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DDT on Trial:

The Wisconsin Hearing, 1968-1969

By Thomas R. Dunlap

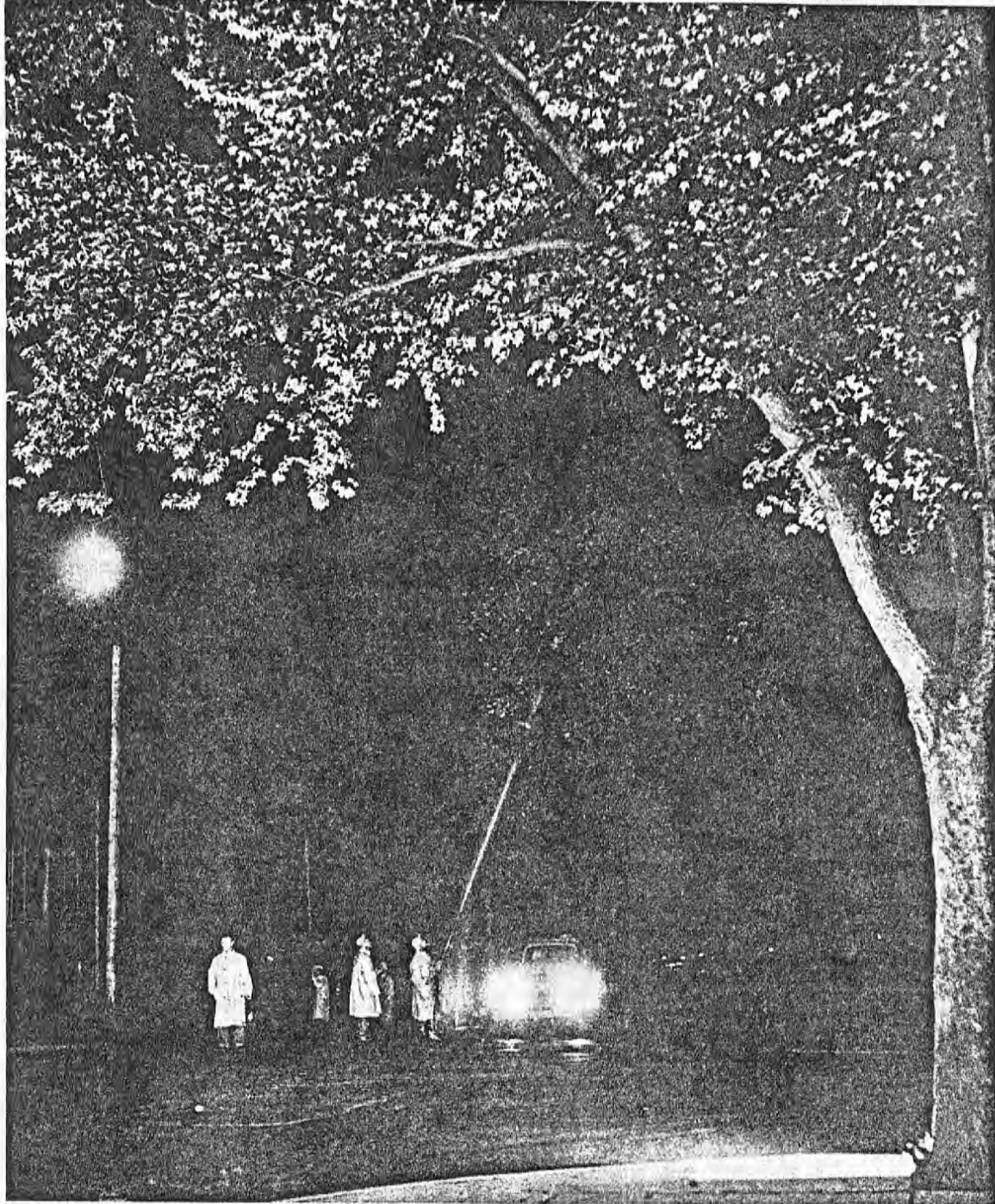
GROUPS seeking the preservation of America's natural resources and wilderness areas or the abatement of pollution now routinely resort to court action. This approach, however, is a quite recent development. Prior to 1970, environmental suits were rare, and environmental law, now a thriving legal specialty, hardly existed.¹ One of the first instances—and one of the most important—in which the modern brand of environmentalists sought to use judicial or quasi-judicial processes in an environmental cause was against the chemical pesticide DDT, which by the late 1960's had become one of their primary targets. For the environmental-

ists, DDT was a symbol of human thoughtlessness and biotic degradation. Moreover, in their opinion, a mass of scientific evidence made DDT vulnerable and justified their attempt to have it banned.

