ENVIRONMENTAL PROTECTION AGENCY
Washington, D.C.

CONSOLIDATED DDT HEARING

HEARING EXAMINER'S RECOMMENDED FINDINGS, CONCLUSIONS, AND ORDERS

(40 CFR 164.32)

Issued: April 25, 1972

Edmund M. Sweeney
Hearing Examiner

ENVIRONMENTAL PROTECTION AGENCY
Washington, D.C.

HEARING EXAMINER'S RECOMMENDED FINDINGS, CONCLUSIONS, AND ORDERS. (40 CFR 164.32)

In the Matter of:

A. Relating to PR Notice 71-1 issued January 15, 1971 in re DDT-

I.F.&R. No.	Petitioner	I.F.&R. No.	Petitioner
63	Stevens Industries, Inc.	87	Thompson-Hayward Chemical Co.
64	W. R. Grace & Company	88	Meherrin Agricultural & Chem. Co.
66	Cotton States Chemical Co.	89	Triangle Chemical Company
70	Woolfolk Chemical Works, Ltd.	90	Carolina Chemicals, Inc.
71	Octagon Process, Inc.	91	Southern Agric. Chemicals, Inc.
73	Micro Chemical Co., Inc.	92	Helena Chemical Company
74	Cleveland Chemical Co.	93	Kaiser Agricultural Chemicals
75	Coahoma Chemical Co., Inc.	96	Wyco, Inc.
77	Helena Chemical Co.	100	Valley Chemical Co.
78	Howerton Gowen Chemicals, Inc.	101	Olin Corporation
80	Cotton Producers Assoc.	102	Borden, Inc.
82	Daly-Herring Co.	103	Riverside Industries
83	Parramore & Griffin Co., Inc.	105	USDA (Plant Protection Div.)
84	Staple Cotton Services Assoc.	106	The Wallerstein Company
85	Standard Spray & Chem. Co.	107	Planters Chemical Company
86	FCX, Inc.	148	Riverside Industries

B. Relating to PR. Notice 71-3 issued March 12, 1971 in re TDE-

I.F.&R. No. 209 Olin Corporation

C. Relating to PR Notice 71-5 issued March 18, 1971 in re TDE-

I.R.&R. No. 121 Helena Chemical Company
I.F.&R. No. 149 Stark Bro's Nurseries and Orchards Co.
I.F.&R. No. 184 Olin Corporation
I.F.&R. No. 210 Borden, Inc.

D. Intervenors

The Secretary of Agriculture
I.F.&R. No. 97 B. F. Cannon & Son, Incorporated
I.F.&R. No. 223 Eli Lilly and Company
National Agricultural Chemical Association
Environmental Defense Fund, National Audubon Society, Sierra Club and West Michigan Environmental Action Council

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A. STATEMENT OF THE CASE

I. SUBJECT MATTER

The subject matter of this consolidated hearing is one of the most controversial in circulation; DDT and what should be done with it. DDT is a well-known insecticide in practically every part of the world. It is of special concern because it is the most widely-used pesticide. The two most common allegations against DDT use are that it is detrimental to many non-target organisms, especially birds, fish, and crustaceans, and that it is possibly a carcinogen to man. On the other hand, precipitous removal of DDT from interstate commerce could seriously disrupt public health programs and agricultural yield, and probably would force widespread resort to highly toxic replacements. The need to know makes it appropriate to examine the status of DDT and to make administrative determinations therefrom.

The full professional name of DDT is 1,1,1-trichloro-2,2-bis (p-chlorophenyl) ethane. Technical DDT is composed of approximately 75% p,p'-DDT isomer and 20% o,p'-DDT isomer and 5% other isomers and other compounds. The active insecticidal ingredient in DDT formulations is the p,p'-DDT isomer. The melting point of that isomer is 108.5° C. The molecular weight of DDT is 354.5 grams. Vapor pressure of DDT is 1.0×10^{-7} mm. mercury at 20° C. DDT has a water solubility of approximately 1.2 parts per billion. One of the attributes of DDT which make it desirable as an insecticide, is its persistence

As the testimony demonstrates, the questions raised are not confined to DDT itself. Its metabolites and isomers are question-raisers on their own. The metabolites DDE and DDD (alias TDE) are prominent factors in the pros's-and-con's of this case. In fact, TDE (dichloro diphenyl dichloroethane) was the subject of cancellation notice PR Notice 71-5, one of the three notices under consideration. For ease of reference here, it seems best to use the term DDT to mean, interchangeably, either DDT itself and/or one of its metabolites.

In addition to PR Notice 71-5, which was issued March 18, 1971, as an intention to cancel all products containing TDE, two other notices comprise the aggregate basis for this public hearing (Tr. 1:5): PR Notice 71-3 was issued March 12, 1971, and indicated the cancellation of registrations of certain products bearing directions for use on food in the absence of finite tolerances or exemptions; and PR Notice 71-1 issued January 15, 1971.

PR Notice 71-1 is the most important of the three because it declared a cancellation of the registrations of all products containing DDT not theretofore the subject of a cancellation notice. In a preamble the Notice refers to: the concern of the scientific community for several years over the levels of DDT in the environment; the recent official actions taken to restrict the uses of DDT; and the remand holding of the Circuit Court in Environmental Defense Fund v. Ruckelshaus, 439 F.2d 584 (1971). Cancellation action is based on the determination that continued registration of products

containing DDT is contrary to certain of the misbranding sections of the controlling law.

Copies of PR Notices 71-1, 71-3, and 71-5 are incorporated herein and carried as Attachment A1, A2, and A3.

II. THE PARTIES

This being an adversary proceeding, there are the usual parties: petitioners and respondent; and, in addition, the intervenors. A total of thirty-seven.

The petitioners are those registrants who seasonably filed and prosecuted their objections to the cancellation notices and their requests for a public hearing. These are 1) the Plant Protection Division of the United States Department of Agriculture (USDA) 1/; 2) 27 corporate-registrants, 2/ which for ease of communication are referred to collectively as Group-Petitioners (GP); 3) Wyco, Inc.; 4) the Wallerstein Company; and 5) Stark Brothers Nurseries and Orchards. 3/

The respondent is the Director of the Pesticide Regulation Division of the Environmental Protection Agency (Resp.).

The parties who were given intervenor-status have varied classification:

a) The Secretary of Agriculture (Int.-USDA). His reason for seeking participation, as given in his motion:

> The Secretary is charged with broad responsibilities in connection with the total agribusiness of the Nation, including the attainment of reasonable quantities of food and fiber,

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1/ Docket I.F.&R. No. 105.

2/ With an aggregate of 33 actions here. The applicable docket I.F.&R. Nos. are: 53, 54, 66, 70, 71, 73, 74, 75, 77, 78, 80, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 100, 101, 102, 103, 107, 148, 209, 121, 186, and 210.

3/ Wyco, docket I.F.&R. No. 96; Wallerstein, docket I.F.&R. No. 106; and Stark Brothers, docket I.F.&R. No. 149, each chose not to actively participate in the presentation of witness testimony, and with the understanding of respondent that each of those cases will be decided individually.

* * * in the interest of the Secretary of Agriculture extend beyond those of the Plant Protection Division.

* * * Accordingly, the Secretary is desirous of presenting a totally objective analysis of all relevant considerations with respect to the subject of DDT. * * *

b) National Agricultural Chemicals Association (Int.-NACA), a trade organization whose motion reads: 4/

> That the NAC is a membership corporation * * *, the members of which produce and formulate approximately 90 percent of the pest control chemicals used on this country's farms and orchards, and upon the behalf of its members, the NAC takes action in appropriate judicial and regulatory proceedings to promote the orderly administration of the [FIFRA], and other actions under which pesticide and residues of pesticidal chemicals are regulated.

c) H. P. Cannon & Son (Int.-Cannon), not a corporate-registrant, and who sought intervention because:

> [Cannon] will show in these objections that, Although it is not a registrant as to this use of DDT, it has standing to object to cancellation of the registration and to request a public hearing * * *.
>
> Cannon finds itself in the position of being totally unable to obtain sweet peppers for processing on the Delmarva Peninsula unless its growers have available DDT for control of the European corn borer.

d) Eli Lilly and Company (Int.-Lilly), a corporate-registrant not filing seasonably and whose motion states:

> Lilly will be adversely affected by permanent cancellation of TOPOCIDE [R] registration as a

4/ Int.-NACA took no active part in these proceedings.

result of its loss of ability to market the product. Lilly will not adequately be represented by the present parties; products involved are not comparable.

e) Environmental Defense Fund, Inc.; National Audubon Society; West Michigan Environmental Action Council; and Sierra Club (Int.-EDF et als) who sought to represent the public-interest, and who stated in their motions for intervention:

> In the proceedings before EPA, the Department of Agriculture and the Courts, [EDF, et als] have demonstrated their interest in eliminating the adverse effect on the environment of DDT. Their role in bringing about these cancellation proceedings has been crucial. In addition, they will add considerable depth to the proceedings because of their expertise in crucial areas concerning DDT.

As can be seen from the line-up of the parties, there was a clear division of purpose between the positions taken on each side of the aisle in this hearing: the Respondent and Int.-EDF et als defending the proposed cancellations of DDT registrations; and all other parties opposing the cancellations.

III. THE LAW INVOLVED

1. These cases arise out of and are governed by the Federal Insecticide, Fungicide, and Rodenticide Act (Act) (FIFRA), 61 Stat. 163, as amended (73 Stat. 286; 75 Stat. 18, 42) and particularly by Act of May 12, 1964, (P.L. 88-305, 78 Stat. 190); 7 U.S.C. 135-135k.

The pertinent parts of the Act are:

a. Sec. 2. For the purposes of this Act --

* * * *

z. The term "misbranded" shall apply --

* * * *

(2) to any economic poison --

* * * *

(c) if the labeling accompanying it does not contain directions for use which are necessary and if complied with adequate for the protection of the public;

(d) if the label does not contain a warning or caution statement which may be necessary and if complied with adequate to prevent injury to living man and other vertebrate animals, vegetation, and useful invertebrate animals;

* * * *

(g) if in the case of an insecticide, nematocide, fungicide, or herbicide when used as directed or in accordance with commonly recognized practice it shall be injurious to living man or other vertebrate animals, or vegetation, except weeds, to which it is applied, or to the person applying it;

b. Sec. 4(c),

* * * The Secretary, in accordance with the procedures specified herein, may suspend or cancel the registration of an economic poison whenever it does not appear that the article or its labeling or other material required to be submitted complies with the provisions of this Act. Whenever, the

> Secretary refuses registration of an economic poison or determines that registration of an economic poison should be cancelled, he shall notify the applicant for registration or the registrant of his action and the reasons therefor. Whenever an application for registration is refused, the applicant within thirty days after service of notice of such refusal, may file a petition requesting that the matter be referred to an advisory committee or file objections and request a public hearing in accordance with this section. A cancellation of registration shall be effective thirty days after service of the foregoing notice unless within such time the registrant (1) makes the necessary corrections; (2) files a petition requesting that the matter be referred to an advisory committee; or (3) files objections and requests a public hearing.
> * * *

Other Pertinent Rules and Regulations and Law Applicable:

2. Interpretations With Respect to Warning, Caution, and Antidote Statements Required To Appear On Labels of Economic Poisons. 40 CFR 162.100 et seq; and particularly Interpretation Number 18, 40 CFR 162.116 (Re-promulgated by Environmental Protection Agency. 36 F. R. 22518, November 25, 1971).

3. Reorganization Plan No. 3 of 1970 (35 F. R. 15623; U.S. Code Cong. & Ad. News, p. 2996, 2998, 91st Cong. 2d Sess., 1970) which transferred the responsibilities for administering FIFRA; and which reads in pertinent part:

> Sec. 1. Establishment of Agency. (a) There is hereby established the Environmental Protection Agency hereinafter referred to as the "Agency".
> (b) There shall be at the head of the Agency the Administrator of the Environmental Protection Agency, hereinafter referred to as the "Administrator". . . .

Sec. 2. Transfers to Environmental Protection Agency. (a) There is hereby transferred to the Administrator:

* * * *

(8)(1) The functions of the Secretary of Agriculture under the Federal Insecticide, Fungicide, and Rodenticide Act, as amended (7 U.S.C. 135-135k), * * *.

4. Rules Governing the Appointment, Compensation, and Proceedings of an Advisory Committee; and Rules of Practice Governing Hearings Under the Federal Insecticide, Fungicide, and Rodenticide Act. (40 CFR 164.1 et seq.)

5. The Administrative Procedure Act (5 U.S.C. 551, et seq.).

IV. THE ISSUES

The issues that have been tried in this case sound both in law and in equity. The notices of cancellation fall quite squarely in the statutory requirements tailored by certain segments of the "misbranding" section of FIFRA. But equally important, I think, are the equitable considerations of evaluating DDT as to its risks, vis-a-vis its benefits.

The questions to which the evidence was addressed included: (1) The nature and magnitude of the foreseeable hazards associated with DDT; and whether the hazard, if any, is inherent in the normal use of DDT or whether it results primarily from misuse; and (2) the nature of the benefit conferred by the use of DDT; whether its absence would merely cause some inconvenience to would-be users, or would cause serious risk to public health or disruption of important social needs. Likewise, available alternatives and their propensities (Exh. GP-19, Attachment A, post).

In that light, I define the issues here as follows:

A. Is the economic poison DDT, as offered under the registrations involved herein, misbranded because:

[2.z.(2)(c)] - the labeling accompanying it does not contain directions for use which are necessary and if complied with adequate for the protection of the public; or [2.z.(2)(d)] - the label does not contain a warning or caution statement which may be necessary and if complied with adequate to prevent injury to living man and other

vertebrate animals, vegetation, and useful invertebrate animals; or [2.z.(2)(g)] - when used as directed or in accordance with commonly recognized practice it shall be injurious to living man or other vertebrate animals, or vegetation, except weeds, to which it is applied, or to the person applying DDT?

B. Does the use of the economic poison DDT, as offered under the registrations involved herein, produce a risk that unreasonably outweighs its benefit?

V. THE PROCEEDINGS

Upon the lapse of the period allowed by sec. 4.c. of the Act, in which to exercise one of the options permitted following the receipt of the three cancellation notices involved here, a total of 37 public hearings had been seasonably requested. Registrants having more than one action sought to have their matters joined into one hearing for each. But that only cut the number of requested hearings to 31. It seemed quite obvious to everyone concerned that a single, consolidated public hearing was the proper vehicle; and that is the way it was handled.

The pre-trial work was hampered by the lack of statutory authority for discovery; as well as the hearing itself, by the lack of subpoena power.

The public consolidated hearing continued for a total of eighty-one days between August 17, 1971 and March 16, 1972.

The parties offered the testimony of 125 witnesses, as follows: GP - 13 and 6 in rebuttal; USDA - 6 and 4 in rebuttal; Wyco, Inc., The Wallerstein Co., and Stark Bros. Nurseries and Orchards - none. Int.-USDA - 30; Int.-Cannon - 5; Int.-Lilly - (1 by deposition); Int.-NACA - none; Resp. - 45 (and 1 by deposition); and Int.-EDF et als- 12 (and 1 by deposition). The testimony of 2 witnesses was presented jointly by USDA; Int.-USDA; and Respondent. A list of witnesses presented is incorporated herein and carried as attachment B.

The parties offered into evidence 365 exhibits as follows: GP - 59; USDA - 28; Wyco, Inc., The Wallerstein Co., and Stark Bros.

Nurseries and Orchards - none; Int.-USDA - 66; Int.-Cannon - 8; Int.-Lilly (11 with its deposition); Int.-NACA - none; Respondent - 131 and Int.-EDF et als. - 69. A list of exhibits is incorporated herein and carried as Attachment C. (The exhibits in the sequence of the day-of-receipt will accompany this opinion in a series of file-folders properly identified.)

The parties filed individual analyses of the evidence and brief statements of law and argument.

Oral argument was held on March 14, 15, and 16, 1972.

Suggested findings, conclusions, and orders were submitted by the parties.

The consolidated hearing was stenographically reported and transcribed.

The transcript consists of eighty-one volumes, one for each day of hearing; a total of 9312 pages.

During the course of the hearing the parties submitted eleven items, each of which was designated as an admission, and to the proof of which no evidence was required (Tr. 81:9285 - 9287). (These admissions are a part of the record herein and will accompany this opinion in a file-folder properly identified.) These admissions are described as follows:

Admission No. 1: "The following uses for pesticides containing DDT have been finally cancelled and are not in use in this proceeding," it consists of two pages.

Admission No. 2, in summary: "The uses of DDT, which the United States Department of Agriculture, on December 30, 1970 submitted to

the Environmental Protection Agency as essential and which USDA currently deems to be essential, are the following." That consists of seven pages.

Admission No. 3: "The market basket surveys" -- consisting of two pages, plus a document entitled, "Residues of Pesticides in Milk, Meat, and Foodstuffs, Duggan, 1971," which consists of 15 pages.

Admission No. 4: "An announcement of the Ontario Minister of Agriculture," two pages.

Admission No. 5: "A decision by the Swedish National Poisons and Pesticides Board," four pages.

Admission No. 6: "Summary of DDT Sales by Montrose Chemical Corporation of California." It consists of two pages.

Admission No. 7: "Summary of 1970 DDT Domestic Sales," three pages.

Admission No. 8: "Agricultural Statistics, 1969, reports the following data on the amount and location of cotton production in the United States." This consists of three pages.

Admission No. 9: "Agricultural Statistics, 1969, reports the following data on the amount and location of peanut production in the United States." It consists of two pages.

Admission No. 10: "On August 2, 1971, the State Department of Agriculture of Oregon issued a permit to potato growers throughout the State of Oregon for use of DDT with the following statement" -- this consists of three pages.

Admission No. 11, as amended: "The 327 labels, which Group Petitioners will defend in this proceeding, direct uses for 16 of the 34 essential use patterns as follows." This consists of five pages.

B. DISCUSSION

I. GENERAL

During the extended hearings of this case much of the material offered through the 125 witnesses and 365 exhibits was necessarily redundant, repetitive and of minor significance. But I am constrained to inject a personal feeling that no Hearing Examiner will ever enjoy the privilege that I had in listening to so many leaders in the field of scientific and medical achievement; from so many areas of expertise throughout the world, really; and including among them a recent Nobel Peace Prize winner, and the Surgeon General of the United States. No restrictions were placed on the parties as to the number of witnesses they could present, other than the necessary exhortations concerning relevance and materiality.

The pros and cons of DDT have been well aired.

To attempt to summarize the entire record cannot do justice to all the participants. In gleaning the main facets of the case we must necessarily summarize what appear to be the essential thrusts of the evidence.

During the quarter of a century of its use, the reputation of DDT grew to preeminent heights as a benefit to man in the area of public health and agricultural assistance. However, that ascendance has been followed by a decline, possibly spurred by Rachel Carson's "Silent Spring," on the charge that it is a pollutant and a dangerously toxic chemical that should not be continued at loose in the environment. At this point, most of the evidence was presented in

a manner removed from the hysterical and emotional state engendered in some discussions of DDT.

I think the right of cross-examination spurred a genuinely sober assessment of the facts available, particularly on the question of the benefits and risks of DDT; and it exposed those few instances where the purpose was to generate more heat than light on the subject.

There were some appalling instances of incredible inactions such as the publication of a paper containing faulty information which, after discovery, was never corrected and, apparently, is still being relied upon (Tr. 63:7234-7240). Likewise, the audacious refusal of a witness to answer a question on the grounds that the cross-examining lawyer (and I suppose the Hearing Examiner was included) wouldn't be capable of understanding the statistics (Tr. 36:4571).

However, practically every witness from the scientific community responded readily to this first-of-a-kind subjection of his professional work on DDT to the crucible of cross-examination; and that process is recommended as a tool of the truth in all future cases of this kind.

The thoroughness with which the topic of DDT was explored and analyzed has not made easier my task in evaluating, in a short space of time, the conclusions that result therefrom.

II. BURDEN OF PROOF

There is no need to spend much time on the question as to who, in this case, has the burden of proof and the initial burden of going forward with the evidence. Those burdens are on the petitioner - registrants who filed objections to the notices of cancellation and requested a public hearing. The point was raised at the outset of these proceedings and I ruled as above; relying on the Rules of Practice (now 40 CFR 164.20 at 164.28), Environmental Defense Fund v. Ruckelshaus (439 F.2d 584, 593 fn. 34), and The Report of the Hearing Before a Subcommittee on Agriculture and Forestry, United States Senate, Eighty-eighth Congress, First Session on S.1605, September 10, 1963.

I can see no reason to quarrel with placing the burden of proof on the petitioner-registrant. DDT is an economic poison which requires regulation as to its use. It is not unfair to rest the proof of disputed points on the one who seeks to maintain the registration.

Likewise, I can see no reason to quarrel with that part of section 4.c. of the Act that gives the Administrator the authority to determine, without prior public hearing, that a need exists for the cancellation of a registration; because that authority is balanced by the statutory requirement that "he shall notify the registrant of his action and the reasons therefor" which, in turn, can be the basis for a public hearing if the registrant exercises that option.

Perhaps there is a question as to what constitutes the burden of proof in this case. Rule of Practice 164.28, supra, provides that "at the hearing" the person whose objections raised the issues to be determined shall be "within the meaning of 5 U.S.C. 556(d) (formerly 5 U.S.C. 1006(d)), the proponent of the order sought, and accordingly shall proceed first at the hearing and have the burden of proof". The "order sought" in this case is an order of the Administrator that the cancellation notices issued by the Director of the Pesticide Regulation Division should not become effective.

So, what do petitioners here have to prove?

PR Notice 71-1 cites the concern of the "scientific community" and the results of a special study; and it then proceeds to predicate the need for cancelling all remaining DDT registrations on the grounds of "misbranding" under sections 2.z.(2)(c); -(d); and -(g) of the Act.

The framer of PR 71-1 did not articulate the relevance of the scientific community's concern or the conclusions of the special study, so as to furnish any detailed explanation as to any particular manner in which the labels involved here can be said to constitute misbranding.

Thus, it appears that, in the absence of specifics, the petitioners here have the burden of affirmatively proving only that the language on each label satisfies the requirements of sections 2.z.(2)(c); -(d); and -(g) and regulations in implementation thereof.

