $30 million for materials science, and its stake in the field is expected to double this year.

The director of the new division is Dr Harold W. Paxton, recruited to the NSF from the metallurgy department of Carnegie-Mellon University, and the deputy director is Dr Howard Etzel, formerly director of the NSF's Solid State and Low Temperature Physics Program. The chief problem facing the division at present is that although it is already formally constituted, it has run into staffing troubles because of restrictions imposed on government agencies by the wages and prices freeze.