As little as ten years before, this situation would have seemed unlikely, for DDT (from its technical name, dichloro-diphenyl-trichloroethane) had revolutionized insect control worldwide, saving thousands of human lives and untold millions of tons of foodstuffs. The chemical was first synthesized in 1874; its insecticidal properties were discovered in 1939 by a team of investigators working for the Geigy Chemical Company of Switzerland. In 1948 the head of the team, Paul Muller, received a Nobel Prize in chemistry for this discovery. During World War II the Allies pressed DDT into service to protect troops and civilian populations from the insect vectors of disease, and by 1945, when the chemical first became available for non-military use, production exceeded two million pounds per month. Potent and inexpensive, DDT quickly displaced older pesticides, opening up new avenues for the chemical control of insect pests.

AUTHOR'S NOTE: I would like to thank my colleagues at Virginia Polytechnic Institute and State University, Susan Laura Miller and Neil Larry Shumsky, for their advice and criticism, and Henry Steck, Department of Political Science, State University of New York-Cortland, for criticizing an earlier and much abbreviated draft of this paper, which was presented at the 1977 meeting of the Organization of American Historians. The hearing record is contained in the Department of Natural Resources' transcript, "In the matter of the CNRA of Wisconsin, Inc., et al. for a Declaratory Ruling on DDT, 3-DR-1" (unpublished transcript, Wisconsin Department of Natural Resources, 1969). Accounts of the hearing are Harmon Henkin, Martin Merta, and James Staples, *The Environment, the Establishment, and the Law* (Boston, 1971), and Orie L. Loucks, "The Trial of DDT in Wisconsin," in John Harte and Robert H. Socolow, eds., *The Patient Earth* (New York, 1972). Yannacone's conclusions about the hearing and some parts of the transcript also appear in Victor J. Yannacone and Bernard S. Cohen, *Environmental Rights and Remedies* (Rochester, New York, 1971).

¹ Joseph L. Sax to George C. Bales (recommending the Environmental Defense Fund for the John and Alice Tyler Ecology Award), September 3, 1973, copy from Joseph L. Sax; Luther J. Carter, "Environmental Law (I): Maturing Field for Lawyers and Scientists," in *Science*, 179: 1205-1209 (March 23, 1973); and "Environmental Law (II): A Strategic Weapon Against Degradation?" *ibid.*, 179: 1310-1311 (March 30, 1973).



Milwaukee Journal photo

Nighttime spraying of elm trees with DDT, Milwaukee, ca. 1967.

mental degradation.⁵ They had first come together to stop a local application of DDT, and the members wanted to continue work against the chemical. For the first year of its existence, the EDF sought a case in which it could present its evidence in open court. One

⁵ Until after the Wisconsin hearing, the Environmental Defense Fund had a board of ten trustees who comprised the entire membership. This account of

of the members offered to raise money for such an action in Michigan, his home state, where EDF tried, and failed, to find a suitable action. In several instances the defendants—towns using DDT for Dutch elm disease sprays—agreed not to use the chemical, giving

EDF activities is based on interviews with Victor J. Yannacone, Jr., December 21, 1973, and March 17, 1977, Patchogue, New York; with Charles F. Wurster,

sent expert testimony, and were subject to cross-examination. Basic rules of evidence applied, though the examiner had considerable latitude in deciding what was relevant to the inquiry. At the end, there would be a verdict based upon the scientific testimony. While a ruling that DDT was a water pollutant would not ban the chemical, it would provide the basis for further legal action and seriously set back the defenders of DDT.