When the petitioners accomplish that goal, the duty of producing evidence passes to the respondent.

The Respondent argues 5/ that under FIFRA the burden of proof is not the preponderance-of-the-evidence test, but, rather, the standard of clear-and-convincing evidence. I have searched the language of FIFRA and find nothing upon which to base such an assumption. Likewise, as to Respondent's argument that in this case the burden of proof is identical to that in hearings involving an original application for registration. Such a position appears to be bottomed upon gratuitous assumptions not supported by FIFRA. There is no evidence to indicate that any party here challenges the seriousness of meeting the safety requirements deemed necessary to permit the granting of an application for a registration of an economic poison with the propensities of DDT. However, it does not follow that, once that application has been approved by the proper authorities, subsequent actions involving that registration should not be governed by their own requirement. For example, in this case, registrations once properly granted are now the subject of cancellation proceedings on a challenge of misbranding under the three sections 2.z.(2)(c); -(d); and -(g). As I see it, those are the sections of FIFRA that establish the guidelines for the quantum of proof necessary to meet the relative burdens of the parties.

5/ R. 3; Resp. Reply Analysis of the Evidence and Summary of the [illegible].

In other words, as long as FIFRA remains a "misbranding" statute, the primary burden on any Petitioner-registrant in this case remains one of proving that its labels comply fully with the Act. I believe that a balancing of benefit against risk, if it has to err, should err on the side of safety; nevertheless, such a balancing must rest on solid grounds. The risk side should not be based on such factors as possible future risk, unforeseeable abuse, and a strict requirement of no-damage-to-wildlife. In my opinion, an unreasonable risk must be demonstrated in order to overcome the indicated or the proven benefits of DDT. If the Congress had desired to stress more strongly the maintenance of a higher risk standard, it would have enacted a "strictly prescription" type of usage; thereby giving the Respondent here complete control over the policy of overall usage of DDT rather than control merely over the label language. It might well be that the prescription-type procedure is the one to establish under this Act. However, until that is accomplished, the proof must fit the law as we take it.

III. THE LABELS

"Every economic poison shall bear a label containing the information specified in the Act and the regulations in this part." 40 CFR 162.4. That is the opening direction in the regulations setting out such particulars as: the language to be used; the contents of label and labeling; placement of label; name, brand or trademark; registration number; and the ingredient statement. As it should be, nothing is left to the imagination.

In this case every label has to meet the labeling particulars in the light of sections 2.z.(2)(c); -(d); and -(g).

A closer look at those sections might be helpful.

"(c)" reads: if the labeling accompanying it does not contain directions for use which are necessary and if complied with adequate for the protection of the public.

Thus, directions for use must be approved by the Agency as to the method of application, the amount to be applied, when and how often it can be applied, and the requirement, if any, for special protective equipment to be used during application.

"(d)" reads: if the label does not contain a warning or caution statement which may be necessary and if complied with adequate to prevent injury to living man and other vertebrate animals, vegetation, and useful invertebrate animals.

Here, the Act instructs the Agency to change focus to a determination of appropriate language adequate to give the necessary alarm. This section is the only one of the three that has been the subject of a specific interpretation by the Agency. I refer to

Interpretation Number 18; and I will discuss this more fully shortly.

"(g)" reads: if in the case of an insecticide, nematocide, fungicide, or herbicide when used as directed or in accordance with commonly recognized practice it shall be injurious to living man or other vertebrate animals, or vegetation, except weeds, to which it is applied, or to the person applying such economic poison.

This section refers to the economic poison as a compound. The Agency is responsible for the evaluation of the hazard involved despite the adequacy of directions for use and the adequacy of warning or caution statements.

When you study those three sections in the light of maximum effectiveness, you must conclude that the language used has to be addressed to all segments of the public that might have contact with the compound. But it is clear that there is no requirement to satisfy all levels of understanding, which leaves us with the yardstick that has served legal interpretation so well in so many areas: The reasonable, prudent man. If the directions for use, the warning or caution statement and the evaluation of the hazard appear on the label in language that can be understood by the reasonable, prudent man, they must be in compliance with the Act. In any event, that's the criterion I used in analyzing the labels involved in this case.

Now, I want to return to section 2.(s)(2)(d) and Interpretation No. 18.

As noted earlier, sec. -(d) is the only one of the three sections in question that has been the subject of an official Agency Interpretation. It is found in 40 CFR 162.116. After referring to sec. -(d) it points out that Section 3.a.(3) of the Act requires that any economic poison which contains any substance or substances in quantities highly toxic to man must bear on the label the skull and crossbones, the word "Poison," in red, on a contrasting background, and an antidote statement.

The next part of the Interpretation provides for categories of toxicity and general provisions as to statements required for economic poisons, as follows:

> (1) Four general categories of toxicity of economic poisons are recognized. The first is the highly toxic class as defined in sec. 162.8.
>
> The second is the class immediately below the highly toxic, and in general includes formulations having toxicities down to one-tenth those of the highly toxic class.
>
> The third group embraces products having hazards below the class two but to a degree which still requires some cautions and usually includes toxicities down to about one-tenth of those in class two.
>
> The fourth class is comparatively free from danger.
>
> (2) Products in the categories specified in subparagraph (1) of this paragraph are to be distinguished from each other by the following general scheme:
>
> (i) Highly toxic products are required by the act to be labeled with the skull and crossbones, the word "Poison" (in red) on a contrasting background,

and an antidote statement. The antidote statement should include the sentence "Call A Physician Immediately." In addition, the label should carry the word "Warning" and instructions for handling to reduce chances of injury in use.

(ii) Labels of products which fall in the second category should carry warning statements equivalent to those required for highly toxic materials, but they do not need to bear the skull and crossbones, the word "Poison", or an antidote statement.

(iii) Labels of products in the third category should carry the word "Caution" and statements indicating the means of avoiding the principal hazards of use. Use of the skull and crossbones, the word "Poison", and antidote statements are not necessary for these products.

(iv) No warning, caution, or antidote statements are required for the few formulations in the fourth category, although unqualified claims for safety are usually not justified.

Interpretation No. 18 continued on with miscellaneous provisions contemplated to make the label more effective.

Before setting out the pertinent acceptable warning, caution and antidote statements, we must go back for a look at sec. 162.8 which defines the first-class, or highly-toxic, category referred to in the Interpretation. It reads:

(a) Economic poisons which fall within any of the following categories when tested on laboratory animals as specified in subparagraphs (1), (2), or (3) of this paragraph are highly toxic to man or contain substances or quantities of substances highly toxic to man within the meaning of the Act (such economic poisons being hereinafter in this part referred to as economic poisons highly toxic to man): Provided, however, that the Director may, upon application and after opportunity for hearing, exempt any economic poison which is in any of these categories, but which is not in fact highly toxic to man, from

the requirements of the Act and the regulations in this part with respect to economic poisons highly toxic to man:

(1) Oral toxicity. An economic poison which has a single dose LD_{50} of 50 milligrams or less per kilogram of body weight when administered orally to both male and female rats which have been fasted for a period of 24 hours (or to other rodent or nonrodent specified by the Director); or

(2) Toxicity on inhalation. An economic poison which has an LC_{50} of 2,000 micrograms or less of dust or mist per liter of air or 200 parts per million or less by volume of a gas or vapor, when administered by continuous inhalation for one hour to both male and female rats (or to other rodent or nonrodent species specified by the Director), if the Director finds that it is reasonably foreseeable that such concentration will be encountered by man; or

(3) Toxicity by skin absorption. An economic poison which has an LD_{50} of 200 milligrams or less per kilogram of body weight when administered by continuous contact for twenty-four hours with the bare skin of rabbits (or other rodent or nonrodent species specified by the Director).

(b) Tests on other species. Tests on other specified rodent or nonrodent species may be required by the Director with respect to individual economic poisons or to classes of economic poisons whenever he finds that tests on other species are necessary to determine whether an economic poison is highly toxic to man.

(c) Terms LD_{50} and LC_{50}. An LD_{50} as used in connection with oral toxicity and skin absorption toxicity tests specified in paragraph (a)(1) and (3) of this section is the dose and LC_{50} as used in connection with inhalation tests specified in paragraph (a)(2) of this section is the concentration which is expected to cause death within 14 days in 50 percent of the test animals so treated.

(d) Toxicity based on human experience. If the Director finds, after opportunity for hearing, that available data on human experience with any economic

poison indicate a toxicity greater than that determined from the above described tests on animals, the human data shall take precedence and if he finds that the protection of the public so requires the Director shall declare such an economic poison to be highly toxic to man for the purposes of this Act and the regulations thereunder.

Up to this point we haven't discussed where DDT fits into the toxicity classification. I could find nothing in the evidence that seemed to give toxicity classifications in the same context as sec. 162.8. Therefore, for my purposes here I am going to refer to a document entitled Pesticide Reference Standards of the Entomological Society of America, Committee on Insecticide Standards, Revised 1970. In there we find the following:

DDD: (see TDE)

DDT: Toxicity-
Slightly toxic; acute oral rats LD_{50} = 250 mg/kg.

TDE: Toxicity-
Slightly toxic; acute oral rats LD_{50} = 3400 mg/kg.
Non-phytotoxic.

Aldrin: Toxicity-
Toxic; acute oral rats LD_{50} = 55 mg/kg.

Carbaryl: Toxicity-
Moderately toxic; acute oral rats LD_{50} = 500-700 mg/kg.

Dieldrin: Toxicity-
Toxic; acute oral rats LD_{50} = 60 mg/kg.
Absorbed through skin.

Endrin: Toxicity-
Highly toxic; acute oral rats LD_{50} = 11 mg/kg.
Absorbed through skin.

Malathion: Toxicity-
Moderately toxic; acute oral rats LD_{50} = 900 - 5800 mg/kg.

Methyl parathion: Toxicity-
Highly toxic; acute oral rats LD_{50} = 15 mg/kg.

Parathion: Toxicity-
Extremely toxic; acute oral rats LD_{50} = 3 - 15 mg/kg.
Absorbed through skin.

Strobane(R): Toxicity-
Toxic; acute oral rats LD_{50} = 200 - 250 mg/kg.

Toxaphene: Toxicity-
Toxic; acute oral rats LD_{50} = 69 mg/kg.

Now, going back to Interpretation No. 18 (40 CFR 162.116(d)) we find:

> (d) Acceptable warning, caution and antidote statements for economic poisons containing specified ingredients. The following subparagraphs set forth or indicate acceptable warning, caution and antidote statements for economic poisons containing the ingredients specified therein. The exact wording used in the suggested statements is not obligatory, although the substance of all such statements will be required, unless under special conditions of handling or use it is unnecessary. The manufacturer is obligated to use any added warning, caution or antidote statements which any special characteristics or uses of his formulation indicate to be necessary. Where the notation (H.P.) for "household package" appears following a precautionary statement, it indicates that the warning will be required only on packages commonly stored or used in the household where there is greater danger of accidents involving children or pets. The insignia

POISON

always refers to the skull and crossbones and the word "Poison" (in red) on a contrasting background. The

fire hazard caution prescribed in this paragraph in each case is based on the flash point of the chemical named.

At this point it appears important to recite the specific directions set out for DDT and certain other compounds known to be used in formulation with DDT in the labels involved in this case.

Dichloro diphenyl dichloroethane. [DDD] Treat on same basis as DDT.

Dichloro diphenyl trichloroethane (DDT) — (i) Technical emulsions, and wettable powders above 25%.

Caution: Harmful if swallowed. Avoid skin contact with solutions. In case of skin contact, wash with soap and water. Avoid breathing dust and spray mist. Avoid contamination of feed and foodstuffs.

(ii) Emulsifiable or petroleum oil solutions for agricultural and industrial use 25% and below.

Caution: Avoid contact with skin. In case of skin contact, wash with soap and water. Avoid breathing spray mist. Avoid contamination of feed and foodstuffs.

(iii) Emulsifiable or petroleum oil solutions for household use.

Caution: Harmful if swallowed. Avoid contact with skin. Avoid prolonged breathing of spray mist. Wash with soap and water after using. Avoid contamination of feed and foodstuffs. Remove birds, pets, and fish bowls from rooms being sprayed. Keep out of reach of children.

Note: See also Interpretation 15 (162.113). 6/

(iv) Self-propelled sprays.

Caution: Do not spray on skin or animals. Wash with soap and water after using. Avoid inhalation of mist. Avoid contamination of feed and foodstuffs. Remove birds, pets, and fish bowls from rooms being sprayed. Keep out of reach of children.

Note: See also Interpretation 15 (162.113). 7/

6/ Not pertinent here.
7/ Id.

(v) Dust and wettable powder formulations 25% and below.

Caution: Avoid breathing dust. Avoid contamination of feed and foodstuffs.

Toxaphene (chlorinated camphene containing 67 to 69% chlorine) -- (i) Dry formulations 25% and above.

Warning: May Be Fatal If Swallowed! Do not breathe dust or spray mist. Do not get in eyes, on skin or on clothing. Wash thoroughly after using. Do not store near feed and food products. To protect fish and wildlife, do not contaminate streams, lakes, or ponds with this material.

(ii) Dry formulations below 25%.

Caution: Harmful If Swallowed! Avoid prolonged breathing of dust or spray mist. Avoid contact with eyes, skin and clothing. Wash thoroughly after using. Avoid storage near feed and food products. To protect fish and wildlife, do not contaminate streams, lakes, or ponds with this material.

(iii) Solutions and emulsions. Labels should bear precautionary statements covering the combined hazards of toxaphene and solvent.

(iv) Self-propelled sprays.

Caution: Do not spray on skin, or animals. Wash with soap and water after using. Avoid inhalation of mist. Avoid contamination of feed and foodstuffs. Remove birds, pets, and fish bowls from rooms being sprayed. Keep out of reach of children.

O,O-Dimethyl-O, p-nitrophenyl thiophosphate. [methyl parathion] Treat on same basis as parathion.

Parathion (O,O-Diethyl O,p-nitrophenyl thiophosphate) — (i) Above 2% (except aerosols; see below).

☠ Poison ☠

Antidotes: If swallowed. Give a tablespoonful of salt in a glass of warm water and repeat until vomit fluid is clear. Have victim lie down and keep quiet. Call a Physician Immediately!

If on skin. In case of contact remove contaminated clothing and immediately wash skin with soap and water.

Warning Poisonous If Swallowed, Inhaled, or Absorbed Through Skin! Rapidly Absorbed Through Skin! Do not get in eyes, on skin, or on clothing. Wear natural rubber gloves, protective clothing and goggles. In case of contact, wash immediately with soap and water. Wear a mask or respirator of a type passed by the U.S. Department of Agriculture for parathion protection. Keep all unprotected persons out of operating areas or vicinity where there may be danger of drift. Vacated areas should not be reentered until drifting insecticide and volatile residues have dissipated. Do not contaminate feed and foodstuffs. Wash hands, arms and face thoroughly with soap and water before eating or smoking. Wash all contaminated clothing with soap and hot water before reuse.

(ii) Dusts, 2% and below.

Warning: May Be Fatal If Swallowed, Inhaled, or Absorbed Through Skin! Rapidly Absorbed Through Skin! Do not get in eyes on skin or on clothing. Wear natural rubber gloves, protective clothing and goggles. In case of contact wash immediately with soap and water. Wear a mask or respirator of a type passed by the U.S. Department of Agriculture for parathion protection. Keep all unprotected persons out of operating areas or vicinity where there may be danger of drift. Vacated areas should not be reentered until drifting insecticide and volatile residues have dissipated. Do not contaminate feed and foodstuffs. Wash hands, arms, and face thoroughly with soap and water before eating or smoking. Wash all contaminated clothing with soap and hot water before reuse.

(iii) Aerosols -- greenhouse use.

♀ Poison ♀

Antidotes: Internal. Give a tablespoonful of salt in a glass of warm water and repeat until vomit fluid is clear. Have victim lie down and keep quiet. Call a Physician Immediately!

If on skin: Wash thoroughly with soap and water.

Warning: Poisonous if Inhaled or Absorbed Through Skin! Do not get on skin. Use only while wearing a full face mask of a type passed by the U.S. Department of Agriculture for parathion protection. Replace canister as directed. Wear protective clothing and natural rubber gloves. Wash hands, arms and face

with soap and water after using the bomb. Wash contaminated clothing with soap and hot water before reuse. Do not contaminate feed and foodstuffs.

1-Naphthyl N-methylcarbamate (Sevin) [Cartaryl] -- (i) Above 50%.

Caution: Harmful if swallowed or inhaled. Avoid breathing of dust or spray mist. Avoid prolonged or repeated contact with skin; wash thoroughly after handling. Wear clean clothing. Avoid storage near feed and food products.

(ii) 50 % and below.

Caution: Harmful if swallowed. Avoid prolonged breathing of dust or spray mist. Avoid prolonged or repeated contact with skin; wash thoroughly after using. Avoid storage near feed and food products. Keep out of reach of children (H.P.).

Endrin (hexachloro-epoxy-octahydro-endo, endo-di-methano naphthalene) — (i) 2.5% and above.

☠ Poison ☠

Antidotes: If swallowed. Give a tablespoonful of salt in a glass of warm water and repeat until vomit fluid is clear. Have victim lie down and keep quiet. Call a Physician Immediately!

If on skin. Wash immediately with soap and water.

Warning: Poisonous by Swallowing, Inhalation, or Skin Contact! Do not get in eyes, on skin, or on clothing. Do not breathe dust or spray mist. In case of contact, immediately remove all contaminated clothing and flush skin or eyes with plenty of water for at least 15 minutes; for eyes, get medical attention. Wear clean synthetic rubber gloves and a mask or respirator of a type passed by the U.S. Department of Agriculture for endrin protection. Wash thoroughly with soap and water after handling and before eating or smoking; wear clean clothing. Do not apply or allow to drift to areas occupied by unprotected humans or beneficial animals. Do not contaminate feed and foodstuffs. To protect fish and wildlife, do not contaminate streams, lakes, or ponds with this material.

(ii) Below 2.5%

Warning: Hazardous by Swallowing, Inhalation, or Skin Contact! Rapidly Absorbed Through Skin! Do not get in eyes, on skin, or on clothing. Do not

breathe dust or spray mist. In case of contact with skin or eyes, flush with plenty of water, for eyes, get medical attention. Wash thoroughly with soap and water after handling and before eating or smoking; wear clean clothing. Wear clean synthetic rubber gloves and a mask or respirator of a type passed by the U.S. Department of Agriculture for endrin protection. Do not apply or allow to drift to areas occupied by unprotected humans or beneficial animals. Do not contaminate feed and foodstuffs. To protect fish and wildlife, do not contaminate streams, lakes, or ponds with this material.

Malathion (O,O-Dimethyl dithiophosphate of diethyl-mercaptosuccinate).

Caution: Harmful if swallowed. Avoid prolonged breathing of dust or spray mist. Avoid prolonged or repeated contact with skin; wash thoroughly after using. Avoid contamination of feed and foodstuffs. Keep out of reach of children (H.P.).

Note: For dusts and wettable powders below 20% the caution "Harmful if swallowed" may be omitted.

Aldrin (95% hexachloro hexahydro-endro, exo-dimethano napthalene) — (i) 60% and above.

o o
x Poison x

Antidotes: If swallowed. Give a tablespoonful of salt in a glass of warm water and repeat until vomit fluid is clear. Have victim lie down and keep quiet. Call a Physician Immediately!

If on skin. Wash immediately with soap and water.

Warning: Poisonous If Swallowed, Inhaled or Absorbed Through Skin! Do not breath dust or spray mist. Do not get in eyes, on skin or on clothing. In case of contact immediately remove contaminated clothing and flush skin or eyes with plenty of water; for eyes, get medical attention. Wash thoroughly with soap and water after handling and before eating or smoking; wear clean clothing. During commercial or prolonged exposure in spray-mixing and loading operations, wear clean synthetic rubber gloves and a mask or respirator of a type passed by the U.S. Department of Agriculture for aldrin protection. Do not apply or allow to drift to areas

occupied by unprotected humans or beneficial animals. To protect fish and wildlife, do not contaminate streams, lakes or ponds with this material.

(ii) 10% to 60%.

Warning: Hazardous If Swallowed, Inhaled, or Absorbed Through Skin! Do not breathe dust or spray mist. Do not get in eyes, on skin or on clothing. In case of contact, immediately remove contaminated clothing and flush skin or eyes with plenty of water; for eyes, get medical attention. Wash thoroughly with soap and water after handling and before eating or smoking; wear clean clothing. During commercial or prolonged exposure in spray-mixing and loading operations, wear clean synthetic rubber gloves and a mask or respirator of a type passed by the U.S. Department of Agriculture for aldrin protection. Do not apply or allow to drift to areas occupied by unprotected humans or beneficial animals. To protect fish and wildlife, do not contaminate streams, lakes or ponds with this material.

(iii) Below 10%.

Caution: Harmful if swallowed, inhaled or absorbed through skin. Avoid breathing of dust or spray mist. Avoid contact with skin, eyes or clothing. In case of contact with skin or eyes, flush with plenty of water; for eyes, get medical attention. Wash with soap and water after handling and before eating or smoking; wear clean clothing. Avoid contamination of feed and foodstuffs. Do not apply or allow to drift to areas occupied by unprotected humans or beneficial animals. To protect fish and wildlife, do not contaminate streams, lakes or ponds with this material.

(iv) Fertilizer formulations.

Caution: Avoid prolonged or repeated inhalation of dust or contact with skin. Wash thoroughly after handling. To protect fish and wildlife, do not use where runoff will contaminate streams, lakes or ponds.

O,O-Dimethyl S-[4-oxo-1,2,3-benzotriazin-3(4H)-ylmethyl] phosphorodithioate (Guthion) — (1) Above 2%.

Poison

Antidotes: If swallowed. Give a tablespoonful of salt in a glass of warm water and repeat until vomit fluid is clear. Have victim lie down and keep quiet. Call a Physician Immediately!

If on skin. In case of contact remove contaminated clothing and immediately wash skin with soap and water.