THE environmentalists moved swiftly. On October 28, less than three weeks after the Milwaukee hearing, the CNRA petitioned the Department of Natural Resources for a declaratory ruling on DDT, asking that the chemical be declared a highly toxic, persistent substance whose existence in the biosphere constituted pollution and which should be restricted so that it would not contaminate the environment. Van Susteren scheduled the hearing for December 2 in Madison, and appointed himself to hear the case. He allowed ten days for arguments by the petitioners, who were represented by the EDF, and by any intervenors who might wish to appear in opposition.¹⁰

The environmentalists were fortunate to have Van Susteren on the case. He was interested in the subject, had some scientific background (he had been a pre-med major at the University of Wisconsin), and made a conscientious effort to keep up with the issues raised during the hearing. He also sought to bring out the issues and evidence in the case and have them tested by cross-examination. He allowed both sides considerable latitude in

¹⁰ Maurice Van Susteren, "Examiner's Summary of Evidence and Proposed Ruling," in "In the Matter of the CNRA of Wisconsin, Inc., et al. for a Declaratory Ruling on DDT, 3-DR-1" (unpublished transcript, Wisconsin Department of Natural Resources, 1969). Transcript of the hearing cited below as "Wisconsin DDT Hearing" was prepared by the DNR, and the copy I used was from the collection of Maurice Van Susteren. Interview with Maurice Van Susteren, undated. During the preparation of my dissertation, Van Susteren spent several evenings going over the events of the hearing and the legal issues. Comments and observations he made at these meetings were not usually dated. Dated interviews with all sources were either tape recorded or, if written notes were used, the subject received a copy for correction.



Madison Capital Times

Maurice Van Susteren, chief hearing examiner during the Wisconsin DDT hearing.

presenting their cases, avoiding narrow definitions of relevance but keeping the hearing focused on the issue. He permitted vigorous cross-examination but managed to keep the counsel under control (though counsel for the intervenors complained later that Van Susteren had allowed Yannacone to badger their witnesses).¹¹ Van Susteren's commitment to a full exposition of the case was one of the reasons the environmentalists were able to make good use of the forum they had obtained under the declaratory ruling procedure.

One of the advantages of fighting environmental degradation through legal action rather than public education quickly became obvious. The prospect of putting DDT on

¹¹ Interview with Louis A. McLean, November 5, 1973, Northfield, Illinois. Interview with Willard Stafford, August 22, 1973. Stafford, perhaps because he was on the losing side, was reluctant to dwell on the subject. When I called him for an interview he said: "The DDT hearing! You don't want to talk about the DDT hearing. That's history!" Despite an explanation that this was precisely why I was interested, Stafford was noncommittal.

had a quick mind and assimilated the essential points of an argument with a speed that surprised the scientists who were briefing him.¹⁵ In court he could use arguments skillfully, either to make the environmentalists' point or to mount an attack on a hostile witness. In addition, he was committed to both the environmental cause and to a good fight. He was not daunted by the odds nor particularly bothered by the lack of precedent for environmental law. The law, he felt, had to meet social needs. If there was a social need to be met, there must be a legal way to meet it. The lawyer's job was to find the way or, if there was none, to "invent it."¹⁶

Behind the scenes Charles Wurster, one of the founders of the EDF and head of its Scientists' Advisory Committee, managed the case. He testified early in the hearing, presenting the outline of the EDF's argument. His most important contributions were outside the hearing room; though less conspicuous than Yannacone, he was equally essential. During the academic year which the hearing occupied, Wurster, a marine biologist at the State University of New York—Stony Brook, devoted all his free time to the case. He was the expert on DDT and the EDF's scientist for this project. He laid out the parts of the argument, found witnesses to testify on each, convinced them to come, and served together with Yannacone as permanent staff in Madison. It was Wurster who did the dogged detail work, solved day-to-day problems, smoothed over personal differences, and reduced friction in the coalition that carried on the fight.¹⁷

By late November, 1968, he had outlined the EDF's case and found witnesses for each part. There were five major contentions that the environmentalists wished to prove. First, that there was an ecosystem—an interrelated system of air, water, soil, and biological organisms. Second, that DDT unavoidably—because

¹⁵ Speech of Charles F. Wurster to conservationists, autumn, 1968, in the board room of the Milwaukee Public Museum. Mrs. Owen Otto of Milwaukee furnished a tape recording.

¹⁶ Yannacone interview (1973).

¹⁷ Otto interviews; Yannacone interview (1973); Reeder interview. Reeder was one of the faculty members who assisted the Environmental Defense Fund; he organized the scientific reference service the EDF used during the hearing.



Madison Capital Times

Victor J. Yannacone, counsel for the Environmental Defense Fund.

of its physical and chemical properties—contaminated the entire ecosystem when released into it at any point. Third, that residues of DDT had adverse effects on wildlife. Fourth, that they were a potential hazard for humans; their safety was not established. Finally, the EDF argued that it was possible to replace DDT with safer insect controls.¹⁸ In their first presentation the petitioners concentrated on proving the first three points—the existence of the ecosystem, the properties of DDT which made it dangerous, and the effects which the chemical had on sensitive wildlife species. In

¹⁸ Charles F. Wurster, memo to prospective witnesses, November 22, 1968; Wurster and Yannacone (1973) interviews. The memo is from the papers of Victor Yannacone.

accumulated the substance and passed the burden to the next level (herbivorous animals would be the second level). Species such as the Bermuda petrel, which were at the end of long or particularly contaminated food chains, might be in serious danger even though they never approached areas where DDT was used.²⁸

McLean kept Wurster on the stand for a day and a half of cross-examination. Lacking scientific advisors, McLean had to fall back on the successful defenses which the industry had used in publicly arguing the case for DDT. He stressed the need for pesticides and the benefits derived from their use. He questioned Wurster's expertise in assessing this need and raised the argument that only those who applied the chemicals in the field were competent to discuss their effects and benefits.²⁹

The EDF quickly attacked the distinction McLean had drawn between the "practical" entomologists and their "impractical" opponents. Robert van den Bosch, the next witness, was an entomologist from the University of California-Berkeley. He had been responsible for recommending spraying schedules and pesticides to protect California field crops for over a decade, and strongly supported the EDF's contention that DDT was harmful and that it was possible to replace it with better, safer means of control. He also reinforced the points about federal control which Yannacone had elicited in examining Fisher. The agencies funding research on DDT, he said, had largely ignored its effects on non-target species. "No ecological thought has gone [*sic*] into these materials originally. Essentially, none is going in now. And this is the basic root of the problem."³⁰

Van den Bosch's testimony brought the petitioners more favorable publicity. One newspaper said, "Scientific Convert Warns State on DDT," another, "Ex-DDT Backer Says He Wouldn't Approve it Now." The second paper went on to quote van den Bosch's statements that entomologists had "created a monster" through DDT and that they had seized on the chemical while "totally ignorant



Photo by Gene Coffman

Professor Hugh H. Iltis, University of Wisconsin botanist.

of the genetic and ecological implications of its use."³¹

The EDF devoted the rest of its direct-case presentation to establishing DDT's effects upon organisms in the Wisconsin regional ecosystem. Its witnesses testified that DDT was accumulating in the ecosystem; that residues could affect various organisms, and that residues were damaging susceptible species in the wild. They provided the details which filled out Wurster's general statement and established the legal case. The scientists came from a variety of disciplines and had done several kinds of studies; indeed, the most striking feature of the case was the broad interdisciplinary effort involved.

THE effects of DDT on several species of birds of prey was a particularly important part of the environmentalists' argument, one of the most telling examples they cited of the chemical's action in the ecosystem. The environmentalists believed that DDT broke down into a closely

²⁸ Hugh H. Iltis in "Wisconsin DDT Hearing," 80-107; Orie Loucks, *ibid.*, 206-219.

²⁹ Charles F. Wurster, *ibid.*, 219-588.