Warning: Poisonous If Swallowed, Inhaled, or Absorbed Through Skin! Do not get in eyes or on skin. Wear natural rubber gloves, protective clothing and goggles. In case of contact, wash immediately with soap and water. Wear a mask or respirator of a type passed by the U.S. Department of Agriculture for guthion protection. Keep all unprotected persons out of operating areas or vicinity where there may be danger of drift. Vacated areas should not be reentered for at least two days. Do not store near feed and food products. Wash hands, arms, and face thoroughly with soap and water before eating or smoking. Wash all contaminated clothing with soap and hot water before reuse.

(ii) Dusts, 2% and below.

Warning: May Be Fatal If Swallowed, Inhaled or Absorbed Through Skin! Do not get in eyes or on skin. Wear natural rubber gloves, protective clothing and goggles. In case of contact wash immediately with soap and water. Wear a mask or respirator of a type passed by the U.S. Department of Agriculture for guthion protection. Keep all unprotected persons out of operating areas or vicinity where there may be danger of drift. Vacated areas should not be reentered for at least two days. Do not store near feed and food products. Wash hands, arms, and face thoroughly with soap and water before eating or smoking. Wash all contaminated clothing with soap and hot water before reuse.

Dieldrin (85% hexachloro epoxy octahydro-endo, exo-dimethano naphthalene) -- (i) 60% and above. Treat as aldrin.

(ii) 10% to 60%. Treat as aldrin.

(iii) Below 10% for agricultural use. Treat as aldrin.

(iv) Fertilizer formulations. Treat as aldrin.

(v) 0.5% self-propelled sprays or solutions and 1.0% dusts for household use.

Caution: Avoid prolonged or repeated inhalation of dust or spray mist or contact with skin. Do not

contaminate foods, utensils, dishes or drinking water. Do not apply to humans, pets, or birds, or near fish bowls. Keep out of reach of children.

Note: See also kerosene sprays.

O,O-Dimethyl-S-p-chlorophenylthiomethyl phosphorodithioate (methyl trithion).

Warning: May be fatal if swallowed, inhaled, or absorbed through skin. Do not get in eyes, on skin, or on clothing. Do not breathe dust or spray mist. In case of contact, wash immediately with soap and water. Wear clean clothing. Wash all contaminated clothing with soap and hot water before reuse. Do not store near feed and food products. To protect fish and wildlife, do not contaminate streams, lakes, or ponds with this material.

Terpene polychlorinates (chlorinated mixture of camphene, pinene and related terpenes, containing 65 to 66% chlorine) (Strobane).

(i) Dry formulations 25% and above. Treat as toxaphene.

(ii) Dry formulations below 25%. Treat as toxaphene.

(iii) Solutions and emulsions. Treat as toxaphene.

(iv) Self-propelled sprays. Treat as toxaphene.

Probably it isn't necessary to delineate in such detail the pertinent recitals of Interpretation No. 18, just above, in order to make the points that have to be made; namely, that DDT is indeed an economic poison the use of which has to be regulated; and that other economic poisons, with which DDT most often is combined, indeed need even more strict regulation to satisfy the misbranding sections. However, having checked each label involved here against Interpretation No. 18, I realize that the difference in impact, especially as to safety, between DDT and its associates needs to be shown as clearly as possible; and I think the content of Interpretation No. 18 does just that.

Involved in this action are 320 labels. Of these, 314 are under registrations issued to Group-Petitioners; 2 are under registrations belonging to the Plant Protection Division of USDA; one label each of petitioners Wyco, Inc., The Wallerstein Co., and Stark Brothers Nurseries and Orchards; and one label that Intervenor-Eli Lilly and Company had with its registration, the cancellation of which was not appealed seasonably.

The Respondent made no effort to furnish me with a list of registrations which he claimed were canceled by PR Notices 71-1, 71-3, or 71-5, or those registrations which he claimed had been canceled earlier. The Respondent made no effort to furnish me with copies of the labels involved. At my request, the petitioners furnished such copies. Thereupon Respondent filed a motion-to-strike certain of the labels. However, he did not pursue it to a conclusion, with the result that the motion fell under the rule of undisposed-motions (Tr. 81:9310). On April 17, 1972, a month after the hearing in this consolidated case was closed (Tr. 81:9311) I received from Respondent a letter presenting a argument in the matter of the registrations involved in Borden, Inc. I.F.&R. 210. A check of the records discloses that Borden's objections and request for public hearing was filed April 29, 1971, and contained a list of the now-disputed registration numbers. Respondent's "Answer to Objections" was filed May 21, 1971, listing those registration numbers and in no way contesting their viability. Likewise, in the motion-to-strike, mentioned above, Respondent did not seek to

strike the registrations set out i· Borden's Inc. I.F.&R. 210. Respondent has had ample opportuni to question th particular registrations. It is too late now · open up a con ersial For the purposes of this case, the strations in n, I· I.F.&R. 210 are considered to hav · subject to] ce 71-·.

On April 18, 1972, I · · letter · containing a long dissertation · several regist· · ·ave here that were the subject of his motion-to-strike mentioned above Such belated attempts to do what could have been done in open hearing over a six-months period is a disservice to any attempt on my part to render an appropriate decision. This case must not be decided on any such ex parte approach.

Now, to get back to my discussion of all the labels.

One by one I compared all of the labels at issue with the pertinent directions set out in Interpretation No. 13.

In all cases, except two 8/, the language of the label was in substantial compliance with the requirements designated for DDT.

It is evident that if Respondent has no established procedure for frequent verification of all labels, it should inaugurate such a program at once.

Any question of the relative safety of DDT compared to such compounds as Parathion, Endrin, or Methyl Parathion is quickly

8/ Label accompanying Reg. No. 2460-46 did not contain statement "Do not breathe dust or spray mist." Label accompanying Reg. No. 3238-8 did not contain the word "Caution".

dispelled by an examination of the safeguards required of each by Interpretation No. 18.

At this juncture we could consider the evidence presented to show whether or not in actual practice the label language is adequate for the purposes of FIFRA's requirements in section 2.z.(2)(c); -(d); and -(g), respectively. Such evidence is necessarily dependent upon an evaluation of the benefits and risks involved in the use of DDT insofar as they go beyond the narrower issue of misbranding. While it must be borne in mind that each label is subject to a test of benefit-risk, such a task would not only be long and tedious, but is unnecessary because the evaluation can be more easily handled in the broader discussion of benefit-risk which will follow.

1. GP Model DDT Labels

During the hearing, Group-Petitioner submitted 15 documents which they recommended as models for future labels relative to the use of DDT. These suggested model labels were recommended for the following uses: for cotton; for military use on clothing; for peppers and pimentos; for fresh market corn; for peanuts; for cabbage, cauliflower, and brussel sprouts; for tomatoes; for lettuce; for potatoes; for sweet potatoes (southern states only); for use in commercial greenhouses and nurseries; for beans (dry, lima, snap); for bat and rodent control; for emergency use for agriculture, health or quarantine purposes; and for onions and garlic.

It is my opinion that I have no jurisdiction to consider the application or qualification of these models in connection with this hearing.

However, I think the submission of these suggested labels is an indication of the close cooperation that should exist continually between the respondent and registrants under the FIFRA. Therefore, I forward these suggested model forms along with this case and recommend that they be considered fully in the light in which they were offered and in which I send them forward. The model labels will accompany this decision in a separate file-folder, properly identified.

IV. BENEFIT VERSUS RISK

As explained earlier, although the issue raised by the cancellation notices is the sort of down-to-earth challenge where the proof is confined to precise application to statutory standards of FIFRA, there is the further issue, not spelled out in legislative history or enactment, which, in recent years particularly has been accepted generally in considering appropriateness of cancellation: --benefit against risk.

The basic point appears in Environmental Defense Fund v. Ruckelshaus, supra, at 594:

> The cancellation decision does not turn on a scientific assessment of hazard alone. The statute leaves room to balance the benefits of a pesticide against its risks. The process is a delicate one, in which greater weight should be accorded the value of a pesticide for control of disease, and less weight should be accorded its value for the protection of a commercial crop.

In applying that observation to the misbranding sections involved here the first thing that becomes clear is that an unlimited interpretation of the language used would not be helpful.

For example, section 2.z.(2)(d) requires the warning or caution statement to be adequate to prevent injury, inter alia, to useful invertebrate animals. To interpret that to its full impact would mean such animals as common ants, unharmful mites, and, no doubt, hundreds of other species that might abide in the area of DDT application, and all such species probably having some usefulness. Certainly, no one in this hearing has offered any theory of FIFRA that

extends protection to all useful invertebrates. If that were the case it would be mandatory to conclude that it is just impossible to frame a label that will meet the requirements of section 2.z.(2)(d). But no serious reader of FIFRA believes that the Congress intended such a result. In speaking of useful invertebrate animals, Respondent (Tr. 80:9168-69) talks in terms of "beneficial insects;" "the predator and prey" in cotton fields and other agricultural activities; "bees;" "aquatic insects" that are fish food; and "shrimp;" an indication that respondent recognizes the limitations of the broad term useful invertebrates.

Likewise there must be an assessment of what is meant in sec. - (d) by the phrase "adequate to prevent injury, etc., to useful invertebrate animals." By definition DDT is an economic poison. No economic poison is spatial specific; that is that it will kill only the target insect, e.g. a poison that can be applied on cotton that will injure only the boll weevil. And Interpretation No. 18 gives full recognition to that by providing for use of skull-and-crossbones, and the word "poison" with contrasting colors. If the implementation of the Act recognizes that such poison does in fact cause some injury, even to the extent of requiring an antidote, how can it be argued that the Act means that no injury shall be done to useful invertebrate ani[illegible]. To me, it seems that the only acceptable rationale of [illegible] (2)(d) is that the Congress wanted the label to con[illegible] warning or caution statement that

would be adequate to prevent all unreasonable injury to those invertebrate animals within the range of application who are known to be helpful in eliminating the pertinent pests when the immediate need for elimination does not demand the power of the economic poison. That is a balancing of the benefit against the risk.

Of course I don't mean that the whole scope of benefit-risk has a simple answer. There are two areas of contention: the global benefits and risks of DDT for all uses; and the particular benefits and risks of a specific use of DDT, such as on an agricultural product.

Concerning the global significance of DDT I would feel compelled to join the forces seeking the cancellation of all economic uses of DDT if the evidence here gave proof that the use of DDT created an "imminent hazard" to man 9/, either directly through carcinogenic effects on humans, or indirectly by destroying man's food chain and environment so as to make the earth uninhabitable. Similarly, if the evidence gave proof that DDT was completely innocuous, non-persistent in the environment, of absolute safety to man, and injurious only to a few non-target organisms of no significance, I would have to find that the use of DDT presented no global risk

9/ Respondent has specifically rejected this contention, since the action to be taken under FIFRA would be immediate suspension of all uses of DDT rather than cancellation. See p. 12, Environmental Protection Agency, Reasons underlying the Registration Decisions, etc. March 18, 1971. (Exh. CP-19.)

and, therefore, find unwarranted any cancellation of registrations on the basis of the benefit-risk approach to the problem.

Respondent argues that because of its persistence, transportability, bioconcentration in animals, and its toxicity, DDT is such a risk to wildlife and the safety of man, that most, if not all, of its present uses should be banned.

Group-Petitioners counter-argue that DDT has had a long history of human safety, and that the minimal risks to the environment from its use do not diminish substantially the record of overwhelming benefits derived in the areas of public health and agricultural betterment, including increased yields of food and fibre.

The proceeding here concerns itself with the cancellation of the registrations of uses of DDT and its metabolites. It is not a trial of every pesticide or other chemical compound the use of which may have a deleterious effect on man or his environment. In analyzing the benefits and risks of DDT it should be of some significance to determine whether or not replacements 10/ for DDT may be more or less safe, efficient and economical; however, much of such information is conflicting, hypothetical, and, generally, of limited value.

10/ Most of the testimony and arguments throughout the hearing when talking of other pesticides have labeled them "alternatives." It is noted that if DDT were canceled for all uses, other chemicals would thereby become "replacements." I believe this distinction is significant. When discussing present uses, therefore, I have attempted to use the word "alternative;" while discussing possible future action should DDT be generally banned, I have attempted to use "replacements."

Similarly, this case is involved only with those uses of DDT as to which the Department of Agriculture has issued a statement of essentiality. 11/ As an indication of the extent to which the use of DDT has been curtailed by prior cancellation action, the evidence shows that whereas 79 million pounds of DDT were used in 1959 12/, the domestic sales of DDT in 1970 were 11,966,196, of which over ten million pounds were used on cotton 13/. The sales from January 1 to August 1, 1971, as listed by the only basic DDT producer as of January 1st, are listed as 8,827,900 lbs. 14/.

For a better assessment of the benefits and risks of DDT under present uses, and a reasonable projection into the future, a summary history of DDT, as portrayed by the evidence, is in order.

DDT was first used as an anti-malaria insecticide during the closing years of World War II. It was found to be of immense benefit to Armed Forces personnel, particularly in the Pacific Theater where the anopheles mosquito was the problem.

Thereafter, the use of DDT was extended to control vectors of many other diseases, such as typhus, encephalitis, yellow fever,

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11/ See Admission No. 2, supra, which lists Pome Fruits; Stone Fruits; Citrus Fruits; Papaya; Chestnut; Blueberry; Caneberries; Cranberry; Strawberry; Cotton; Hops; Mint; Peanuts; Sugarbeets; Beans; Broccoli/Cabbage/Cauliflower; Carrots; Lettuce; Peas; Peppers & Pimentos; Potatoes; Fresh Market Corn; Sweet Potatoes; Tomatoes; Weed Crops; Cutworm Control; Forest Insect Control (Seedling dip); Commercial Greenhouse and Nurseries; Turf & Lawns; Fabric Treatment; Public Health Pests; and Agricultural, Health, and Quarantine Treatments in Emergencies.

12/ Exh. CP 19

13/ See Admission No. 7.

14/ See Admission No. 6.

tick fever, bubonic plague, cholera, and dengue fever. Its uncontradicted primary role in the area of public health is still being heralded.

Later, a major use of DDT was for agricultural crops. As the world population has increased, the necessity has arisen for a domestication of food plants. With the organization of crops and animals, came the outbreak of major pest problems. Both man and pests were relieved of the necessity of searching for food. As the escalation of organized agricultural procedures advanced the hosts for pests, the need for insecticides, with their concomitant hazards, escalated. DDT proved to be one of the most successful weapons in the armory of insecticides.

Accordingly, DDT's effectiveness against insect pests caused its use to become so widespread, unrestricted, and indiscriminate that some forests and aquatic areas were inundated with DDT in order to control black flies around aquatic areas, such tree-destroying insects as the spruce budworm, and the gypsy moth.

As time went on, the other-side-of-the coin began to show. Injury to certain species of wildlife was charged to DDT, and the restrictive powers of FIFRA were invoked to stop apparent excesses and unnecessary uses. Surveillance was increased to monitor real and potential hazards to the environment from the use of DDT.

Since 1960 the use of DDT has been drastically curtailed,

Past accomplishments of DDT in the public health area, and its present use for such purposes and on agricultural crops overseas are not a part of the determination in this hearing. Likewise, the former uses of DDT which, as pointed out above, have since been cancelled or restricted are not in issue here. But both furnish helpful background data.

V. BENEFITS

The hearing concerned itself predominantly with witnesses called by Respondent or Int.-EDF et als; all of whom testified generally in opposition to the continued use of DDT. Witnesses were presented by Group-Petitioners and USDA in anticipation or rebuttal of the criticisms of the use of DDT. Benefits resulting from the use of DDT are sometimes too easily presumed and consequently ignored.

There seems to be little question of the far ranging public health and welfare benefits from DDT, historically. For example, a simple recollection that in 1945 some 1.8 billion of the world's population lived in malarial areas; and that by 1969 eradication programs had acquired control or elimination of that disease for 700 million people, and that another 700 million were in the process of the administration of similar programs. DDT was the genuine warrior against the deadly mosquito. 15/

The evidence here showed that few persons seriously advocate the banning of DDT for use against the ravages of disease in the expanding disadvantaged nations. Actually there was substantial testimony to the effect that DDT should be kept available for emergency health purposes here in the United States.

Although less dramatic, the fight DDT makes against insects in the agricultural betterment programs, which are necessitated by expanding world population, has wide-ranging dynamic effects.

15/ Exh. GP-6.

The confidence placed in the ability of DDT is clearly indicated by its widespread use with agricultural crops; despite the necessary restriction from the aquatic and forest areas where wildlife was said to be damaged by the type of use.

VI. RISKS

1. Human Safety

DDT has been the most widely used pesticide for the past twenty-five years. It has also been the most widely studied for possible effects on human health.

When considering its record of safety, it is perhaps ironic that the exposure by humans to DDT is the natural result of its extensive worldwide use for public health purposes.

Dr. Simmons 16/ in a statement entitled "Brief History of the Pesticide DDT In Disease Control," said (Tr. 9:1086):

> Malaria control campaigns have extended over 2 decades, and no toxic effects have been reported among the hundreds of millions of people who live in houses that have been sprayed nor among the 200,000 or more spraymen applying the material.

This viewpoint of human safety was also recognized by Surgeon General Steinfeld who after confirming the foregoing statement, testified further on the point (Tr. 11:1347-48):

> Although DDT has been studied more extensively in man than any other known insecticide, no concrete evidence has been presented that it presently constitutes any health hazard to man, even among industrial production workers whose daily exposure to it for more than two decades has greatly exceeded that of the general public. Its use record, with respect to human safety is unparalleled in the history of insecticides. DDT is not recommended as an out-of-door treatment for antimalaria programs and contamination of waterways, soils and vegetation from spraying the interiors of houses with DDT is minimal. The safety, long-lasting action, and low

16/ Samuel W. Simmons, former Director of Pesticide Community Studies, EPA, Atlanta, Georgia.

> cost of DDT make it the only known insecticide that can be used on the scale required in malaria eradication programs within the resources currently available to such programs or that can be reasonably expected to be available to them in the foreseeable future.

Those that would ban all use of DDT because of the possibility of some damage to man, the evidence of which is said to consist of the results of a few experiments with animals, would do well to compare such skimpy evidence of risk with the well-documented proof of the benefits which DDT has bestowed on mankind.

Granted that the past successes of DDT in the area of public health cannot by itself justify any future use on agricultural crops, it must be noted that the DDT record of safety to man, particularly in comparison to other pesticides which might be used as replacements, is an item to be considered in any balancing of risks versus benefits in the case of DDT.

2. Carcinogenicity

Just as the highest benefit of DDT is in the area of public health, so the greatest concern should be as to any potential risk to human safety. The potential is aided by the evidence of the persistence, mobility, and possible biomagnification of DDT, placing it in the environment where it can be an indirect hazard to man.

The hazard of the carcinogenicity of DDT has been the subject of many scientific studies. In these proceedings the Respondent takes the position that DDT is a carcinogen. Nevertheless, it seems to be generally agreed that the carcinogenic properties, if any, of DDT do not present an "imminent hazard" to man's safety.

With any studies of the carcinogenicity of DDT there is the immediate difficulty of the moral and ethical considerations of experimenting with humans.

Although some studies have been made of possible effects of DDT on employees in a manufacturing plant 17/; on pesticide workers 18/; and on volunteer prison inmates 19/; no such studies can be conducted with humans with the scientific thoroughness that can be applied to experimentation with animals. The man-studies and the observation of the effect on the millions of people, both recipients and applicators, in the malaria programs has furnished no actual instance of the development of cancer in man from the use of DDT.

17/ Exh. GP-32. Men With Intensive Occupational Exposure to DDT, Laws, 1967.
18/ Donald P. Morgan, M.D. Tr. 17:2069.
19/ Exh. Int.-USDA 39A. Effect of Known Repeated Doses, etc., Hayes, 1956. Exh. Int.-USDA 39B. Evidence of Safety, etc., Hayes, 1971.

Therefore, the argument over the potential carcinogenicity of DDT revolves around experiments with animals. The significance of the various experiments with mice and rats, and the propriety of extrapolating the results to man, is the crux of that issue.

Group-Petitioners and USDA argue that extrapolation from mice and rats to man cannot be undertaken so as to produce answers based upon reasonable medical certainty. On the other hand, Respondent urges that while the continued development of adequate testing protocols and facilities is necessarily a priority undertaking, the in-the-meantime extrapolation from small scale laboratory analyses must err on the side of safety 20/. Reference is made to the Delaney anti-cancer amendment, so called, 21/ as a clear demonstration of the intent of the Congress in this question.

Despite the fact that the Delaney amendment has application only to food additives under the Food, Drug and Cosmetic Act, and has been held specifically not to apply to pesticides, the general concern created by chemical compounds with carcinogenic propensities places a heavy burden on an administrative officer to explain the basis for a decision to permit the continued use of a chemical known to produce cancer in experimental animals 22/.

The key to the application of the Delaney Amendment is the word "known", viz, known to produce cancer in experimental animals; and

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20/ EPA. Reasons Underlying the Registration Decisions, etc., March 18, 1971: Exh. GP-19 (Tr. 5:603).
21/ 21 U.S.C. § 348(c)(3)(A).
22/ Environmental Defense Fund v. Ruckelshaus, 439 F.2d 584, 596 (1971).

the key to the value of results of animal experiments is the validity of their extrapolation to man.

The evidence in this proceeding clearly indicates that extrapolation cannot be a reliable tool. Several expert witnesses freely opined that they thought extrapolation was justified; and several others were emphatic as to the impossibility of depending upon that device as a bridge.

The best explanation of why extrapolation should not be attempted came, strangely enough, from a respondent-witness who gave every indication of espousing the extrapolation theory except for this answer to a question by the Hearing Examiner:

> The biological response of animals, such as these commonly used for testing, to a variety of chemical agents and physical agents, that leads to the development of tumors is very comparable as a biological phenomena as a disease process to what we see in man, and, therefore, the qualitative correlation holds true. * * *
>
> I would say there is a fairly common belief and scientifically based point of view in the scientific community of people familiar and expert with cancer research, experiments in this field, that the quantitative extrapolation is essentially impossible at the present state of our knowledge, between the results of those response studies in animals and those in men. [23/]

The necessity of establishing both the qualitative and quantitative bases for extrapolation is clear. No matter how closely, physiologically, the structure and functions of the mouse or rat can be compared to a human, there is no reliable way to arrive at

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23/ Umberto Saffiotti, M.D., Associate Scientific Director for Carcinogenesis, National Cancer Institute, NIH, HEW. (Tr. 34:4277-78.)

a reasonable, medical conclusion as to similarity of impact of DDT, or any other chemical compound, upon a human if the dosage given to the experimental animal can not be the equivalent of the dosage to which the human is exposed.