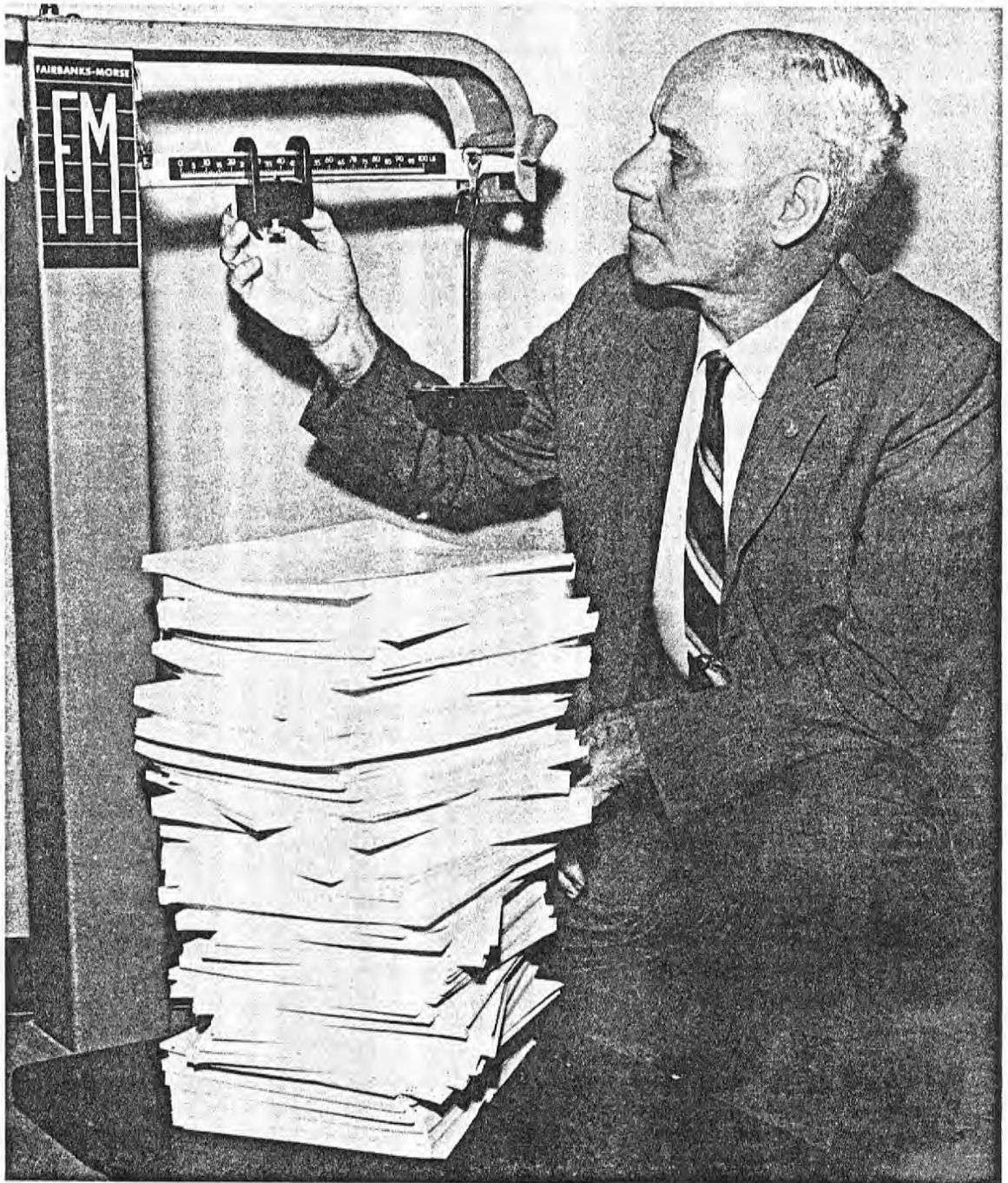
³⁰ Robert van den Bosch, *ibid.*, 595.

³¹ *Milwaukee Journal*, December 7, 1968; *Capital Times*, December 6, 1968.



Photo by Gordon Menzie

Robert W. Risebrough, research ecologist in the University of California and a witness at the Wisconsin DDT hearing, is pictured examining the nest of a brown pelican atop a cliff on the California coast in March, 1969. Brown pelicans, like birds of prey and other animals at the end of food chains, suffer reproductive failures from DDT contamination.



Madison Capital Times

Walter Scott of the Wisconsin Department of Natural Resources is shown with the transcript of the DDT hearing, which weighed forty pounds and ran to 4,499 pages.

dues and the damage, while pharmacological work indicated only a mechanism by which the compound might be responsible for the problems observers had found in the wild. The witness who the hearing examiner felt

“nailed down” the connection between chlorinated hydrocarbon pesticides and thin eggshells was Lucille F. Stickel, pesticides research co-ordinator at the Patuxent Wildlife Research Center of the Department of the In-



Madison Capital Times

Willard S. Stafford of Madison, counsel for the chemical industry and its spokesmen.

tion of the intervenors' case from McLean, put Hayes's qualifications on the record and then led him through a description of his studies about DDT's effects on man. Hayes gave the chemical a clean bill of health. He had conducted studies of workers in DDT-manufacturing plants, men with up to nineteen years exposure. Though they had much higher levels of DDT in their fat than the general population, they had no symptoms of DDT poisoning or of any pathology traceable to the chemical. Convict volunteers, fed massive doses of DDT, had concentrations in their blood fifty to one hundred times as high as most people but also showed no pathology which could be attributed to their exposure.⁴³

⁴³Wayland J. Hayes in "Wisconsin DDT Hearing," 1892-1897.