No facet of any issue before me in this consolidated hearing received more attention from counsel on both sides of the aisle then did this question of cancer experiments on animals; principally mice and rats. The knowledgeable scientists who testified left their mark on this case record; and to make the presentation of the evidence on this point more forceful, the total testimony was subjected to a critique by two medical men whose formidable stature in this field is acknowledged and accepted by the scientific community. These men are Dr. Samuel S. Epstein 24/, who believes DDT is carcinogenic; and Dr. William H. Butler 25/ who believes that carcinogenicity of DDT has not been medically demonstrated.

Dr. Epstein proceeded to review the literature available in this hearing on the question of rodent studies on the carcinogenicity of DDT. He divided the studies into three groups according to his evaluation of their authenticity, genuineness, and reliability as a basis for a sound conclusion.

In the first category were four studies which he believed provided definitive evidence of the carcinogenicity of DDT. These

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24/ Samuel S. Epstein, M.D., Professor, Environmental Health and Human Ecology, Case Western Reserve University, Cleveland, Ohio.
25/ William H. Butler, M.D., Pathologist, Toxicology Unit, Scientific, Medical Research Council Laboratories, Carshalton, Survey, England.

were: The Bionetics (Innes) study; the Fitzhugh (unpublished, 1969) study 26/; the Milan study sanctioned by the World Health Organization (WHO); and the Lyon study, also sanctioned by WHO, performed by Dr. Higginson under the direction of Dr. Tomatis.

In the second category were the ones that were merely suggestive of carcinogenic properties, but which did not contain sufficient information to be completely reliable. This class included: Fitzhugh and Nelson (1947); Kemeny and Tarjan (1969); and Halver (1967).

The third grouping of studies included those which Dr. Epstein declared were inappropriate to negate the carcinogenic properties of DDT because the dosage used was too low; or the route of administration was too low; or too few animals were used; or the length of the experiment was too short; or a combination of those defects. In this category were: two papers by Hayes; the Laws' study (1967); Hogg, et al (1947); Kimber (1964); Cameron and Chang (1951); Dall et al (1963); Agthe et als (1970); Radomski (1965); and Kreon and Pledland. 27/

Dr. Epstein's conclusions are summed up as follows: (Tr. 65:7370)

> * * * DDT has been shown to be carcinogenic in a series of well designed experiments on the basis of standard toxicological carcinogenesis procedure and philosophy. We have no reason to exclude the fact

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26/ The validity of the results of the Fitzhugh paper was questioned (Tr. 79:8915-46; Tr. 81:9248-51) because of an error not disclosed in the item Dr. Epstein was citing. See Exh. R-131.

27/ Bionetics, Innes, Exh. GP-24; Milan study, Exh. R-2; Lyon study, Exh. R-2; Fitzhugh and Nelson, Exh. GP-22; Kemeny and Tarjan, Exh. GP-25, fn. 4, 5; Halver, Exh. GP-25, fn. 3; Hayes, Exh. Int.-USDA 39A and 39B; Laws, Exh. GP-32; other papers not readily identified as exhibits or cites.

> that DDT represents a significant carcinogenic hazard to man, especially, over and above the factors which I mentioned, we are dealing with material which is highly persistent, highly mobile, highly complicated in the environment and stays around a long time.

It appears to me that what Dr. Epstein has said is that, in his opinion, the material he has evaluated supports a conclusion that DDT has not been proven to be not carcinogenic as far as humans are concerned.

Dr. William H. Butler, presented as a rebuttal witness by Group-Petitioners, also critiqued the same cancer studies referred to by Dr. Epstein.

Dr. Butler disagreed specifically on the Bionetics paper. He believes that the protocol of that study would not permit any sound conclusion that DDT is a carcinogen. Concerning the unpublished 1969 Fitzhugh paper 28/, he questioned the unusual results, viz, a predominance of hepatic carcinogens in the females whereas usually a four-to-one ratio in favor of males is the result of such tests. Dr. Butler also disagreed as to the Lyon study. He said he doesn't believe the results support any finding that DDT is a carcinogen. He agreed that the nodules developed in the test animals could be defined as hepatomas, but he doubted any showing that they were neoplastic. He also testified that the Milan study did not support any conclusion that DDT caused cancer in the mice used. 29/

28/ The challenge for error had not been made at that time.
29/ Dr. Butler says he thinks now that mice are not appropriate animals for cancer tests. (Tr. 78:8828-29.)

Dr. Butler's summary:

> From the evidence I have read * * * I would suggest that [DDT] is not a carcinogen for man.

I think what Dr. Butler's testimony shows is a failure in the methodology of such tests to develop facts that can be interpreted with reasonable medical certainty. I have no doubt that both of those men of medical expertise have a consuming concern for human safety. Both demonstrate the need for continued study of the causes of cancer. So, we have Dr. Epstein saying the equivalent of there-is-no-clear-proof-that-DDT-is-not-a-carcinogen-for-man; and Dr. Butler saying the equivalent of there-is-no-basis-for-interpreting-present-knowledge-as-any-proof-that-DDT-is-a-carcinogen-for-man.

The MRAK Commission Report 30/ to which reference was frequently made during this hearing, contains this statement:

> * * * accordingly, with the evidence now in, DDT can be regarded neither as a proven danger as a carcinogen for man nor as an assumedly safe pesticide; suspicion has been aroused and it should be confirmed or dispelled.

In my opinion the evidence presented demonstrates a continuing need to pursue the truth as to the fact of DDT as a carcinogen for humans. Although the evidence at times appeared to deny the carcinogenic properties of DDT for animals and at other times seemed to confirm it, there was no showing of any evidence that man himself was not safe from cancer from the present dosages to which we are exposed. Really, it can't seriously be contended that the fact that

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30/ Report of the Secretary's Commission on Pesticides and Their Relationship to Environmental Health, Parts I and II, Dec. 1969. Judicial notice taken of certain material therein, Tr. 56:6374; Tr. 68:7797.

DDT has NOT been proven NOT to be carcinogenic in man, is a logically basis for advocating a complete ban on all future uses of DDT.

I give a lot of weight to the testimony of the Surgeon General, Dr. Jesse Steinfeld. In the first place, he has no-axe-to-grind, as the saying goes. He has to consider the health of all the people in the United States. And judicial notice can be taken of the prompt and forthright official actions he has taken in this regard. In addition, Dr. Steinfeld is a highly competent doctor of medicine who prior to his appointment did extensive research in the area of cancer. Through his present position Dr. Steinfeld has available to him all the literature, including the MRAK Report, concerning the problem of the possible carcinogenicity of DDT. So, his statement quoted here earlier (Tr. 11:1347-48), and which was subject to cross-examination in the same manner as other testimony, covered as well his conclusions regarding DDT as a carcinogenic hazard for man.

The risk of DDT as a carcinogen was presented fully by the parties, including the present levels of intake and other impacts of DDT to which the human population of this country is presently subjected. The testimony is sufficient in amount and quality to permit appropriate findings and conclusions.

3. Mutagenicity and Teratogenicity

It is well recognized that serious and irreversible harm could result if a seemingly safe chemical should later be discovered to have mutagenic propensities. Likewise, there is difficulty in discovering mutagenic agents. No more compelling reasons are needed to encourage continued and accelerated extensive research to find the truth of the matter.

In this hearing, the evidence shows at the outset a conflict of experts on the question as to whether carcinogenic agents are ipso facto mutagenic; and vice versa. Then there is the agreement that in humans it takes so long, generations in fact, to obtain adequate and satisfactory data. The Respondent here, in support of the position that DDT is a mutagenic hazard, relied basically on the testimony of one witness who had conducted in vitro experiments with kidney tissues of the kangaroo rat; and in vivo studies with hamsters. The scientist-witness 31/ has unquestioned competence; and his work was directly under the authority of the Surgeon General, to whom his results were forwarded. The Surgeon-General testified: (Tr. 11:1360)

> I don't think we have any evidence that [DDT] has caused any genetic changes in man.

There was evidence, also, that experiments with rats and dogs, all exposed to high doses of DDT, showed no reproduction difficulties after three generations of observation. (Tr. 33:4096; 4122.)

31/ Marvin S. Legator, Ph.D., Geneticist. Chief of the Toxicological Branch, Food and Drug Administration.

There is no serious testimony which would support any theory that DDT has been shown to have teratogenic effects.

There is no serious testimony which would support any theory that DDT has been shown to have teratogenic effects.

4. Effect on Aquatic Organisms

Respondent argues that DDT has acute, chronic, sublethal and lethal effects on freshwater insects and other aquatic invertebrates as well as important ecological implications in its introduction to seawater. DDT has been wisely banned from use in or on aquatic areas. 32/ Nevertheless, Respondent claims, by run-off, drift and through volatilization and subsequent rainfall DDT does get into aquatic areas under present usage.

A particular problem with fish is biomagnification, making predator fish susceptible to high concentrations of DDT in its body. Testimony brought forward by Respondent and Int.-EDF et als enumerated some disturbing observations concerning DDT's effect on aquatic organisms. There is evidence that DDT is accumulating in phytoplankton, a source of food for many sea animals and the dominant vegetation in the sea (Tr. 44:5193-96). DDT in fish is often in the order of 20,000 times the level of DDT to which they were exposed (Tr. 27:3187).

Random examples of "global" level of residues of DDT found in fish were: 68 ppm in blubber of a pilot whale off the Faroe Islands (Tr. 28:3293), 1.24 ppm in fat of a dolphin in the Mediterranean (Tr. 28:3293). Average DDT residues in all fish monitored at various monitoring stations generally in the Cotton Belt of the United States in 1969 and 1970 were: Elizabethtown, North Carolina - 0.90 ppm (1969); Summertown, South Carolina - 1.5 ppm (1969); Savannah,

32/ Admission No. 1, supra.

Georgia - 0.57 ppm (1969); Uniontown, Florida - 1.11 ppm (1969); Jim Woodruff Dam, Florida - 0.75 (1969); McIntosh, Alabama - 7.5 ppm (1969), 3.88 ppm (1970); New Orleans, Louisiana - 0.44 ppm (1970); Brownsville, Texas - 2.5 ppm (1969), 5.42 ppm (1970); Pine Bluff, Arkansas - 2.73 ppm (1970). (Exh. R-51; Exh. R-52.) Studies made in the Laguna Madre estuary near heavy application of DDT showed decline from 30 juvenile trout per acre to less than 0.2. Samples showed 1 - 2 ppm of DDT residue in the trout. Moreover, Respondent argues, particularly damaging is the potential damage of DDT in estuaries which are susceptible to deposit through run-off of DDT. Estuaries are important in the maturing of fish. 55% of commercially valuable fish depend on estuaries. In addition Blue Crabs mature in coastal water, but depend on estuaries for early growth. Clams and oysters and many shrimp spend their entire life cycle in estuaries (Tr. 31:3701). In laboratory experiments, shrimp were killed at 0.1 ppb's in the water (Tr. 31:3713).

An example of the unbalancing of the estuary ecosystem is the tendency for DDT to cause increased reproduction of snails in experiments. Other experiments showed 50% of fish used in an experiment were killed in 96 hours with water containing 10 ppb's of DDT (Tr. 45:5343); .6 ppb's for shrimp; 6 ppb's for hermit crabs (Tr. 45:5348). A sophisticated experiment with salmon, showed that 50% less fish treated with DDT than controls return to spawn, thus indicating that DDT affected the "learning" process of the

salmon (Tr. 46:5542-47). On the other hand, an experiment with trout indicated the learning process or reaction to escaping predators was not affected by DDT. Laboratory experiments indicated that DDT can cause fish to seek higher temperature, where they often die; this was explained as a "temperature selection process." (Tr. 46:5526-5531.)

Testimony was given that DDT residues in fish in cotton areas in the South, were directly related to run-off from fields (Tr. 27:3182). In ditches where DDT was trapped, mosquito fish would die or lose equilibrium after heavy rainfalls. Two lakes in Mississippi near cotton areas where DDT was sprayed, had been closed to all fishing, because residues in the fish were above the 5 ppm's level permitted.

On the other hand, Group-Petitioners' arguments which were introduced primarily through cross-examination of the witnesses presented by Respondent, were that the amount of DDT in the water does not constitute a hazard to fishes. Residue levels in the Rio Grande and Anazaldus Rivers averaged .01 - .02 ppb's (Tr. 34:4327), an amount insufficient to cause damage. Moreover, experiments in the laboratory cannot be extrapolated to nature, since the disadvantages of DDT are not as consistent as in the laboratory, and the complexities of nature cannot be adequately represented. Furthermore, DDT is not alone in detrimental effects on aquatic life. Other additions to the environment that affect marine fishes are heavy metals (zinc, cadmium) synthetic detergents, compounds with high biological

oxygen demands, heated effluents from steam-electric stations, effluents from pulp and paper mill waste, spills as a result of crude oil and their attempt to clean up mixtures with chemical oil dispersants.

Group-Petitioners argue further that the theory of biomagnification has not been sufficiently analyzed. Additionally, even if some hazard exists from the magnification in the residues of fish as one progresses up the fish food chain line, the number of fishes remaining in the environment is the important factor rather than the sublethal effects or even lethal effects to fishes. Cross-examination 33/ of Respondent's witness revealed that only 2% of fish kills were caused by all pesticides combined. Fish harvests have been generally higher each year. Moreover, what problems may exist with respect to DDT's effect on aquatic life is due to abuse rather than use of DDT, as well as past accumulations from uses not presently at issue.

Group-Petitioners agree that DDT can have a lethal effect in high dosages on certain species of fish. However, in attacking the testimony concerning fish kills in cotton areas, Group-Petitioners pointed out that drainage ditches from cotton fields are specifically and purposely established to retain pesticides - to act as pesticide sumps - so that they will degrade within the ditches, and to permit only a minimum be carried to other waterways.

33/ Tr. 2743214. David L. Stalling, Ph.D., Research chemist, Chief Chemist, Fish-Pesticide Research Laboratory, Bureau of Sport Fisheries and Wildlife, Department of the Interior.

The theory of biomagnification would seem to be adequately demonstrated in the case of fish, giving rise to concern over use of pesticides with a persistence such as DDT. And it seems hardly enough to say that the amounts of DDT residue will remain in fish for a substantial period of time even if DDT were entirely banned. The marine system, although it covers a huge area and diffuses the amount of DDT to a very low extent, is somewhat a closed system. Although even non-degradable residues on soil would seem to harm little else than perhaps insects and earthworms traveling in that vicinity, DDT in the water is constantly filtered through and to an extent retained by aquatic organisms such as fish.

Although it is not part of this hearing, I am constrained to note that encouragement should be given to a development of more sophisticated methods to further prevent DDT residues from entering water systems, whether they be municiple sewers, drainage ditches leading to streams, or direct run-off from application of DDT in the fields to lakes and the ocean.

While it is necessary to maintain a vigilant concern over the possibility of serious damage to our important aquatic life, it is questionable whether the evidence presented in this case supports a finding that, at present and foreseeable future levels, the use of DDT would cause damage to aquatic life sufficient to justify complete cancelation.

5. Effect on Birds in the Wild

A considerable amount of testimony concerned itself with what effect DDT may have on birds. Respondent sought to show that the build-up of DDT in the food chain resulted in large amounts being stored in birds, causing a consequent thinning of the shells of eggs and reproductive failures. The argument is that experiments in the laboratory which showed such effects could properly be extrapolated to birds in the wild. It was alleged that the viability of certain bird species populations is endangered, either through poisoning or through the effect of reproductive failure.

An enumeration of some examples offered will be helpful.

Cowbirds maintained on laboratory experimental low-diets of DDT or exposed to higher dosages for short periods of time, were found either to eliminate the DDT or to store it in tissues where, apparently, it causes no poisonous effects. However, when fat reserves are utilized, the DDT may be released to the brain with lethal effect.

An experiment with Black Ducks being fed on 10 ppm DDE (dry weight) in the feed showed 24% shell-thinning.

There was a lot of testimony in regard to eggshells in-the-wild. Perhaps the best summary of such data from the point of view of the extremely adverse effect of DDT was posed by Dr. Joseph J. Hickey et al, 34/ in the article "Eggshell Changes in Certain North American Birds." (Exh. R-84, Hickey et al, 1970.)

34/ Ph.D. Professor, Wildlife Ecology, College of Agriculture, University of Wisconsin.

Analysis of eggshell thickness-index changes on a decade basis, carried out with 2,088 eggs representing that many individual females of 11 species and 14 geographical areas, disclosed an apparent decrease in Golden Eagles in the 1890s in western North America; this represented 1 significant decade-change (a decrease) out of 91 decades compared. Comparisons in the other 13 analyses disclosed no significant changes. When this comparison was enlarged to include a total of 2,804 eggs through 1969, significant decade differences were apparent in 12 of the 14 cases, 9 of these at the 0.005 level of probability. In this arbitrarily selected group of species, we conclude that eggshell changes were rare before 1939 and common sometime thereafter.

Expansion of this sample to 20,654 eggshells taken prior to 1946 and to 3,004 taken since then reveals that 9 out of 25 species have sustained shell-thickness and shell-weight decreases of 20 or more percent, at least for brief periods: The Peregrine Falcon in at least three regions, the Marsh Hawk and Brown Pelican in two regions and the Prairie Falcon, Cooper's Hawk, Double-crested Cormorant, Black-crowned Night Heron, Bald Eagle and Osprey in at least one region each. In eight of these, regional declines are known; and in some cases, these declines continue.

These eggshell changes appear to be absent in Whooping Cranes, Broad-winged Hawks and Rough-legged Hawks. They have reached 15-19% in Ontario Common Loons, 14-16% in some White Pelicans, 7-9% in some Great Blue Herons, 8-12% in California Goshawks, 9-13% in some Sharp-shinned Hawks and 10% in Great Lakes Herring Gulls. Changes generally under 10% (with some local exceptions) were observed in Red-tailed Hawks, Red-shouldered Hawks, Golden Eagles, Gyrfalcons, American Sparrow Hawks, Great Horned Owls and Common Crows. The species we reviewed are not regarded as a representative cross-section of North American birdlife, and the population significances of the data are restricted by small samples and time spans, often representing only a few years in a given region.

The shell-change data seem to characterize regional differences in chemical fallout, contamin-

> tion that varies with diet and phylogenetic differences in sensitivity to pollutants. DDE is the pollutant most often associated with these physiological changes and population decreases. The importance of additional chlorinated hydrocarbons, including PCBs, as well as mercury remains to be worked out. The threat to North American species is geographically widespread and not limited to the site of pesticide application. It probably involves a small fraction of the continent's species and often only some geographic fraction of a species population; but it seems to be mounting, and its occurrence in the tropical parts of North and South America remains to be worked out.

On the other hand, the counter-argument appears to be that the phenomenon of eggshell thinning is simply an example of correlation rather than of cause and effect; and that simply because some eggshells have been found to be thinner than those collected prior to the advent of DDT, does not prove that, on the average, eggshells are not thinner than they were before. As an example, reference is made to the use of museum eggs for comparison purposes. The argument is that museum eggs were of the highest caliber and not a random selection; so, therefore, a comparison of experimental eggs with museum eggs does not represent a true appraisal.

Dr. Kenneth L. Davison, 35/ a witness presented by Int.-USDA reviewed certain studies that had been conducted on the question of eggshell thickness; and compared the results with those of certain of his own experiments (Tr. 22:2700-2767). He concluded that mean thickness or the weight of eggshells is not significantly affected by DDT, nor is that percentage of calcium in the eggshells affected.

35/ Ph.D., Research Physiologist, Animal Science Research Division, Metabolism and Radiation Research Laboratory, Fargo, North Dakota.

He said that it would be very difficult to obtain in the wild a result of what effect DDT has on eggshell thinning in the wild.

The evidence was clearly conflicting as to whether or not extrapolation could be had in this matter.

It appears that the ultimate injury to be condemned is the adverse effect on the reproductive ability of each species of birds. There was quite a bit of testimony as to whether or not the bird populations presently are thriving or not thriving; and the validity of such bird counts as the Hawk Mountain Survey and the National Audubon Christmas Count received considerable attention. The position taken by Group Petitioners and USDA posed the question as to whether or not these tests as to eggshell thinning were valid insofar as the protocol and methodology were concerned. Likewise an attack was made on the conclusions because of inability to interpret the results.

There was no evidence that DDT was the only factor in a decline of bird populations and examples given included pollutants, other pesticides than DDT, the advances of urbanization which brought human population changes and noise factors, and also disruption of the normal bird life by unnecessary intrusion.

In this particular facet of my discussion of the effect of DDT on wildlife it seemed natural to raise the question as to what would happen if a certain species become eliminated. I am of the impression that in answer to my question in that regard Dr. Hickey stated that insofar as the Peregrine Falcon is concerned, man could get

along without it even though it would be a sentimental and esthetic loss that would be very great; but as a predator it would be replaced more or less through a readjustment by nature itself. In other words, I think he was telling me that some other predator would simply take over the work that was being done by the Peregrine Falcon.

I don't find any evidence that focused its direct thrust on damage to birds by the uses of DDT that are permitted under the registrations in question. It can be seen that some of the former uses could have placed the DDT in areas where birds would have access to it. For example, the extensive use of DDT for spraying against the Spruce budworm and also for spraying against the spread of gypsy moth and likewise the direct spraying of some waterways.

The evidence adequately shows that there should be a continued and extended experimentation and observation of the effect of DDT, as well as any other pesticide, on the bird populations in the wildlife; in the event that such studies might reveal more serious damage to the birds in the wild than has heretofore been shown.

6. Effect on Other Animals

The usual experiments concerning the toxicity of DDT have been with rodents, testing for carcinogenicity. Of course, DDT purposefully is used to kill rats and bats by attacking the nervous systems of those targets.

One of the significant studies involving DDT and animals was conducted by Dr. Alice Ottoboni 36/ with the use of beagle dogs. as to the results, Dr. Ottoboni testified (Tr. 33:4122):

> We have examined every dog in the study that has finished its role in the project. As I mentioned earlier, we have autopsied approximately 500 dogs. There have been no tumors related to dose of DDT. I have seen no liver tumors.

The scientist also noted that DDT has caused no detrimental reproductive effect in beagles; although menopause was delayed, thereby sometimes permitting an additional litter of pups.

As far as the effect on domestic animals is concerned, the record reflecting the action taken because of the use of DDT on and around livestock was noted with approval. When, during the early 1950's, those responsible for the monitoring of pesticide residues noticed that an increase of DDT in cow's milk had reached a level higher than acceptable, appropriate investigations were instituted, and the results of the experiments showed that DDT was absorbed easily through the skin of cows; and that alfalfa containing high residues of DDT led to the transfer of DDT to the milk. Prompt action in cancelling the use of DDT on livestock and limiting DDT

36/ Ph.D., Biochemist, California Department of Public Health, Berkeley, California.

residues on feed, plus the necessary cooperation of those concerned with the program, virtually eliminated that problem. The evidence indicated that it has not reoccurred significantly.

Other experiments show that cows were affected by dizziness and disequilibrium when fed massive doses of DDT. However, there are no reports of significant damage to livestock or domestic animals from DDT through the uses at issue in this hearing.

The evidence indicates that continued experimentation should be conducted on animals to determine whether hitherto undetected damage may be taking place in domestic animals at reasonably expected exposure levels from present and future use.

7. Transport, Persistence and Biomagnification

In enumerating the reasons for partial and complete banning of the uses of DDT, Respondent and Int.-EDF et als frequently alluded to the persistence, transport, and bioconcentration (or biomagnification) as well as the toxicity of DDT. Basically, their argument runs like this: the nature of DDT is such that it is an inherently uncontrollable chemical that cannot be confined to its site of application; so, as a result, DDT and its metabolites are available to, and concentrated in, non-target organisms including fish and wildfowl.

There was testimony that DDT has been discovered in the Adelie penguin in the Antarctic 37/, in a pilot whale off Faroe Islands 38/, and in dust particles over the Island of Barbados 39/, even though no DDT has been known to be applied at or near any of those areas.

Vehicles of the natural mobility of DDT from the site of application are: drift from the point of application; volatilization (or evaporation) from soil and plants after application; and run-off from the fields. DDT is also transported by "abusive" methods such as waste from formulating plants and the disposal of containers or the cleaning of spraying equipment in streams and lakes. The transport of DDT is very difficult clearly to analyze and understand. Although traces of DDT have been discovered in far-ranging areas, the problem remains as to how, exactly, they arrived there. The

37/ Exh. Int.-EDF-18; Risebrough, et al, 1972.
38/ Dr. Peterle, Tr. 28,293.
39/ Exh. Int.-EDF-16; Risebrough, et als, 1968.

answers are not only necessarily incomplete, but they are not well documented.

The problem of avoiding drift is nothing more than the age-old struggle to get a chemical to end up where it should. Wind velocity and temperature inversion, as well as techniques of application 40/, are primary factors in attempting to prevent excessive drift.

Huge strides have been made in refining the techniques for the application of pesticides, particularly by aerial application, since the days of the late 1940's when crop-dusters, perhaps romantically, sprayed DDT over the proposed target area and sometimes half of the immediate environment surrounding it. Inventions such as the cutoff nozzle, and reduced caliber of the nozzle openings have raised substantially the percentage of accuracy in the application of pesticides.

In the words of Norman B. Akesson 41/:

> * * * there is no doubt that we were causing a great deal of difficulty in the 1950's, but this has certainly been very considerably controlled and that in the present instances we have means and methods by which we are keeping this application on the site to a very significant degree; that we have in the offing equipment and methods, application techniques which will keep this very nearly 100 percent on the field we want to treat * * *

This was confirmed by Farrell Higbee 42/ who stated:

> Cutoff of the machines after they had left the field was an early problem. However, with the

40/ In an attempt to reduce the problem of drift, many states have enacted laws regulating application of pesticides. See Exh. GP-40, EPA, Digest of State Pesticide Use and Application Laws.
41/ Professor of Agricultural Engineering, University of California at Davis.
42/ Executive Director, National Agricultural Aviation, Washington, D.C. and Loveland, Colorado.

development of sprays and nozzles and orifices that made the sprays more concentrated, the problem of drift has been minimized through the years.

He believed that, at the present time, aerial application has reached a range of 93% accuracy.

Nevertheless, there is testimony that a not-insignificant amount of DDT does end up not precisely on the intended area.

A second phenomenon, less controllable and perhaps less measurable, is that of the volatilization of DDT.

A prime factor effecting the rate of volatilization is that of temperature. Exactly how much of the DDT that is sprayed on a field and lies on top of plants and the soil, and later is volatilized is not exactly known, although estimates have been made of 5 - 10% during the first 24 - 48 hours after application, much less thereafter 43/ (Tr. 6:741). Whether this DDT is then lost in the ionesphere or comes down in the Antarctic or Barbados, or wherever, is a speculation of too exotic proportions to produce any meaningful conclusions based on the tenuous testimony presented at this hearing.

The soil performance of DDT was discussed by Dr. Philip C. Kearney 44/ who said (Tr. 30:3522 - 23):

> It is very difficult to come up with a precise time for DDT to disappear from soils. A large number of factors influence DDT disappearance. Degradation

43/ Virgil H. Freed, Ph.D., Professor of Chemistry, Head of the Department of Agricultural Chemistry, and Director of the Environmental Health Science Institute at Oregon State University.
44/ Ph.D., Leader, Pesticide Investigations Group--dealing with behavior of pesticides in soils, ARS, USDA, Beltsville, Maryland.

> is just one mechanism by which DDT disappears in soils. Volatilization, lateral movement, chemical reaction, photodecomposition, are all involved in the disappearance of DDT from soils, and they have to be taken into account.
>
> * * * I think a time encompassing as little as six months to a period greater than 10 years would be a reasonable range to give for the persistence of DDT in the soils.

Apparently, a number of factors affect the soil persistence, e.g. rate of application; depth of incorporation in the soil; soil type; soil temperature; cultivation; type of formulation; soil acidity; plant cover; microbes; topography; wind movements; inter-reactions with other pesticides and soil chemicals; and recycling by organisms.

A third method of transport is run-off. Because of the persistence of DDT, it has been argued that DDT is more available than most other pesticides to be carried away by water run-off into adjoining ditches and eventually to rivers, estuaries, and even into the ocean, where it can affect the various ecosystems. There was testimony to the effect that in some cotton areas sluiceways are purposely dug to cause DDT run-off into ditches, thus endangering all aquatic areas and permitting the survival of only such marine organisms and animals that can withstand the exceptional degree of the pesticide.

There was testimony 45/ that two lakes in Mississippi were closed because of the high concentration of DDT, said to be due partly to run-off from cotton spraying. However, the deposition evidence tends

45/ See deposition of Billy Joe Cross, Tr. 67-7587 and Exh. R-127.

to support an argument that the lakes in question, not having any flushing ability, were in themselves a pesticide sump. In my opinion, this deposition evidence is the only forceful demonstration of any alleged direct injury due to any uses of DDT permitted under the registrations involved here.

I would like to discuss for a moment the testimony regarding DDT residues in the soil.

Dr. Kearney, supra, testified that residues usually found in soils that have been treated with DDT are: From crop lands, o-p' DDT, 0.03 ppm; p-p' DDT, 0.16 ppm; o-p DDD, 0.01 ppm; p-p' DDD, 0.05 ppm; o-p DDE, at less than 0.01 ppm; and p-p' DDE, 0.06 ppm. He says that the concentrations that are found in run-off are extremely low, viz, less than 1 ppb. The National Soils Monitoring Program, 1969, shows the only states with residues of DDT in the soil greater than 1 ppm are: Michigan - 2.09 ppm; Mississippi - 2.06 ppm; California - 1.43 ppm; and Alabama - 1.13 ppm. In non-crop lands, such as cities, only Bakersfield, California showed a residue less than in a crop land. E.g., Camden, New Jersey - 1.36 ppm; Miami - 5.93 ppm; Milwaukee - 1.07 ppm. The witness said that there was no established cause for this. The witness concluded that there is a DDT level of equilibrium in soils that, when reached, will not continue to build up from that rate of application. (Dr. Kearney said that the finding of residues on non-crop land confounded him, giving as an example Maryland at 0.09 ppm on non-crop land and 0.01 ppm on crop land.)

Concerning residues in fresh water, Dr. H. Page Nicholson 46/ testified that in 1966, the results of a six and one-half-year residue study of an Alabama river system, draining 400 square miles of cotton-producing area, indicated maximum concentrations of DDT at 30 parts per trillion and DDE at 90 parts per trillion.

Testimony revealed a wide range of amounts of DDT found in coastal and estuarine ocean water; and, since the amounts were so minute, a problem of accuracy arose. A finding of 1 - 3 parts per trillion would seem to be typical (Tr. 68:7794 - 96) (See, also, Exh. R-26, and Exh. R-28).

Residues on food have been categorized in the "Market Basket Survey" by the Federal Drug Administration. This survey indicates that the daily dietary intake of DDT (and metabolites) in milligrams per kilogram body weight for the years 1965 through 1970 is as follows:

1965 - 0.0009	1968 - 0.0007
1966 - 0.0010	1969 - 0.0005
1967 - 0.0008	1970 - 0.0004

The FAO and WHO acceptable daily intake has been set at 0.005. 47/ It would appear, therefore, that the daily intake of DDT by the average person in the United States has been declining since 1966 and is presently well within an acceptable rate.

46/ Ph.D., Chief, Agriculture and Industrial Water Pollution Control Research Program, EPA, Southeast Water Laboratory, Athens, Georgia.

47/ See Admission No. 3, supra.

The level of DDT in adipose of the general population from 1967 through 1970 are as follows: 1967 - 6.22 ppm; 1968 - 7.60 ppm; 1969 - 6.26 ppm; and 1970 - 5.81 ppm. 48/

The problem of measuring residues of DDT, particularly in animals and in water, has been made much more difficult because of the problem of accurate chemical measurement. In addition, there has been widespread confusion, particularly prior to 1967, with the residues of the chemical polychlorinated biphenyls, commonly referred to as PCB's.

Earlier in our discussion I mentioned briefly the phenomenon of biological accumulation (also referred to in the literature as bioconcentration; biological concentration; and biomagnification). The evidence indicates that there is no clear and concise understanding of this phenomenon and likewise the evidence does not clearly satisfy the curiosity as to whether such a food-chain build-up actually has adverse effects (except in the situation where the concentration exceeds any promulgated tolerance levels).

In searching the statements of those who espouse more forcefully the theory of biomagnification, perhaps the most acceptable summary appears in the testimony of Dr. Nicholson 49/, who during cross-examination (Tr. 28:3268-69) reiterated an earlier published statement of his which read as follows:

> The implications for damage are great, but well defined examples are few, perhaps because biological accumulation is not as generally damaging as feared; but also perhaps because the ecological relationships involved are so extremely complex that they are difficult to unravel.

48/ Exh. CP-34, EPA, Human Monitoring Survey, Yobs, M.D. June 1971.

Perhaps the more reasonable way to conclude the discussion of biomagnification is to remember that the persistence which makes DDT a desirable compound for the elimination of pests is at the same time the persistence that holds a potential threat to species of wildlife; and should be used as a reminder that adequate vigilance must be maintained to prevent any threat from becoming a reality in our environment.

VII. USES

As mentioned earlier, this case is concerned only with those uses of DDT as to which the Department of Agriculture has issued a statement of essentiality and which statement appears here as Admission No. 2. The primary use is on cotton. The evidence indicates that it has been estimated that over one-half of the DDT, used in the United States, is used on cotton.

Although there is no concession on the record, I believe that, other than from Int.-EDF et als. 49/, there is little objection to limited uses of DDT, viz, for spraying the underside of vehicles to prevent the spread of gypsy moth infestations; for disinfecting airplanes and personnel carriers, for standby to be used in emergency health situations as determined by appropriate federal and state government officials; and for prescription uses. I say that because I think the evidence shows that the risk to the environment is minimal.

Rather than set out at this point a list of the essential uses, with a short discussion of each, I think it will suffice to concentrate on two specific uses, namely the use on cotton; and the use on sweet peppers. What I say as to those two uses adequately demonstrates my thinking on the other uses involved here as well.

49/ From the outset, Int.-EDF et als has maintained an incredibly implacable position that all uses of DDT should be banned, e.g., Tr. 80:9151.

1. Cotton

It has been estimated that two-thirds of the DDT that is used in the United States is used on agriculture, and that 75% of the DDT that is used on agricultural crops is used on cotton. Currently less than 38% of the cotton acreage in the United States is treated with DDT (Tr. 52:6171-72). Group-Petitioners presented testimony that indicated that DDT is essential for use on cotton.

On the other hand, Respondent takes the position that this widespread use of DDT is the extreme example of forcing hazard upon the environment; citing such things as damage to wildlife, fish and birds, and to beneficial insects such as bees, and predators of pest-targets. There was testimony that in many instances the primary pests of cotton, that is the boll weevil and the bollworm, have become resistant to DDT; and that, in addition, it is not an indication of effective and economical management to continue the use of DDT. The argument is that alternative chemical pesticides are more effective, being so partly because they permit a more immediate resurgence of beneficial insects after the pesticide spraying, whereas the use of DDT creates a resurgence of secondary pests because of its persistence against the beneficial insect predators.

The Respondent urges a more widespread use of alternative means which would be less damaging to the environment and at the same time, from present appearances, would be more effective than DDT.

The evidence as to the suggested alternatives to DDT for the control of cotton pests included the sterile male release method; the development of cultivation of crop varieties, such as Frego Bract, which purport to offer greater resistence to insects; pest attractants, which could be both chemical and physical; cultural and sanitation methods, such as stock-stripping; the use of natural predators and parasites for maximum control; the use of microbial agents or pathogens; and the, so-called, diapause program, which uses a combination of stock destruction together with a limited use of a pesticide. A very interesting pictorial display of the approach methods on the question of cotton pests is found in Exh. GP-41 which are the 80 individual prints of slides shown during the testimony of David F. Young, Jr. (See Tr. 1:98-152 and 2:158-208.) These methods were the subject of a considerable amount of testimony. However, it was the opinion of one expert in pest control 50/, who was a pioneeer in the area of developing alternative methods to insecticidal control of pests that:

> In spite of the diligent effort of entomologists and associated scientists to develop ways to control insects without using chemicals, the instances of success are very few. (Exh. Int.-USDA 2.)

Dr. Knipling was of the opinion that cancellation of all DDT uses would result in potentially more adverse materials being used as a pesticide. He said:

50/ E. F. Knipling, Ph.D., Science Advisor to the Administrator of the Agricultural Research Service, USDA.

[illegible] information and experience, [illegible] not enough of the right kind of [illegible] agents in our natural environment to provide effective control for the boll weevil or the pink bollworm or the cotton flea hopper and certain other insects that affect cotton, for example. * * * Now, this leaves for the present, then, the only way to produce cotton productively * * * involves the use of chemicals * * *. (Tr. 3:402-03.)

Of course, I have been weighing these things for years, but in my honest opinion, as things now stand, and my concern may be a little bit different than others, I would rather see DDT and Toxaphene be continually available to the cotton growers for the time being, waiting to see how our experiments are coming out rather than to deny them these materials at the present time. One reason, they are effective against the boll weevil, and at the same time they alleviate the bollworm problem. I am actually more concerned that if these are not used, that the alternatives that will be used are going to do more to upset the beneficial destructive insect complexes in the cotton fields in the South than to continue to use DDT and Toxaphene.

* * * I am concerned about the potential hazard of DDT in the environment and what it may do to fish and wildlife. This is obviously important, I think, to all of us. * * * But for the uses for cotton, for the other uses in which the alternative may be more damaging, at least to the immediate environment, are more hazardous to people, I can't hardly . . . I can't justify in my mind that we should switch. (Tr. 3:419-421.)

There is an argument put forth that it is less expensive to apply a replacement for DDT. However, as I see it, the evidence was conflicting and there appeared to be some merit to the argument that DDT might be more economical to apply in view of the fact of its

persistence the number of applications required can be reduced (Tr. 3:343). There was also evidence that the yield of cotton was increased. The organophosphates appear to be the principal replacement for DDT. It is said that low initial application rates may well provide effective control. There appears to be no question but what the person applying the organophosphates could be subject to a greater hazard. This seems to be borne out by the label requirements as we have seen earlier. Also, the use of organophosphates appears to increase the likelihood of immediate harm to non-target animals and separate species located in the treated area. There was quite a bit of testimony in regard to the effect of pesticides on the very important beneficial invertebrate bees. There seemed to be a concensus that although bees are adversely affected if they are subject to DDT, the adverse effect is greater, in some instances, if they are subjected to a treatment of organophosphates.

Resistance to DDT by both the boll weevil and the bollworm was the subject of some of the testimony. Actually, I do not find it necessary for the purposes of this case to determine the degree of resistance, if any, in any particular geographical area. I think that what must be decided here is whether or not DDT is still effective as a pesticide against the primary pests on cotton. According to the evidence I heard, DDT is still so effective.

There was testimony also that an improvement in the management practices of cotton-growing would eliminate some of the need for the

use of DDT. I do not think that argument carries much weight. While the evidence convinces me that the use of DDT on cotton is declining and should be reduced as soon as effective replacement means of controlling pests are developed, I do not feel that the evidence to date permits any conclusion to the effect that DDT should be banned for use on cotton at this time.

2. Sweet Peppers

Although the use of DDT on sweet peppers in the Delmarva Peninsula is of a lesser significance in the overall consideration of the benefit-risk equation in this hearing, it appears to be economically illustrative of the benefit-risk problem as it applies to a specific use of DDT. I use this example even though it is not a specific issue since it is a matter concerning an intervenor who is not a Registrant.

Testimony revealed that only about 3% of the nation's sweet peppers are produced for canning in the Delmarva Peninsula. Admittedly, peppers are a secondary rather than a staple food product and appear to be a food that appeals only to certain segments of our society. However, the farming of sweet peppers is an important item in the Delmarva Peninsula. It is the sole livelihood of many workers. That area is low and flat and it is punctuated with estuaries and smaller peninsulas, all of which seem to be ideally susceptible to the concentration of DDT in the aquatic and marsh habitats; and, thereoy, seem to be potentially injurious to the commercially important oyster, crab, and fish industries.

That DDT was the only efficient pesticide for use against the European corn borer, a pest with a great affinity for sweet peppers, was uncontradicted. The evidence indicated that where, as in the Commonwealth of Virginia, the pesticide carbary. (Sevin) has been recommended, its use resulted in a disastrous sweet pepper harvest.

Witnesses indicated that not only does the European corn borer attack with a rapid infestation, but also sweet peppers to be successfully marketed must display an extremely high degree of non-infestation. Apparently, the use of DDT provides the necessary marketability.

From a benefit-risk point of view, I think that the situation of sweet peppers in the Delmarva Peninsula provides a situation where adverse effects of the use of DDT could be traced quite easily. Whereas the extent of cotton production suggests, territorially, a tremendously large area from which to make detailed tracings of the adverse effects that follow the use of DDT, the relatively small area of sweet pepper cultivation in Delmarva, being near marshes and waterways, provides a more reasonable proving ground. In other words, if the run-off from those agricultural lands contaminated the waterways, it would appear that it might be subject to practical proof. There was no evidence that such adverse results would flow from the use of DDT on sweet peppers.

C. FINDINGS OF FACT

Based upon the evidence in this case, I make the following Findings of Fact:

1. The Petitioners are registrants under FIFRA.

2. The registrations involved here were properly issued under FIFRA.

3. Notices of cancellations by PR Notices 71-1; 71-3; and 71-5 were authentically issued on the dates stated thereon, and applied to the registrations involved herein.

4. The Petitioners filed objections to the pertinent notices of cancellation and requested a public hearing within 30 days following receipt thereof.

5. The parties were represented by legal counsel of their choice during the proceedings herein.

6. The parties had all reasonable opportunity to offer and to present all evidence, oral and written, which would be relevant and material to the issues involved here.

7. The subject matter of this proceeding is DDT, an economic poison under FIFRA.

8. Technical DDT [1, 1, 1 - trichloro - 2, 2 - bis (p-chlorophenyl) ethane] is composed of approximately 75% p, p' - DDT isomer and 20% o, p' - DDT isomer and 5% other isomers and other compounds. The active insecticidal ingredient in DDT formulations is the p, p' - DDT isomer; and whose melting point is 108.5° C. The molecular weight of DDT is

354.5 grams; the vapor pressure is 1.0×10^{-7} mm. mercury at 20° C; and its water solubility is approximately 1.2 parts per billion.

9. Under the registrations involved herein DDT is used as an insecticide in combination with other chemical compounds such as toxaphene, methyl parathion, parathion, endrin, guthion, etc.

10. DDT has the property of persistence.

11. The factors affecting persistence of DDT are: (a) chemical structure; (b) formulation; (c) concentration; and (d) soil considerations, viz. (i) type, (ii) organic matter, (iii) rainfall, (iv) temperature, (v) microbial population, (vi) mineral content, (vii) acidity.

12. DDT can be transported from the target area by physical drift, soilbonded run-off with water, and volatilization.

13. DDT is soluble in fat or lipid tissue.

14. DDT is extremely low in acute toxicity to man.

15. DDT is not a safety hazard to man when used as directed.

16. The daily dietary intake of DDT in milligrams per kilogram body weight as computed in the "Market Basket" survey showed a decline from previous years to 0.0004 in 1970.

17. Carcinogenicity studies have been conducted with mice, rats, and some other animals.

18. Some tests of the effect of DDT on humans were conducted with pesticide workers, volunteer-prisoners, and employees in a DDT manufacturing plant.