Stafford then questioned Hayes about the effects of environmental levels of DDT. The Food and Drug Administration, he said, had just seized ten tons of coho salmon from Lake Michigan, contaminated with up to nineteen parts per million of DDT. Hayes did not think that the fish represented a health hazard. He pointed out that one would have to live on such fish for nineteen years to get a dose equivalent to that received by the factory workers, and the men had shown no ill effects. What about the possible estrogenic effects of the chemical? Hayes replied that even massive doses of DDT in rats had produced only temporary effects. After leading Hayes through this survey, Stafford again asked if Hayes thought DDT was safe for the general population over a lifetime. Yes, said Hayes, it was; his studies proved it.⁴⁴

THE environmentalists had to rebut Hayes's testimony, particularly his sweeping conclusion that DDT was safe for the general population over a lifetime. It was not essential for their case, which rested largely on the effects of DDT upon wildlife, but it could seriously affect the larger issue. Most people would be far more concerned about DDT if they thought there was a chance that it might harm them than if it affected only wildlife. If, through Hayes's testimony, the intervenors defused the emotional issue of public health, they might leave the EDF a hollow victory—a judgment against DDT in Wisconsin but no public pressure for national action.

Yannacone's cross-examination did not attack Hayes's evidence directly, and the environmentalists did not dispute the medical studies of the effects of DDT on the test groups. Rather, they questioned the conclusion that these studies proved DDT was safe. Yannacone pointed to limitations in the work, contending that the subjects were not representative of the population and that the examinations were not adequate to ferret out all of DDT's effects. Healthy, adult males comprised the test groups; there were no old or sick people, no women or infants among the population studied. Physical examinations

⁴⁴*Ibid.*, 1411-1423.

preferably conducted on experimental groups over their lifetime.⁴⁶

During the cross-examination of Wayland Hayes, Harry Hays, the director of pesticide registration in the U.S. Department of Agriculture, entered an appearance "as interests may appear" to describe the process of pesticide registration under federal law. He presented the USDA's position that it was regulating pesticides effectively. Hays, however, was a poor witness (McLean said later he was "the world's worst")—easily led, quickly flustered, and short-tempered. He made a bad impression, and under cross-examination admitted that the Department of Agriculture did not evaluate pesticides; it only reviewed the information submitted by the manufacturers. Nor did it require complete tests of a pesticide's effects. Not until 1968, he said, had the USDA asked applicants to test their products for toxicity to wildlife.⁴⁷

The situation also gave Yannacone a chance to attack the USDA's procedures. The department, he said, was responsive neither to public concern nor to new scientific information. He pointed out that, in response to a lawsuit by the Environmental Defense Fund, the secretary of agriculture had claimed that his agency's procedures were not subject to judicial review. The department had also refused to show Wisconsin's Senator Gaylord Nelson the data for the registration of DDT as a pesticide. Yannacone forced Hays to admit that his department had no routine for using new scientific information to re-evaluate the registration of a pesticide already in use.

After this setback, the intervenors resumed their case. It should have constituted a coherent rebuttal to the petitioners' scientific evidence, but, lacking funds and scientific advice, the lawyers could do little more than present a succession of unrelated witnesses. Two economic entomologists and an exterminator testified about the benefits of DDT and the need to retain it (an issue outside the scope of the hearing). Two chemists, Francis Coon of the Wisconsin Alumni Research

Foundation and Paul E. Porter of the Shell Development Company, testified about the problems involved in chemical analysis for DDT residues. Coon, who had done the analyses for Hickey's studies of the Lake Michigan ecosystem, gave a confusing explanation of the problems of vapor phase chromatography, but admitted upon cross-examination that his laboratory had no difficulty identifying the traces left by DDE. Porter, questioned about the petitioners' analytical work by Waiss, the NACA's lawyer, replied that both the Wisconsin Alumni Research Foundation and Robert Risebrough had excellent reputations. Yannacone declined to cross-examine Porter; he simply thanked him for appearing to testify.⁴⁸