19. Studies of the effects of DDT on mammalian reproduction were conducted with beagle dogs and rats.

20. DDT can have a deleterious effect on freshwater fish and estuarine organisms when directly applied to the water.

21. DDT is used as a rodenticide.

22. DDT can have an adverse effect on beneficial animals.

23. DDT is concentrated in organisms and can be transferred through food chains.

24. DDT is essential for the uses described in Admission No. 2.

25. The use of DDT in the United States dropped from a peak of 79 million pounds in 1959 to just under 12 million pounds in 1970.

26. The labels involved herein were approved by the appropriate authority under FIFRA.

27. The language on the labels involved herein is in substantial compliance with Interpretation No. 18.

D. CONCLUSIONS OF LAW

Based upon the evidence and the Findings of Fact in this case, I make the following Conclusions of Law:

1. Under the Act, its implementations, the governing rules of practice, and other laws applicable, this Hearing Examiner has jurisdiction over the subject matter and the parties to this proceeding.

2. The intervenors were accorded and exercised all rights commensurate with the full requirements of their participation herein.

3. The registrations involved here were properly issued under the Act.

4. Notices of Cancellation identified as PR Notices 71-1, 71-3 and 71-5, were properly issued under the Act on the dates stated thereon; and they applied to the registrations herein.

5. The Petitioners seasonably filed objections to the pertinent notices of cancellation and requested a public hearing.

6. The quantum of proof herein is the preponderance of the evidence.

7. The labels involved herein are in substantial compliance with the Act.

8. DDT as offered under the registrations involved herein is not misbranded as defined in sections 2.z.(2)(c), 2.z.(2)(d), and 2.z(2)(g) of the Act.

9. DDT is not a carcinogenic hazard to man.

10. DDT is not a mutagenic or teratogenic hazard to man.

11. The uses of DDT under the registrations involved here do not have a deleterious effect on freshwater fish, estuarine organisms, wild birds, or other wildlife.

12. The adverse effect on beneficial animals from the use of DDT under the registrations involved here is not unreasonable on balance with its benefit.

13. The use of DDT in the United States has declined rapidly since 1959.

14. DDT as offered under the registrations involved herein is not misbranded as defined in sections 2.z.(2)(c), 2.z.(2)(d), and 2.z(2)(g) of the Act because it does not create a risk that is unreasonable on balance with the benefit.

15. The continued registration of the products involved herein is not contrary to the provisions of Sections 2.z.(2)(c), 2.z.(2)(d), and 2.z.(2)(g) of the Act (7 U.S.C. 135(z)(2)(c), 135(z)(2)(d), 135(z)(2)(g)).

16. The Petitioners have met fully their burden of proof.

17. There is a present need for the continued use of DDT for the essential uses defined in this case.

18. P.R. Notices 71-1, 71-3, and 71-5 should be vacated, except where otherwise treated by specific order.

19. The pertinent registrations, corrected to indicate only the essential uses defined in Admission No. 2, herein, should be restored to the same force and effect each carried just prior to the issuance of P.R. Notices 71-1, 71-3, and 71-5.

E. OPINION

It is my opinion, and I so rule, that PR Notices 71-1, 71-3, and 71-5, involved herein, should be vacated, except where otherwise treated by specific order; and that the pertinent registrations, corrected to indicate only the essential uses defined in this action, should be restored to the same force and effect each carried just prior to said notices.

Petitioner USDA and Group-Petitioners have met their burden of proving that the labels involved here meet all the requirements of the Act. Likewise, those petitioners have proved preponderantly that the uses of DDT under their registrations do not create an unreasonable risk on balance with the benefits.

There was presented a lot of testimony, both oral and written. Much of it was pointed to a showing of the global extent of the presence of DDT. The purpose of expending so much expert opinion to make that point is somewhat obscure to me. During the hearing, an article appearing in a scientific publication (and allegedly based upon information from a source on Respondent's Counsel staff) stated that I did not understand the "subtle" case against DDT. Well, the only "subtle" aspect about the worldwide approach is the apparently assumed theory that no cause-and-effect showing is necessary to apply the global impact to the uses under the registrations at issue here.

Such limitless ambit of testimony possibly could be pertinent in a rule-making proceeding. At such a hearing all aspects of the

effects of all propensities of the compound being investigated should be explored in order to discover all facets against the adverse effects of which detailed rules and regulations should be promulgated.

But the fact is: this hearing is not a rule-making proceeding. This hearing is an adjudicatory proceeding in every sense of the word. The rights of parties are at stake; and that includes the party commonly referred to as "the public interest." All parties here have a right to know the reasons, in reasonable detail, why the registrations involved should be cancelled; which includes the right to offer all relevant and material evidence, both pro-and-con, in support of their contentions; and the right to subject opposing theories to the test of cross-examination.

The public-interest was represented here by Intervenor Secretary of Agriculture on the side of continued, limited uses of DDT, and by Intervenor Environmental Defense Fund (and its colleagues) on the side of a total ban on all uses of DDT. The Secretary has a statutory duty and responsibility to the attainment of reasonable quantities of food and fiber for all the public; and Environmental Defense Fund has assumed the vital role of representing the interests of all of the public who feel they have no spokesman for their individual concerns for the future of the natural environment.

In my opinion, no one questions the testimony that DDT is found in varied and remote places. Likewise, that its persistence is at once both boon and bane.

During this hearing, the benefits and risks emanating from the uses of DDT were explored competently and thoroughly.

To be considered in the determination of the fate of the particular registrations in question, there has to be a, preponderant showing that the present uses cause an unreasonable adverse effect.

That showing has not been made. That preponderance is the burden of the Respondent. I arrived at that conclusion by the application to this case of the rule of evidentiary burdens in any adjudicatory proceeding. In this case, the issuance of the PR Notices constituted a prima facie case for cancellation. The burden of proof was on the Petitioners to overcome that prima facie case by a preponderance of the evidence. That has been done by proving that the label-language for essential uses of DDT is adequate to accomplish the statutory purpose of the three "misbranding" sections (The first issue herein). Likewise, there has been proof that, on balance with the benefits, the present essential uses of DDT, under the registrations in question, do not create an unreasonable risk (The other issue herein).

The burden of going forward with the evidence passed to the Respondent (and to Int.-EDF, et als, insofar as they purposed to prove the case for Respondent). The burden of going forward with the production of evidence, irrespective of the number of times it shifts between the parties, does not stop until the evidentiary part of the hearing is closed. That burden was not met by Respondent. There was much evidence that reflected degrees of correlation between the presence of DDT and the phenomenon described.

Correlation is not a meaningful finding when cause-and-effect is the required conclusion.

Although it was not in issue here, there was ample evidence to indicate that DDT is not the sole offender in the family of pesticides; and that necessary replacements would in many cases have more deleterious effects than the harms allegedly caused by DDT.

In my opinion, the evidence in this proceeding supports the conclusion that there is a present need for the essential uses of DDT; that efforts are being made to provide a satisfactory replacement for DDT; and that a co-operative program of surveillance and review can result in a continued lessening in the risks involved.

F. ORDERS

I. IN RE USDA AND GP

For good cause shown, it is ORDERED: -

That PR Notice 71-1, dated January 15, 1971; PR Notice 71-3, dated March 12, 1971; and PR Notice 71-5, dated March 18, 1971; all as issued by the Director, Pesticide Regulation Division, Environmental Protection Agency, be and hereby each of them is vacated in all respects in which either individually or jointly they may have any application to the pertinent registrations listed below; and that said pertinent registrations, corrected so as to indicate only the essential uses as defined in this action, be and hereby each of them is restored to the same force and effect it carried just prior to the issuance of the aforesaid notices: -

I.F.&R. No.	Registrant	Pertinent Registration
63	Stevens Industries, Inc.	2459-184; -144; -142; -118; -9; -6; -89; -107; -114; -52; -120; -54; and -42.
64	W. R. Grace & Company	2124-60; -575; -633; -667; -663; -664; -665; -660; -640; -649; -658; -615; -616; -584; -534; and -647.
66	Cotton States Chemical Co.	1339-135; -182; -162; -42; -132; -141; -178, -179; -194; and -195.
70	Woolfolk Chemical Works, Ltd.	769-146; -197; -199, -259; -268, -269; -285, -301; -302; -303; -320; -331; -337; -338; -354; -393; and -404.

I.F.&R. No.	Registrant	Pertinent Registration
71	Octagon Process, Inc.	6830-17; and -9.
73	Micro Chemical Company, Inc.	4841-43; and -33.
74	Cleveland Chemical Company	8867-17; -6; -26; -22; -21; -15; and -18.
75	Coahoma Chemical Company, Inc.	2974-9; -13; -25; -46; -67; -68; -69; -70; -71; -75; -91; -96; -97; -101; and -103.
77, 92, & 121	Helena Chemical Company	5054-54; -60; 2299-241; -192; -143; -212; -162; -166; -246; -188; -130; -227; 5905-63; -53; -37; -59; -33; -89; -83; -8; -52; and -88.
78	Howerton Gowen Chemicals, Inc.	2460-44; -45; -46; -47; and -48.
80	Cotton Producers Association	2269-68; -104; -123; -24; -89; -90; -102; -85; -87; -84; -82; and -62.
82	Daly-Herring Company	240-86; -53; -173; -92; -132; -57; -71; -85; -66; and -134.
83	Parramore & Griffin Co., Inc.	1812-58; -32; -31; -128; -63; -48; -8; -70; -65; -66; -60; -122; -79; -81; and -72.
84	Staple Cotton Services Assoc.	8648-6; -7; -8; -9; -10; -11; -18; -19; and -20.
85	Standard Spray and Chemical Co.	3238-7; -34; -8; and -17.
86	FCX, Inc.	1598-84; -93; -112; -117; -125; -172; -183; and -166.

I.F.&R. No.	Registrant	Pertinent Registration
87	Thompson-Hayward Chemical Co.	148-156; -343; -447; -450; -486; -517; 525; -548; -567; 606; -620; -630; -649; -748; -833; -858; and -693.
88	Meherrin Agric. & Chem. Co.	4139-28.
89	Triangle Chemical Company	1842-16; -120; -121; -172; -193; -195; -116; -163; -149; -175; -173; -148; -235; -241; -216; -157; -211; -242; and 230.
90	Carolina Chemicals, Inc.	1191-100; -140; -222; -229; -235; -236; -252; -253; -269; -275; and -291.
91	Southern Agricultural Chem., Inc.	3743-130; -169; -116; -221; -177; -168; -210; -100; and -202.
93	Kaiser Agricultural Chemicals	9159-1; -12; -14; -20; -24; -25; -30; -31; -33; -43; -59; -82; -97; -98; -111; and -123.
100	Valley Chemical Company	1063-91; -99; -100; -101; and -116.
101, 184, & 209	Olin Corporation	1258-399; 459; -470; -499; -500; -543; -615; -618; -704; -716; -772; -787; -804; -706; and -737.
102 & 210	Borden, Inc.	4185-145; -142; -99; -403; -114; -268; -146; -85; -257; -364; -374; -371; -328; -258; -103; -341; -291; -106; -278; -110; -86; -140; -109; -251; -95; -102; -349; -264; -87; -432; -331; -330; -196; -272; -437; and -92.

I.F.&R. No.	Registrant	Pertinent Registration
103 & 148	Riverside Industries	9779-72; -57; -11; -48; -15; -16; -39; -40; -92; -116; -87; -35; -53; -28; -44; -59; -13; and -12.
107	Planters Chemical Company	1868-101; -107; -133; -131; -135; -146; -147; -149; -174; -205; -207; and -209.
105	USDA (Plant Protection Div.)	10384-1; -2.

Issued: April 25, 1972

The above recommended Findings, Conclusions, and Order are submitted subject to the governing rules of practice set forth in 40 CFR 164.20 et seq.

All proposed or suggested Findings, Conclusions, or Orders which are not incorporated herein are expressly rejected.

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F. ORDERS

II. IN RE: WYCO, INC.
I.F.&R. No. 96

Whatsoever part of the previous Discussion, Findings of Fact, Conclusions of Law, and Order as is necessary to support or to understand this dispositive action, hereby is adopted and incorporated herein and made a part hereof.

Discussion: Wyco, Inc. holds USDA Registration No. 4736-1; and markets a product called TOSSITS to be used as a treatment against mosquito larvae by City, State, and Federal Health Authorities, and Army, Navy, and Air Force Installations. That registration is subject to PR Notice 71-1. Wyco, Inc. seasonably filed objections and a request for public hearing. It was joined in this consolidated hearing. Wyco, Inc. was recorded as accepting the Admissions (Tr. 2:290) and not desiring to offer witness testimony (Tr. 13:1532).

Opinion: It is my opinion, and I so rule, that the label for TOSSITS meets the requirements of Interpretation No. 18, and that its use does not create an unreasonable risk on balance with its benefit.

Therefore, it is ORDERED: That the notice of cancellation PR Notice 71-1 as issued by the Director, Pesticide Regulation Division, Environmental Protection Agency, on January 15, 1971, be and hereby it is vacated as to USDA registration No. 4736-1 and said registration corrected so as to indicate only the essential

uses as defined in this action, is restored to the same force and effect it carried just prior to said notice.

Issued: April 25, 1972

All proposed or suggested Findings, Conclusions, or Orders which are not incorporated herein are expressly rejected.

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F. ORDERS

III. IN RE: THE WALLERSTEIN COMPANY
I.F.&R. No. 106

Whatsoever part of the previous Discussion, Findings of Fact, Conclusions of Law, Opinion, and Order as is necessary to support or to understand this dispositive action, hereby is adopted and incorporated herein and made a part hereof.

Discussion: The Wallerstein Company (Wallerstein) holds USDA Registration No. 1549-10, with label entitled "Wallerstein 222 Moth-Mildew Proofer Concentrated Powder With Added Deodorizing Action." PR Notice 71-1, issued January 15, 1971, applied its cancellation effect to this registration because of its DDT content. Wallerstein seasonably filed objections to the cancellation and requested a public hearing. This case was joined in this consolidated DDT hearing. Counsel for Wallerstein filed written Summaries of Issues and Argument; but there was no participation in the hearing by a presentation of its own witnesses or by cross-examination of witnesses presented by Respondent or Int.-EDF et als. Likewise, there is no record that Wallerstein adopted the Admissions which became a part of the consolidated DDT proceedings. Thus, the question is raised as to whether Wallerstein has proved that its use, which is that of a moth proofer-through-dry-cleaning is a use which is considered essential. Unless that question is answered in the affirmative, there is no need to proceed to a discussion as to whether or not the registration in question here meets "misbranding" requirements

of the Act or whether, on balance with its benefits, its use creates an unreasonable risk.

Admission No. 1 sets forth the uses for pesticides containing DDT that have been finally cancelled and are not at issue in this proceeding. Among those there is listed: "Commercial, institutional and industrial establishments including non-food areas in food processing plants and restaurants (does not include industrial fabric treatments for control of carpet beetles and clothes moths)." Admission No. 2, which lists the essential uses for the purposes of these proceedings, contains fabric treatment as a use-pattern, but limits its use to the military only. Wallerstein offered no testimony as to the essentiality of its labelled use of DDT. It is my opinion, and I so rule, that the question of essentiality is determined here by the contents of Admission No. 2, namely that the use of DDT for fabric treatment is limited to military use only. That being so, there is no need to proceed to any further questions as far as Wallerstein is concerned.

Under date of October 26, 1971, as a result of my telephone request, counsel for Wallerstein submitted two labels: one under USDA Registration No. 1549-10, and one under USDA Registration No. 4708-26. That was the first time that the record in this case indicated that there was any registration involved other than USDA No. 1549-10. There is no record of any seasonable action by Wallerstein in filing objections and request for a public hearing in connection with USDA Registration No. 4708-26. Therefore, it is my opinion, and I so rule, that USDA Registration No. 4708-26 is not a part of this proceeding.

In view of the above, it is ORDERED; that USDA Registration No. 1549-10, as issued to the Wallerstein Company, be and hereby it is cancelled.

Issued: April 25, 1972.

All proposed or suggested findings, conclusions, or orders which are not incorporated herein are expressly rejected.

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F. ORDERS

IV. IN RE: STARK BRO'S NURSERIES AND ORCHARDS CO. - I.F.&R. NO. 149.

Whatsoever part of the previous Discussion, Findings of Fact, Conclusions of Law, Opinion, and Order as is necessary to support or to understand this dispositive action, hereby is adopted and incorporated herein and made a part hereof.

Discussion: Stark Bro's Nurseries and Orchards Co. (Stark Bro's) holds USDA Registration No. 2919-1, with label entitled "New Combination Fruit Spray." PR Notice 71-5, issued March 18, 1971, applied its cancellation effort to this registration because of its TDE content. Stark Bro's seasonably filed objections to the cancellation notice and requested a public hearing. This case was joined in the consolidated DDT hearing. Counsel for Stark Bro's was recorded (Tr. 2;209) as resting its case on the pleadings. Respondent did not object. At the same time Stark Bro's endorsed and accepted the eleven admissions which became a part of the consolidated case that required no additional proof.

Stark Bro's label reads in pertinent part:

> A combination insecticide and a fungicide already mixed--just add the required amount of water and apply as a spray. This combination spray is used for control of many common chewing and sucking insects, such as Curculio, Codling Moth, Oriental Fruit Moth, Japanese Beetle, Leaf Rollers, Aphids, Leaf Hoppers, Mites, San Jose Scale, Forbes Scale, Putnam Scale, and diseases such as Scab, Blotch, Apple Rust, Bitter Rot, Brown Rot, and Leaf Spot, which may injure fruit and trees of Apple, Pear, Peach, Plum, Cherry and Grape.

Included in the ingredients is: "Dichloro-diphenyl-dichloroethane (DDD or TDE) 8.3%."

A reading of Admission No. 1 discloses that except for soil surface application or for treatment for seedlings, the uses for pesticides containing DDT have been finally cancelled on Apple, Cherry, Pear, Plum, and Peach.

By amendment to Admission No. 2, which establishes the essential uses of DDT at issue in this hearing, the use on Grapes was deleted; which, in effect, added Grapes to the fruit on which the use of DDT is cancelled.

The fact that Admissions No. 1 and No. 2 refer to DDT is not important because PR Notice 71-5 bases its cancellation determination on the fact that TDE is a principal metabolite of DDT.

Thus it appears that all of the fruit and trees on which Stark Bro's "Fruit Spray" would be applied according to its label, are admitted to be not at issue in this hearing. That being so, there is no reason to consider the question as to whether the pertinent notice of cancellation should be vacated as to the registration in question.

It is my opinion, and I so rule, that as to USDA Reg. No. 2319-1 said PR Notice 71-5 need not be vacated; and said registration should not be restored to its former force and effect.

Therefore, it is ORDERED:

That USDA Registration No. 2319-1, as issued to Stark Bro's Nurseries and Orchards Co. be and hereby it is cancelled.

Issued: April 25, 1972.

All proposed or suggested Findings, Conclusions, or Orders which are not incorporated herein are expressly rejected.

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V. ORDERS

V. IN RE: INTERVENOR H. P. CANNON & SONS, INCORPORATED I.F.&R. No. 97

Whatsoever part of the previous Discussion, Findings of Fact, Conclusions of Law, Opinion, and Order as is necessary to support or to understand this dispositive action, hereby is adopted and incorporated herein and made a part hereof.

Discussion: Intervenor H. P. Cannon & Sons, Incorporated (Int.-Cannon) is a user of certain unspecified DDT products primarily for protection against the European corn borer on the sweet pepper crop in the Delmarva Peninsula. The evidence indicates that Int.-Cannon contracts with growers for their crops which it processes for public consumption. (Tr. 13:1539-41) It contends that the use of DDT is so essential to production as to be virtually the difference between success or failure in their enterprise (Tr. 13:1550-51). Int.-Cannon is in a peculiar position in this hearing because, although it claims it must have the use of DDT, the formulators who used to furnish it did not file objections to the cancellation notice PR 71-1. Thus, I have no jurisdiction to restore any USDA Registrations for the purpose of providing a source of supply to Int.-Cannon. Nevertheless, since, by decision of May 17, 1971, I determined that intervenor privileges were proper, evidence was allowed to show whether the use itself would support a label that could meet the requirements of Interpretation No. 18 and could stand the test of balance between benefit and unreasonable

risk. It is my opinion, and I so rule, that the evidence (Tr. 13;1536-1671; 51;6132-6144) indicates that the use on sweet peppers does support label requirements and a showing of no unreasonable risk on balance with benefits. (See: supra, VII USES, 2, Sweet Peppers.)

There appears to be no reason why a registration for use of DDT on sweet peppers should not be available; particularly since such use is on the essential-use list appearing as Admission No. 2 in this proceeding.

It is my opinion, and I so rule, that Respondent has the authority necessary to accomplish the appropriate disposition of this problem.

Therefore, for good cause shown, it is ORDERED: that upon the filing by Int.-Cannon of a properly documented application for the issuance of a registration for use of DDT on sweet peppers in the Delmarva peninsula, the respondent shall process such application, and accept the testimony in this proceeding, and this decision, as probative evidence in support thereof.

Issued: April 25, 1972.

All proposed or suggested Findings, Conclusions, or Order which are not incorporated herein are expressly rejected.

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F. ORDERS

VI. IN RE: INTERVENOR ELI LILLY AND COMPANY - I.F.&R. NO. 223

Whatsoever part of the previous Discussion, Findings of Fact, Conclusions of Law, Opinion, and Order as is necessary to support or to understand this dispositive action, hereby is adopted and incorporated herein and made a part hereof.

Discussion: Intervenor Eli Lilly and Company (Int.-Lilly) held registration USDA No. 1471-1 just prior to the issuance of PR Notice 71-1 on January 15, 1971. The product which Int.-Lilly offered under that registration was called TOPOCIDE(R). DDT comprised approximately 1% of the preparation. TOPOCIDE(R) was a pharmaceutical intended for application to local areas of the human body for infectations with crab lice, scabies, and head lice. It was issued by prescription only.

Int.-Lilly failed to file seasonably under section 4.c. of the Act. As an intervenor, Int.-Lilly submitted the deposition testimony of one witness, together with six exhibits. Cross-examination was conducted by counsel for Int.-EDF et als by questions and answers over the telephone. (See Tr. 7544-7573). The deposition, with exhibits, accompanies this opinion in a separate file-folder entitled Eli Lilly & Company I.F.&R. 223.) It appears that the only risk in the use of TOPOCIDE(R) comes from the amount of DDT that is washed down the drain after a prescribed application.

Opinion: The evidence indicates that it was not contemplated that this prescription product should be the subject of PR Notice 71-1, since TOPOCIDE(R) must be used under the supervision of or at the direction of a licensed physician only. The primary governing law in this instance is the Federal Food, Drug, and Cosmetic Act; and the recital in 35 F.R. 14576 - 9/17/70 (Int.-Lilly Exh. VI) shows compliance by TOPOCIDE(R) with that law. It is my opinion, and I so rule, that Respondent can make a proper disposition of this case.

Therefore, it is ORDERED: that Respondent shall vacate so much of PR 71-1 that pertains to USDA Registration No. 1471-1; and shall refer the matter of TOPOCIDE(R)'s compliance with applicable statutory regulations to the appropriate department of the Federal Food and Drug Administration.

Issued: April 25, 1972

All proposed or suggested Findings, Conclusions, or Orders which are not incorporated herein are expressly rejected.

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ENVIRONMENTAL PROTECTION AGENCY

Washington, D.C. 20250

Pesticides Regulation Division

PR Notice 71-1

January 15, 1971

NOTICE TO MANUFACTURERS, FORMULATORS, DISTRIBUTORS AND REGISTRANTS OF ECONOMIC POISONS

Attention: Person Responsible For Federal Registration of Economic Poisons

Cancellation of Registration Under the Federal Insecticide, Fungicide, and Rodenticide Act of Products Containing DDT

The insecticide DDT has been used extensively in the control of agricultural pests and insect vectors of diseases. The continued widespread use and the relatively slow rate of dissipation have resulted in contamination of the environment with low levels of DDT. Residues of this chemical are widespread in the environment and can be detected in areas far removed from sites of any known application. Although the levels of DDT in the environment are in most cases relatively low, they have been of concern to the scientific community for several years.

Recognizing the importance of this issue, the Department of Agriculture took steps to restrict the uses of DDT. These included the cancellation of registration for certain DDT products, and the publication of a notice in the Federal Register on November 25, 1969, proposing to eliminate other uses at a future date. This notice afforded interested persons an opportunity for a period of 90 days to submit views and comments. After consideration of the comments received, additional cancellation actions were taken in August 1970.

On December 2, 1970, the functions of the Secretary of Agriculture and the Department of Agriculture under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) were transferred to the Administrator of the Environmental Protection Agency. Since that date, this Agency has been reviewing previous actions and recommendations relating to the use of DDT, together with the relevant information available to the Agency. It has been our intention to issue at the earliest possible date a notice covering all of the remaining uses of DDT.

On January 7, 1971, the United States Court of Appeals for the District of Columbia Circuit in the case of Environmental Defense Fund, et al., v. William D. Ruckelshaus, Administrator of the Environmental Protection Agency, et al., held that the FIFRA requires

Attachment A1

the Secretary "to issue notices and thereby initiate the administrative process whenever there is a substantial question about the safety of a registered pesticide." The Court further stated that "when, as in this case, he reaches the conclusion that there is a substantial question about the safety of a registered item, he is obliged to initiate the statutory procedure. . ." The Court found that the statement of the Secretary of Agriculture filed in the case "makes it plain that he found a substantial question concerning the safety of DDT. . ." The Court then ordered that the Administrator issue notices of cancellation of registration with respect to the remaining uses of DDT, and thereby commence the administrative process.

In view of the above, and in accordance with the provisions of Section 4c of the Federal Insecticide, Fungicide, and Rodenticide Act (7 U.S.C. 135b(c)), it has been determined that all registrations of DDT products should be canceled for the reason that continued registration of these products is contrary to the provisions of Sections 2z(2)(c), 2z(2)(d), and 2z(2)(g) of the Act (7 U.S.C. 135(z)(2)(c), 135(z)(2)(d), 135z(2)(g)). Accordingly, you are hereby notified that the registrations of all products containing DDT not heretofore the subject of a cancellation notice are canceled, effective 30 days following receipt of this notice, unless the procedures set forth in Section 4c of the Act are invoked.

Lowell E. Miller
Acting Director

ENVIRONMENTAL PROTECTION AGENCY
Pesticides Regulation Division
Washington, D.C. 20250

PR Notice 71-3

March 12, 1971

NOTICE TO MANUFACTURERS, FORMULATORS, DISTRIBUTORS, AND REGISTRANTS OF ECONOMIC POISONS

Attention: Person responsible for Federal registration of economic poisons

Cancellation of registration of certain products bearing directions for use on food in the absence of finite tolerances or exemptions

Upon recommendation of the Presidents's Science Advisory Committee and based on difficulties arising from zero tolerance and no residue registration, the Agricultural Research Service of the U.S. Department of Agriculture and the Food and Drug Administration of the Department of Health, Education, and Welfare requested that a committee be appointed by the National Academy of Sciences, National Research Council to evaluate the practice of registering pesticides for use on food crops on a zero tolerance or no residue basis. The committee completed its study in June 1965, and submitted a report which included the following recommendation:

> "The concepts of 'no residue' and 'zero tolerance' as employed in the registration and regulation of pesticides are scientifically and administratively untenable and should be abandoned."

After extensive consideration of the report, the Agricultural Research Service and the Food and Drug Administration agreed on a procedure to implement the committee's recommendations.

A joint USDA-HEW Statement for implementation of the NRC Pesticides Residues Committee's "Report on 'No Residue' and 'Zero Tolerance'" was published in the Federal Register on April 13, 1966.

It was agreed that registrations of all uses involving reasonable expectation of small residues on food or feed at harvest in the absence of a finite tolerance or exemption should be discontinued as of December 31, 1970, unless evidence were presented to support a finite tolerance or to show that enough progress has been made in the investigation to warrant the conclusion that the registration could be continued without undue hazard to the public health. This phase out was to be completed by December 31, 1970. However,

it has not been possible to complete action on all pending petitions. An additional joint USDA-HEW statement was published in the Federal Register on December 5, 1970, indicating that further extension would be granted beyond December 31, 1970, but in no event beyond December 31, 1971, on the basis of a pending petition or upon request by a Federal Agency.

Registration for many of the pesticide use patterns accepted on a "zero tolerance" or "no residue" basis are being continued based on pending petitions for finite tolerances or upon request of a Federal Agency. A published listing of these extended uses will not be issued. Those uses not cancelled will be considered to be extended until further notice. Additional cancellations will be issued in the event that some pending petitions are withdrawn or the requested clearances are denied.

Those pesticide use patterns involving food or feed as published in the "EPA Summary of Registered Agricultural Pesticide Chemical Uses" which are not supported by finite tolerances or exemptions and for which evidence has not been presented to support a finite tolerance or for which no request by a Federal Agency has been received are listed below.

These cancellations are in addition to those proposed in PR Notice 68-6, 69-4, and 70-4 and published in the Federal Registers of May 11, 1968 (corrected May 21, 1968), May 15, 1969, and May 6, 1970.

Herbicides, defoliants, desiccants, plant regulators

2-(m-chlorophenoxy) propionic acid - plums (Duarte) and prunes (French).

dalapon - alfalfa, birdsfoot trefoil, grass, pastures, and sweetclover.

dichlobenil - alfalfa (seed crop) and ladino clover (seed crop).

4-(2,4-dichlorophenoxy)butyric acid - flax and peas.

2-(2,4-dichlorophenoxy)propionic acid - rangeland clearance.

dimethyl tetrachloroterephthalate - alfalfa (seed crop).

4,6-dinitro-o-sec-butylphenol - flax (seed crop), orchard floor (almonds, apples, apricots, cherries, citrus, dates, filberts, peaches, pears, pecans, plums, prunes, walnuts), and sorghum (seed crop).

4,6-dinitro-o-sec-butylphenol (ammonium salt) - chives and flax.

4,6-dinitro-o-sec-butylphenol (ethanol and isopropanolamine salts) - flax (seed crop) and milo (seed crop).

4,6-dinitro-o-sec-butylphenol (triethanolamine salt) - apricots, peaches, plums, and prunes.

diquat dibromide - castor beans (seed crop) and sorghum (seed crop).

endothall - beans (seed crop), beets, and spinach.

B-hydroxyethylhydrazine - pineapples.

isopropyl N-(3-chlorophenyl)carbamate - broccoli, cabbage, caneberries (except blackberries and raspberries), celery, collards, cotton, grapes, hanover salad, kale, radishes, strawberries, sweet potatoes, turnip greens, and upland cress.

isopropyl N-phenylcarbamate - beans, beets, blackberries, broccoli, cabbage, carrots, cauliflower, celery, chard, chemical fallow (land to be seeded to cotton, cranberries, onions, peas, strawberries), cotton, cowpeas, cranberries, dill, garlic, mint, onions, peas, radishes, raspberries, strawberries, turnips, and vetch.

sodium arsenite - aquatic weeds.

sodium chlorate - beans, cotton (spot treatment only), potatoes, rice, sorghum, and tomatoes.

sodium trichloroacetate - beets, cabbage, cauliflower, flax, and tomatoes.

solan - tomatoes.

tris[(2,4-dichlorophenoxy)ethyl] phosphite and bis[(2,4-dichlorophenoxy) ethyl] phosphite - corn, peanuts, potatoes, and strawberries.

Fungicides and Nematicides

diammonium ethylene bisdithiocarbamate - potatoes (combined with zinc sulfate only).

dichlone - nectarines.

O,O-diethyl O-2 pyrazinyl phosphorothioate - peanuts.

p-dimethylaminobenzenediazo sodium sulfonate - avocados and sugar beets (in-furrow use only).

4,6-dinitro-o-sec-butylphenol (triethanolamine salt) - pears (green tip stage only).

hydroxymercurichlorophenol - beans (snap), corn (sweet), cowpeas, flax, peanuts, peas, potatoes, seedlings (transplant bed), soybeans, sweet potatoes, and velvet beans.

hydroxymercurinitrophenol-hydroxymercurichlorophenol - potatoes and sweet potatoes.

maneb - cherries, plums, and prunes.

methyldodecylbenzyl trimethyl ammonium chloride 80% and methyldodecyl-xylylene bis(trimethylammonium chloride) 20% - potato bags (used).

methylmercury 8-quinolinolate - apples.

nabam (I) - potatoes.

nabam (III) - potatoes (foliar use only).

nabam (IV) - potatoes (foliar use only).

pentachloronitrobenzene - alfalfa, clover, and lettuce (head).

phenylmercuric acetate or phenylmercuric ammonium acetate - apples, cherries, peaches, strawberries, and sugarcane.

potassium ammonium ethylene bisdithiocarbamate - potatoes.

zinc ion and manganese ethylene bisdithiocarbamate 80%, a coordination product of manganese 16%, zinc2%, ethylene bisdithiocarbamate 62% - pecans, peppers, and pineapples.

zineb - potatoes (foliar use only).

Insecticides, Repellants, and Acaricides

binapacryl - almonds and walnuts.

2,3:4,5-bis(2-butylene) tetrahydro-2-furaldehyde - beef cattle, dairy cattle, goats, sheep, swine, barns, dairy barns, feed rooms, hog pens, and milk rooms.

1,1-bis(p-chlorophenyl)-2,2,2-trichloroethanol - almonds, beans (seed crop), birdsfoot trefoil (seed crop), corn (field), cowpeas (seed crop), lespedeza (seed crop), peanuts (seed crop), peas (seed crop), potatoes, sugar beets, velvet beans (seed crop), and vetch (seed crop).

2-butyoxyethanol - beef cattle, dairy cattle, goats, sheep, swine, animal pens, barns, dairy barns, grain bins, milk rooms, and poultry houses.

B-butoxy B'-thiocyano diethyl ether - beef cattle, dairy cattle, goats, poultry, sheep, swine, barns, dairy barns, grain bins, grain elevators, hog pens, milk rooms, poultry houses, and sheep folds.

carbaryl - pecans, small grains (barley, oats, rye, wheat), sugarcane, beef cattle, hogs, and sheep.

carbon disulfide - cattle and hogs.

carbon tetrachloride - beef cattle, dairy cattle, goats, sheep, swine, corrals, dairy barns, milk rooms, poultry houses, and mushroom houses.

chlordane - currants, gooseberries, cashews, dates, birdsfoot trefoil, buckwheat, grasses, lespedeza, millet, milo, pasture, safflower, sugarcane, vetch, horseradish, and velvet beans.

chlorinated benzenes containing 1,2,3,4-tetrachlorobenzene; 1,2,4-trichlorobenzene; and pentachlorobenzene - oyster grounds.

chlorobenzene - animals and animal premises.

chloroform - beef cattle, dairy cattle, goats, sheep, and swine.

coal tar neutral oils and coal tar acid combination - poultry houses.

cresylic acid - poultry houses.

dichloro diphenyl dichloroethane - cotton (foliar only), peanuts (foliar only), soybeans (foliar only).

dichloro diphenyl trichloroethane - almonds, cashews, filberts, hazelnuts, hickory nuts, pecans, and walnuts (these were also cancelled on PR Notice 71-1).

dieldrin - blueberries, huckleberries, sheep, and barns.

O,O-diethyl O-(2-isopropyl-6-methyl-4-pyrimidinyl)phosphorothioate - dairy barns and milk rooms.

O,O-diethyl S-[4-oxo-1,2,3-benzotriazin-3(4H)-ylmethyl]-phosphorodithioate - cotton and potatoes.

4,6-dinitro-o-sec-butylphenol (triethanolamine salt) - peaches.

diphenylamine - beef cattle, dairy cattle, goats, sheep, swine.

endosulfan - almonds.

endrin - corn, apricots, cherries, nectarines, peaches, pears, plums, prunes, quinces, potatoes, sorghum grain and sugar beets.

S-[2-(ethylsulfinyl)ethyl] O,O-dimethyl phosphorothioate - caneberries (except blackberries and raspberries.)

heptachlor - beans, peaches, pears, and rice.

lindane - dairy cattle, dairy barns, and milk rooms.

linseed oil - beef cattle, dairy cattle, goats, sheep, and swine.

malathion - artichokes.

metaldehyde - strawberries and 10.0% dust or spray on vegetables (asparagus, beans, beets, blackeyed peas, broccoli, brussels sprouts, cabbage, cantaloupes, carrots, cauliflower, celery, collards, corn, cowpeas, cucumbers, eggplants, endive, garlic, horseradish, kale, kohlrabi, leeks, lettuce, melons, mustard greens, okra, onions, parsnips, peas, peppers, pimentos, potatoes, pumpkins, radishes, rutabagas, salsify, shallots, spinach, summer and winter squash, sweet potatoes, swiss chard, tomatoes, turnips, and watermelons).

6-methyl-2,3-quinoxalinedithiol cyclic S,S-dithiocarbonate - alfalfa (seed crop).

naled - apricots, clover, endive, filberts, mustard greens, nectarines, onions, plums, potatoes, prunes, sorghum (grain), and vetch.

naphthalene - beef cattle, dairy cattle, swine, farrowing houses, and hog pens.

parathion - asparagus.

phosphamidon - alfalfa, beans, cabbage, cherries, eggplant, peas, rice, sugar beets, watercress, wheat, clover (seed crop), and vetch (seed crop).

pine oil - beef cattle, dairy cattle, goats, sheep, swine, animal sleeping quarters, barns, dairy barns, and milk rooms.

rotenone - beef cattle, dairy cattle, swine, barns, dairy barns, hog pens, and milk rooms.

sodium fluosilicate - apples, apricots, asparagus, avocados, beans, beets, blackeyed peas, broccoli, brussels sprouts, cabbage, cantaloupes, carrots, cauliflower, celery, cherries, collards, corn, cowpeas, cucumbers, dates, eggplants, endive, figs, garlic, grapefruit, guavas, horseradish, kale, kohlrabi, kumquats, leeks, lemons, lettuce, limes, mangoes, melons, mustard greens, nectarines, okra, olives, onions, oranges, papayas, parsnips, passion fruit, peaches, pears, peas, peppers, persimmons, pimentos, plums, pomegranate, potatoes, prunes, pumpkins, quinces, radishes, rutabagas, salsify, shallots, spinach, squash, strawberries, sweet potatoes, swiss chard, tangelos, tangerines, tomatoes, turnips, and watermelons.

tetradifon - almonds, avocados, cotton, filberts, and walnuts.

tetraethyl pyrophosphate - alfalfa, almonds, apricots, asparagus, barley, beans, beets, birdsfoot trefoil, blackberries, blackeyed peas, blueberries, boysenberries, broccoli, brussels sprouts, buckwheat, cantaloupes, carrots, cashews, celery, cherries, chestnuts, clover, collards, corn, cotton, cowpeas, cranberries, cucumbers, currants, dates, dewberries, dill, eggplants, endive, figs, filberts, flax, garlic, gooseberries, grapefruit, grapes, grasses, hazelnuts, hickory nuts, horseradish, huckleberries, kale, kohlrabi, kumquats, leeks, lemons, lespedeza, lettuce, limes, loganberries, melons, millet, milo, mint, mustard greens, nectarines, oats, okra, olives, onions, parsnips, pasture grass, peanuts, pears, peas, pecans, peppers, persimmons, pimentos, plums, pomegranate, popcorn, prunes, pumpkins, quinces, radishes, raspberries, rice, rutabagas, rye, safflower, salsify, shallots, sorghum, soybeans, spinach, squash (summer and winter), strawberries, sugar beets, sugarcane, sweet potatoes, swiss chard, tangelos, tangerines, tomatoes, turnips, vetch, walnuts, watercress, watermelons, wheat, and youngberries.

toxaphene - potatoes.

turkey red oil - beef cattle, dairy cattle, goats, sheep, and swine.

Xylene - grain bins.

These uses of the foregoing pesticide chemicals would reasonably be expected to result in small residues in or on harvested food or feed. The presence of such residues in or on food or feed would constitute adulteration under the Federal Food, Drug, and Cosmetic Act. Therefore, directions for such uses are not considered to be adequate for the protection of the public. In accordance with the provisions of Section 4 of the Federal Insecticide, Fungicide, and Rodenticide Act (7 U.S.C. 135b) you are hereby notified that products containing such pesticide chemicals which are registered under the Act with directions for such uses are no longer considered to be in compliance with the provisions of the Act and the registration of such products is cancelled effective 30 days following the

except of this notice, unless, all directions for such uses are immediately deleted from the labels of such products or other procedure is invoked as provided in Section 4.

Five copies of corrected labeling must be submitted to the Registration Branch, Pesticides Regulation Division, Environmental Protection Agency, Washington, D.C. 20250, if continued registration is desired.

Lowell E. Miller
Acting Director

LIST OF WITNESSES PRESENTED AT THE CONSOLIDATED DDT HEARING

Cons. Case No.	1971 Date	Party No.	NAME
1	8-17	GP-1	Marshall M. Laird. Ph.D. Professor and Head of the Department of Biology; Director, Center for Environmental Biology, Memorial University of Newfoundland; Member of WHO Expert Advisory Panel on Insecticides. (Tr. 1:33-96)
2	8-17	GP-2	David F. Young, Jr. Ph.D. Leader of Extension Entomology, Mississippi State University. (Tr. 1:98-152; 2:158-208)
3	8-18	GP-3	Cedric R. Jordan. Ph.D. Head, Entomology Department, and Chairman, Division of Entomology, University of Georgia. (Tr. 2:209-238)
4	8-18	GP-4	Farrell Higbee. Executive Director, National Agricultural Aviation, Washington, D. C. and Loveland, Colo. (Tr. 2:239-286)
5	8-19	GP-5	James R. Brazzel. Ph.D. Chief, Methods Development Branch, Plant Protection Division, Agricultural Research Service, USDA. (Tr. 3:297-369)
6	8-19	Int. USDA-1	Edward F. Knipling. Ph.D. Science Advisor to the Administrator of the Agricultural Research Service, USDA (Plant Division). (Tr. 3:371-421; 4:509-513; 5:580-601)
7	8-24	GP-6	Normal B. Akesson Professor of Agricultural Engineering, University of California (Davis). (Tr. 4:431-508)
8	8-25	GP-7	Ted A. Loomis. M.D. Professor of Pharmacology and State Toxicologist, School of Medicine, University of Washington. (Tr. 5:603-709)
9	8-26	GP-8	Virgil H. Freed. Ph.D. Professor of Chemistry; Head of the Department of Agricultural Chemistry; and Director of the Environmental Health Science Institute at Oregon State University. (Tr. 6:712-769)

Cons. Case No.	1971 DATE	Party No.	NAME
10	8-31	GP-9	Harland W. Fowler, Jr. Ph.D. Executive Secretary, Armed Forces Pest Control Board, Department of Defense. (Tr. 7:780-857)
11	8-31	GP-10	Edward R. Laws, Jr. M.D. Chief Resident in Neurosurgery, Johns Hopkins Hospital; Assistant Professor, Johns Hopkins Univ. (Tr. 7:859-932)
12	9-1	GP-11	Anne R. Yobs. M.D. Acting Chief, Division of Pesticide Community Studies, Chamblee, Georgia, EPA. (Tr. 8:945-986)
13	9-1	GP-12	Ralph E. Heal. Ph.D. Executive Secretary of the National Pest Control Association, Elizabeth, New Jersey. (Tr. 8:987-1048; 9:1055-1073)
14	9-2	GP-13	Samuel W. Simmons. Ph.D. Retired. Formerly Director of the Division of Pesticide Community Studies, EPA. (Tr. 9:1075-1110)
15	9-8	USDA-1	Thomas McIntyre Chief Staff Officer in Charge of Forest and Soil Pests, Plant Protection Division, Agricultural Research Service, USDA. (Tr. 10:1121-1189)
16	9-8	USDA-2	Henry F. Nixon Director of the Bureau of Plant Industry, Pennsylvania Department of Agriculture. (Tr. 10:1190-[illegible]
17	9-8	USDA-3	Dean F. Lovitt Chief of the Plant Industry Division, Michigan Department of Agriculture. (Tr. 10:1216-1241)
18	9-8	USDA-4	Robert M. Altman. Ph.D. State Entomologist for Maryland. (Tr. 10:1242-1265)
19	9-9	USDA-5	Haruo Tashiro. Ph.D. Professor of Entomology, Cornell University, New York State Agricultural Experiment Station. (Tr. 11:1268-1302)
20	9-9	USDA-6	Edgar A. Taylor Branch Chief of the Fruit Insect Research Branch, Entomology Research Division, U. S. Department of Agriculture. (Tr. 11:1303-1331)