Several other witnesses added little. Frank Chermers, who testified about eggshells, admitted under cross-examination that he was not qualified to discuss the biochemical processes of eggshell formation. William Gusey, chief wildlife specialist for the agricultural chemical division of Shell Oil Company, admitted under questioning by the examiner that he was not in research and that the papers Waiss was questioning him about were not in his field. Samuel Rotrosen, head of the Montrose Chemical Company of California, one of the last manufacturers of DDT, could contribute little to the scientific case.⁴⁹

THE environmentalists did not rely entirely upon cross-examination to put their opponents on the defensive, though this was clearly their major weapon. During the intervenors' presentation the EDF also maneuvered the introduction of a surprise witness, Goran Lofroth, a Swedish scientist who had conducted a review of DDT's toxicity to humans for the Swedish National Research

⁴⁶ The intervenors' case begins on page 1452 of the transcript, with the witnesses beginning on the following pages: Chapman, entomologist, 1744; Bailey Pepper, entomologist, 2362; Francis B. Coon, analytical chemist, 2040; Paul E. Porter, analytical chemist, 2202. Yannacone's remark to Porter appears on page 2240.

⁴⁹ Chermers's testimony begins on 2198, and his admission about his experience in biochemistry is at 2199. Gusey's testimony begins on 2242; the exchange with the examiner is on 2296-2297. Rotrosen's testimony begins on 2467.

⁴⁷ James Whorton, *Before Silent Spring* (Princeton, 1975); Charles O. Jackson, *Food and Drug Legislation in the New Deal* (Princeton, 1970).

⁴⁸ Harry W. Hays in "Wisconsin DDT Hearing," 1516-1653.



Photo by Gene Coffman

Professor Ori L. Loucks, University of Wisconsin botanist.

found reversible within the time period of the experiment (six hours). Yannacone then recalled Wayland J. Hayes for more questioning about his work, especially his conclusion that DDT was safe. The session concluded with the testimony of Dr. Theodore Goodfriend, a pharmacologist at the University of Wisconsin School of Medicine. Goodfriend said he did not think that DDT was "absolutely safe," citing various cases which raised doubts in his mind.⁵¹

The environmentalists also attacked the contention that DDT and other persistent pesticides were irreplaceable. Robert van den Bosch, who had used DDT for years and now opposed it, had already testified. Now the EDF brought in two other practicing economic entomologists. Both Paul DeBach and Donald Chant had wide experience with integrated controls—the use of a variety of methods, including chemicals as necessary—to keep down pest populations, and both had impressive professional credentials. They agreed that

persistent pesticides were not necessary and in some cases were actual hindrances to effective natural control.⁵²

Orie Loucks, a biologist who had earlier testified about the Wisconsin regional ecosystem, ended the petitioners' presentation with a description of a systems analysis model of DDT's movement through the ecosystem. By this time it was obvious that the Environmental Defense Fund would not have to wait for a decision from the examiner and a state ban in Wisconsin in order to begin a national campaign against DDT. In April, just as the intervenors began their defense of DDT, Michigan was taking action to ban it. When the FDA condemned several tons of Lake Michigan coho salmon as unfit for human consumption, state officials feared the end of Michigan's lucrative sport and commercial fisheries and quickly initiated legal steps to ban DDT and to review the use of other persistent pesticides.⁵³ As the hearing ended in May, the Wisconsin Assembly was debating a bill to ban DDT, and other states were considering similar measures. Events had moved more quickly than the EDF had dared to hope they would, and, by the time Van Susteren decided in their favor a year later, the EDF and other environmental and conservation groups had already begun suits against the Department of Agriculture seeking to halt the use of DDT throughout the country.⁵⁴

IT is evident that the EDF was in accord with public opinion; even

⁵¹ Steinbach in "Wisconsin DDT Hearing," 2251-2599; Goodfriend, *ibid.*, 2665-2695. Further examination of Hayes appears on 2623-2664.

⁵² DeBach, *ibid.*, 2695-2721; Chant, *ibid.*, 2722-2742.

⁵³ *Battle Creek Enquirer and News*, April 12, 1969; *State Journal* (Lansing, Michigan), April 17, 1969; Hal Higdon, "Obituary for DDT [in Michigan]," in *New York Times Magazine*, July 6, 1969, p. 6.

⁵⁴ *New York Times*, November 1, 1969, 30:6; November 13, 1969, 1:8; November 21, 1969, 1:14; January 8, 1970, 14:6; February 3, 1970, 53:2; December 30, 1969, 14:1; March 10, 1970, 42:3; May 5, 1970, 40:3; May 29, 1970, 8:3; June 1, 1970, 20:3; June 18, 1970, 35:1; June 30, 1970, 1:5; November 21, 1970, 18:3; January 8, 1971, 1:5; January 16, 1971, 59:3; March 19, 1971, 1:6; October 26, 1971, 28:1; June 15, 1972, 1:8. See also Environmental Protection Agency, *DDT: A Review of Scientific and Economic Aspects of the Decision to Ban Its Use as a Pesticide* (Washington, D.C., 1975).

brought in enough funds to cover the cost of the operation, and conservation groups from all over the country had requested the EDF's help. It could now sift cases, looking for important issues for which there were both evidence and financial support. The Ford Foundation and the Audubon Society's Rachel Carson Fund provided an assured income, and by 1970 the EDF, with a greatly enlarged staff, was involved in some eighty actions throughout the country.⁵⁵

The growth of the EDF and of similar groups, as well as the popularity of environmental litigation, were due at least in part to the advantages of legal action over public education as a means of rallying public opinion, informing the public, and getting results. The EDF first showed most of these advantages in the Madison hearing. The most obvious benefit of a quasi-judicial proceeding was cross-examination, which allowed the environmentalists to question their opponents. Victor Yannacone put it very simply: "Only in a courtroom can bureaucratic hogwash be tested in the crucible of cross-examination."⁵⁶ With the backing of Charles Wurster and of various outside scientists, and with the volunteer help of both students and faculty at the University of Wisconsin-Madison, Yannacone kept the crucible hot.

The drama provided by the format was another advantage, making it much easier for the environmentalists to get and hold public attention. The Wisconsin hearing gave both structure and coherence to the issue; the case developed gradually over a period of days. Also, unlike other forums for debate, this one had an outcome: someone won, someone lost. The possibility of "beating" the defenders of DDT attracted support from environmental-

ists and conservationists, the stakes attracted the public, and the dramatic possibilities of the situation, which Yannacone skillfully exploited, held their attention.

The adversary procedure before an impartial arbiter also allowed the environmentalists certain advantages. They could define the issue—in this case the effects of DDT residues in the environment—and limit the witnesses. Those who came to testify had to be qualified to speak on the problem; each had to subject his scientific credentials to scrutiny. Each witness had also to confine himself to the issue at hand (though both sides occasionally strayed). Finally, the hearing placed the issue before someone not professionally involved in the field whose livelihood and reputation did not rest with any of the contending interests, and who, unlike officials of the regulatory agencies, did not deal with these issues on a continuing basis. There was the possibility of having an ignorant arbiter, but the environmentalists obviously felt that this was less dangerous than placing their case in the hands of the regulatory agencies.⁵⁷

Following the Wisconsin hearing, other groups took to the courts to defend the environment, and for a time it seemed that environmental litigation would be a cure-all for environmental ills. This has not happened. Court decisions have limited standing, particularly in class-action suits; judges are reluctant to delve deeply into complicated issues of scientific expertise; and the high cost of litigation has discouraged environmentalists, particularly in cases where the environmental benefits of action are diffuse and the costs to the advocates who must bear them are immediate and crushing. Even the Environmental Defense Fund has increasingly sought to work out problems without resorting to legal action. Environmental law will continue to grow as human action impinges with greater force on natural ecosystems, but the place of environmental defenders using litigation is still uncertain.

⁵⁵ Carter, "Environmental Law (I)"; Environmental Defense Fund, "Brief Description of Cases in Which EDF Has Taken Action and Is Considering" (mimeographed, seven-page memo, undated, Environmental Defense Fund). Internal evidence dates it to summer or fall of 1970; a copy is in the papers of Victor Yannacone.

⁵⁶ Quoted in Frank Graham, Jr., "Taking Polluters to Court," in *New Republic*, 158: 8-9 (January 13, 1968).

⁵⁷ Joseph Sax, *Defending the Environment* (New York, 1971).