Cons. Case No.	1971 Date	Party No.	NAME
21	9-9	Int. USDA-2	Jesse L. Steinfeld, M.D. Surgeon General of the U. S. Public Health Service; Deputy Assistant Secretary of the Department of Health, Education and Welfare. (Tr. 11:1333-1397)
22	9-14	Joint-1	Lorenzo Tomatis, M.D. Chief of the Unit for Chemical Carcinogenesis, International Agency for Research on Cancer, WHO. (Tr. 12:1407-1442)
23	9-14	Joint-2	John Higginson, M.D. Director, International Agency for Research on Cancer, Lyons, France. (WHO) (Tr. 12:1442-1507)
24	9-21	Int. Cannon-1	Henry P. Cannon Chairman and Chief Executive Officer of H. P. Cannon and Son, Inc., processors of vegetables in tins. (Tr. 13:1536-1572)
25	9-21	Int. Cannon-2	Carlton L. Byrd President of Byrd Farms, Inc., and Byrd Packing Co., Inc. The companies grow vegetables, process and can them. (Tr. 13:1572-1581)
26	9-21	Int. Cannon-3	Charles N. Jackson Responsible for contracting, growing, producing, and harvesting of vegetables that are processed in the Cannon Company's plant. (Tr. 13:1582-1599)
27	9-21	Int. Cannon-4	Douglas E. Greenwood, Ph.D. Employed as Entomologist by Virginia Truck and Ornamentals Research Station. (Tr. 13:1600-1622)
28	9-21	Int. Cannon-5	Paul P. Burbutis, Ph.D. Researcher and teacher, University of Delaware. (13:1623-1671)
29	9-22	USDA-3	Thomas H. Jukes, Ph.D. Professor in Residence, Medical Physics, University of California. (14:1689-1698)
30	9-22	Int. USDA-4	Kenneth R. Hill, Ph.D. Analytical Chemist, Investigations Leader in charge of analytical investigations in the Pesticide Chemicals Branch, Entomology Division, U. S. Department of Agriculture. (Tr. 14:1700-1771; 15:1811-1852)

Cons. Case No.	1971 Date	Party No.	NAME
31	9-23	Int. USDA-5	Rudolph D. Radeleff. Vet. Med. Director of Veterinary Toxicology and Entomology Research Laboratory, USDA, ARS, College Station, Texas. (Tr. 15:1774-1810)
32	9-23	Int. USDA-6	Clarence H. Hoffmann. Ph.D. Associate Entomologist, Entomology Research Division, Agricultural Research Service, USDA. (Tr. 15:1853-1909; 16:1915-1967)
33	9-28	Int. USDA-7	John E. Davies. M.D. Associate Professor, University of Miami School of Medicine; Director of the Community Pesticides Study in Dade County. Medical specialty is epidemiology; consultant to WHO. (16:1967-2029)
34	9-28	Int. USDA-8	Joseph H. Davis. M.D. Chief Medical Examiner for Dade County, Florida; Professor of Legal Medicine, University of Miami School of Medicine. (Tr. 16:2030-2057; See also 23:2771; 19:2310)
35	9-29	Int. USDA-9	Donald P. Morgan. M.D. Ph.D. Private practice in Tucson, Arizona. Epidemiologist, Community Studies Pesticide Project, University of Arizona, Tucson, Arizona. (Tr. 17:2065-2122)
36	9-29	Int. USDA-10	Clifford C. Roan. Ph.D. Director of Arizona Community Studies Pesticide Project; Professor of Entomology, University of Arizona, Tucson, Arizona. (Tr. 17:2123-2190)
37	9-30	Int. USDA-11	Wayland J. Hayes, Jr. M.D. Toxicologist. Professor of Biochemistry, Vanderbilt University, Nashville, Tennessee. (Tr. 18:2193-2303; 29:3357-3460)
38	10-5	Int. USDA-12	Leo D. Newsom. Ph.D. Boyd Professor and Head of the Department of Entomology, Louisiana University. (Tr. 19:2315-2413)
39	10-5	Int. USDA-13	William G. Eden. Ph.D. Chairman of the Department of Entomology and Nematology, University of Florida. (Tr. 19:2414-2438)

Cont.

Case No.	1971 Date	Party No.	NAME
40	10-6	Int. USDA-14	Richard L. Ridgeway. Ph.D. Entomologist. Investigations Leader, Cotton Insects Research for Agricultural Research Service, U. S. Department of Agriculture, College Station, Texas. Member of the graduate faculty of Texas A and M University; Project Leader, Texas Agriculture Experiment Station. (Tr. 20:2453; 2474-2502; 56:6330-6441)
41	10-6	Int. USDA-15	Lloyd W. Hazleton. Ph.D. Director for Life Sciences, TRW Systems Group, Falls Church, Virginia. (Tr. 20:2454-2473)
42	10-6	Int. USDA-16	Dabney S. Wellford. Director of Economic and Market Research, National Cotton Council, Memphis, Tennessee. (Tr. 20:2503-2539)
43	10-6	Int. USDA-17	Thomas H. Maren. M.D. Professor and Chairman of the Department of Pharmacology, University of Florida College of Medicine, Gainsville, Florida. (Tr. 20:2540-2570)
44	10-6	Int. USDA-18	Fred T. Cooke, Jr. Agricultural economist, Farm Production Economics Division, Economics Research Service, USDA stated at the Delta Branch Experimental Station, Stoneville, Mississippi. (Tr. 20:2570-2594; 21:2665-2694)
45	10-7	Int. USDA-19	Norman E. Borlaug. Ph.D. Director of the Wheat Improvement Project, International Maize and Wheat Improvement Center, Mexico City, Mexico. (Tr. 21:2598-2663)
46	10-8	Int. USDA-20	Kenneth L. Davison. Ph.D. Research Physiologist with the Animal Science Research Division, Metabolism and Radiation Research Laboratory, Fargo, North Dakota. (Tr. 22:2700-2767)
47	10-13	Int. USDA-21	Joseph Capizzi Extension Entomologist, Oregon State University. (Tr. 23:2775-2831)
48	10-13	Int. USDA-22	Joseph C. Street. Ph.D. Professor of Animal Science, Utah State University; Teaching duties in the Toxicology Training Program; Research responsibility in the College of Agriculture. (Tr. 23:2832-2860)

,ons. Case No.	1971 Date	Party No.	NAME
49	10-13	Int. USDA-23	Thomas F. Leigh. Ph.D. Entomologist, Department of Entomology, University of California, Davis. (Tr. 23:2861-2886)
50	10-14	Int. USDA-24	John R. Beck. Vice President and Director of Quality Control for Bio-Serv Corporation in Troy, Michigan. (Tr. 24:2901-2958)
51	10-14	Int. USDA-25	William B. Jackson. Ph.D. Professor of Biology, Bowling Green State University; Director of an Interdisciplinary Environmental Studies Center at the University. (Tr. 24:2959-2975)
52	10-15	Int. USDA-26	Stuart R. Race. Ph.D. Extension Entomologist, Rutgers University, New Brunswick, New Jersey. (Tr. 25:2977-3033)
53	10-15	Int. USDA-27	Gary M. Booth. Ph.D. Assistant Professor of Entomology, University of Illinois, Champagne, Illinois; Project Director for the Pesticide Pollution Team at the State Natural History Survey. (Tr. 25:3034-3064)
54	10-20	Int. USDA-28	George R. Harvey. Ph.D. Organic Chemist. Assistant Scientist, Woods Hole Oceanographic Institution, Woods Hole, Massachusetts. (Tr. 26:3083-3102)
55	10-20	Int. USDA-29	Ned D. Bayley. Ph.D. Director of Science and Education, Department of Agriculture. (Tr. 26:3102-3124)
56	10-21	Resp.-1	William L. Reichel. Chief Chemist, Patuxent Wildlife Center, Bureau of Sports Fisheries, Department of the Interior. (Tr. 27:3132-3149)
57	10-21	Resp.-2	Jerry A. Burke. Analytical Chemist. Acting Head, Industrial Chemicals Residues Branch, Food and Drug Administration. (Tr. 27:3150-3175)
58	10-21	Resp.-3	David L. Stalling. Ph.D. Research Chemist. Chief Chemist, Fish-Pesticide Research Laboratory, Bureau of Sport Fisheries and Wildlife, Department of the Interior. (Tr. 27:3176-3223)

Cons. Case No.	1971 Date	Party No.	NAME
59	10-22	Resp. 4	H. Page Nicholson. Ph.D. Chief, Agricultural and Industrial Water Pollution Control Research Programs, Southeast Water Laboratory, Athens, Georgia. (Tr. 28:3227-3280)
60	10-22	Resp. 5	Tony J. Peterle. Ph.D. Professor and Chairman, Department of Zoology, College of Biological Sciences, Ohio State University. (28:3282-3355)
61	10-26	Resp. 6	John B. Dimond. Ph.D. Professor of Entomology, University of Maine, Orono, Maine. (Tr. 29:3460-3488; 30:3491-3519)
62	10-27	Resp. 7	Philip C. Kearney. Ph.D. Leader, Pesticide Investigations Group - dealing with behavior of pesticides in soils, ARS, USDA, Beltsville, Maryland. (Tr. 30:3520-3567)
63	10-27	Resp. 8	Charles D. Gish. Research Biologist, Patuxent Wildlife Center, Bureau of Sport Fisheries and Wildlife, Department of the Interior, Laurel, Maryland. (Tr. 30:3567-3595)
64	10-28	Resp. 9	Philip A. Butler. Ph.D. Fishery Biologist. Research consultant to Gulf Breeze Laboratory, Florida, and to U. S. Fish and Wildlife Service of EPA. (Tr. 31:3692-3804)
65	10-28	Resp. 10	Robert E. Reinert. Ph.D. Fishery Biologist, Great Lakes Fishery Laboratory, Bureau of Sport Fisheries and Wildlife, Department of the Interior, Ann Arbor, Michigan. (Tr. 31:3806-3824; 32:3828-3860)
66	10-29	Resp. 11	Kenneth J. Macek. Ph.D. Zoologist. Director of Research, Baronomics, Inc., Ware, Mass., a consulting laboratory investigating effects of chemicals in aquatic environments. (Tr. 32:3860-4002)
67	10-29	Resp. 12	Umberto Saffiotti. M.D. Associate Scientific Director for Carcinogenesis, National Cancer Institute, N.I.H., H.E.W. (Tr. 32:4002-4081; 34:4274-4289)
68	11-1	USDA-30	Alice Ottoboni. Ph.D. Biochemist, California Department of Public Health, Berkeley. (Tr. 33:4089-4170)

Cons. Case No.	1971 Date	Party No.	NAME
69	11-2	Resp. 13	Don W. Hayne. Ph.D. Consultant with agencies on ecological problems involving statistics and quantitive methods. Teaching research in the Department of Statistics and Zoology at North Carolina State University. (Tr. 34:4215-4249)
70	11-2	Resp. 14	Mark M. Luckens. Ph.D. Associate Professor of Toxicology and Pharmacology at the College and University of Kentucky. He is on the faculty of the Interdisciplinary Graduate Program on Toxicology at the whole University. (Tr. 34:4249-4274)
71	11-2	Resp. 15	Croswell Henderson. Chief of the Branch of Environmental Improvement, Division of Fishery Services, Bureau of Sport Fisheries and Wildlife. (Tr. 34:4290-4344)
72	11-4	Resp. 16	William H. Stickel. Biologist, Patuxent Wildlife Center, Bureau of Sport Fisheries and Wildlife, U. S. Department of the Interior. (Tr. 35:4349-4442)
73	11-4	Resp. 17	Robert G. Heath. Biometrician, Patuxent Wildlife Research Center, Laurel, Maryland. (Tr. 35:4442-4477; 36:4485-4575)
74	11-11	Resp. 18	Jerry R. Longcore. Wildlife Biologist, Patuxent Wildlife Research Center, U. S. Bureau of Sport Fisheries and Wildlife. (Tr. 38:4611-4660)
75	11-11	Resp. 19	Richard D. Porter. Ph.D. Pesticide Biologist, Patuxent Wildlife Research Center, U. S. Bureau of Sport Fisheries and Wildlife. (Tr. 38:4661-4721)
76	11-16	Resp. 20	Lawrence J. Blus Research Biologist, Patuxent Wildlife Research Center, Bureau of Sport Fisheries and Wildlife, U. S. Department of the Interior. (Tr. 39:4728-4808)
77	11-16	Resp. 21	James O. Keith Chief, Pesticide and Wildlife Ecology, Denver Wildlife Research Center, Bureau of Sport Fisheries and Wildlife, U. S. Department of the Interior. (Tr. 39:4808-4858; 40:4862-4907)

Case No.	Date	Party No.	NAME
78	11-17	Resp. 22	Thomas J. Cade. Ph.D. Professor of Zoology, Section of Ecology and Systematics; Research Director, Ornithology, Cornell University. (Tr. 40:4909-4957; 41:4969-5008)
79	11-18	Resp. 23	Joseph J. Hickey. Ph.D. Professor, Wildlife Ecology, College of Agriculture, University of Wisconsin. (Tr. 41:5008-5092; 42:5096-5166)
80	11-23	Resp. 24	David B. Peakall. Ph.D. Senior Associate, Section of Ecology and Systematics, Cornell University. (Tr. 43:5175-5187)
81	11-30	Resp. 25	Robert R. L. Guillard. Ph.D. Associate Scientist at the Woods Hole Oceanographic Institution. (Tr. 44:5192-5296)
82	11-30	Resp. 26	Herman O. Sanders. Aquatic Entomologist, Fish Pesticide Research Laboratory, Bureau of Sport Fisheries and Wildlife, U. S. Department of the Interior. (Tr. 44:5297-5336)
83	12-1	Resp. 27	Ronald Eisler. Ph.D. Research Aquatic Biologist, EPA's laboratory, National Marine Water Quality Laboratory, West Kingston, R. I. Teaches graduate level course in oceanography, University of Rhode Island. (Tr. 45:5340-5411)
84	12-1	Resp. 28	Stephen W. Hitchcock. Ph.D. Entomologist, Connecticut Agricultural Experiment Station, New Haven, Connecticut. (Tr. 45:5416-5436)
85	12-2	Resp. 29	Blake F. Grant. Ph.D. Chief Biologist, Fish Pesticide Research Laboratory, Columbia, Missouri. (Tr. 46:5447-5519, 5606-5616)
86	12-2	Resp. 30	John M. Anderson. Ph.D. Director, Fishery Research Board, Canadian Department of Environment, St. Andrews, New Brunswick. (Tr. 46:5520-5606)
87	12-3	Resp. 31	Thomas W. Duke. Ph.D. Director, EPA Gulf Breeze Laboratory, Gulf Breeze, Florida. (Tr. 47:5627-5673)

Cons. Case No.	1971 Date	Party No.	NAME
88	12-3	Resp. 32	Clarence M. Tarzwell. Ph.D. Aquatic Biologist. Director, National Marine Water Quality Laboratory, EPA, West Kingston, Rhode Island. (Tr. 47:5675-5699)
89	12-3	Resp. 33	Lee J. Weddig. Executive Director, National Fisheries Institute. (Tr. 47:5700-5709; 5720-5721)
90	12-7	Resp. 34	George E. Burdick. Acting Chief Fish and Wildlife Ecologist, Bureau of Ecological Standards, New York State Department of Environmental Conservation. (Tr. 48:5726-5822)
91	12-7	Resp. 35	Howard E. Johnson. Ph.D. Associate Professor, Department of Fisheries and Wildlife, Michigan State University. (Tr. 48:5834-5875)
92	12-8	Resp. 36	Steven G. Herman. Ph.D. candidate in Zoology. Professor in Biology, Evergreen State College, Olympia, Washington. (Tr. 49:5879-5961)
93	12-8	Resp. 37	Denzel E. Ferguson. Ph.D. Professor of Biology, and Coordinator of Environmental Sciences, Portland State University. (Tr. 49:5961-5996; 70:7964-7988)
94	12-9	Resp. 38	Joel Bitman. Ph.D. Research Chemist, U. S. Department of Agriculture; Leader of the Biochemical Research Branch of the Animal Science Research Division, Beltsville, Maryland. (Tr. 50:6000-60
95	12-9	Resp. 39	David Pimentel. Ph.D. Professor of Insect Ecology, Cornell University Department of Entomology and [illegible] and Ecology in Systematics; Chairman of the Interdepartmental Task Force on Environmental Pollution. (Tr. 50:6096-6123)
96	12-10	Resp. 40	William V. Campbell. Ph.D. Professor of Entomology, North Carolina State University. (Tr. 51:6144-6160)

Cons. Case No.	1971 Date	Party No.	NAME
97	12-14	Resp. 41	Joseph C. Headley. Ph.D. Associate Professor, Agricultural Economics, University of Missouri. (Tr. 52:6167-6228)
98	12-17	Resp. 42	Robert van den Bosch. Ph.D. Professor of Entomology; Chairman of the Division of Biological Control, University of California, Berkeley, California. (Tr. 55:6272-6298)
99	12-17	Resp. 43	Everet J. Dietrick Applied Insect Ecologist for Rincon-Vitova Insectary, Pest Management Company, President. (Tr. 55:6299-6323)
100	12-20	Resp. 44	Charles G. Lincoln. Ph.D. Professor of Entomology and Head of the Department of Entomology, University of Arkansas. (Tr. 56:6444-6457)
101	12-21	Resp. 45	Robert L. Metcalf. Ph.D. Professor, Zoology, Entomology, University of Illinois. (Tr. 57:6467-6491)
102	1972 1-4	Int. EDF 1	Marvin A. Schneiderman. Ph.D. Associate Scientific Director for Demography, National Cancer Institute. (Tr. 58:6522-6630; 63:7123-7192)
103	1-5	Int. EDF 2	Marvin S. Legator. Ph.D. Geneticist. Chief of the Toxicology Branch, FDA. (Tr. 59:6638-6779)
104	1-6	Int. EDF 3	Robert W. Risebrough. Ph.D. Associate Research Ecologist, Bodega Marine Laboratory, University of California, Berkeley. (Tr. 60:6785-6883; 76:8461-8552; 61:6909-7007)
105	1-11	EDF et als 4	Dennis L. Meadows. Ph.D. Assistant Professor, Sloan School of Management, M.I.T., Cambridge, Massachusetts; Director, Club of Rome Project on the Predicament of Mankind. (Tr. 62:7018-7049)
106	1-11	Int. EDF 5	Lawrence R. Cory. Ph.D. Professor of Biology, St. Mary's College at California, Moraga, California. (Tr. 62:7050-7117)
107	1-12	Int. EDF 6	George M. Woodwell. Ph.D. Senior Ecologist, Biology Department, Brookhaven National Laboratory. (Tr. 63:7193-7243)

Cons. Case No.	1972 Date	Party No.	NAME
108	1-13	Resp. 7	Alden D. Hinckley. Ph.D. Associate Professor of Environmental Sciences, University of Virginia. (Tr. 64:7249-7286)
109	1-14	Resp. 8	Samuel S. Epstein. M.D. Professor, Environmental Health and Human Ecology, Case Western Reserve University, Cleveland, Ohio. (Tr. 65:7300-7404)
110	1-18	Resp. 9	Alan B. Steinbach. Ph.D. Teacher and researcher, physiology, neurophysiology, subspecialty in chemical nerve ends; Assistant Professor, Department of Physiology and Anatomy, University of California, Berkeley. (Tr. 66:7427-7498)
111	1-18	Int. EDF 10	Jerry L. Mosser. Ph.D. Postdoctoral Research Associate in the Marine Sciences Research Center, State University of New York at Stony Brook. (Tr. 66:7500-7535)
112	1-20	Int. Lilly 1	James G. Armstrong. M.D. (By deposition) Director, Medical Plans and Regulatory Affairs, Lilly Research Laboratories, Indianapolis, Indiana. (Tr. 67:7544-7573)
113	1-20	Resp. 46	Billy Joe Cross (By deposition) Executive Director, Mississippi Game and Fish Commission. (Tr. 67:7586-7625)
114	1-20	Int. EDF 11	Frederick W. Plapp, Jr. Ph.D. Associate Professor of Entomology and Insect Toxicologist, Entomology Department, Texas A and M University. (Tr. 67:7639-7705)
115	2-1	GP 14 (GP Rbtl-1)	Virgil H. Freed. Ph.D. Professor of Chemistry; Head of the Department of Agricultural Chemistry; Director, Environmental Health Science Center, Oregon State University. (Tr. 6:712-769; 68:7724-7888)
116	2-2	USDA 7 (USDA Rbtl-1)	Waldemar Klassen. Ph.D. Assistant to the Deputy Administrator for Plant Science and Entomology, U. S. Department of Agriculture (ARS). (Tr. 69:7895-7942)
117	2-8	USDA 8 (USDA Rbtl-2)	Stanford H. Smith. Ph.D. Senior Scientist, Bureau of Sport Fisheries and Wildlife, Department of the Interior. (Tr. 71:7996-8043)

Cons. Case No.	1972 Date	Party No.	NAME
118	2-10	Int. EDF 12	George B. Craig, Jr. Ph.D. Professor of Biology, University of Notre Dame; Director of the Vector Biology Laboratory at Notre Dame; Director of WHO International Reference Center for Aedes at Notre Dame. (Tr. 73:8077-8123)
119	2-11	USDA 9 (USDA Rbtl-3)	Kenneth L. Davison. Ph.D. Research Physiologist, Metabolism and Radiation Research Laboratory, Animal Science Research Division, ARS, Fargo, North Dakota. (Tr. 22:2700-2767; 74:8164-8211)
120	2-11	USDA 10 (USDA Rbtl-4)	Bruce C. Switzer Graduate Research Associate, University of Alberta; doctoral candidate in zoology and food science. (Tr: 74:8212-8336)
121	2-14	GP 15 (GP Rbtl-2)	E. L. Robert Stokstad. Ph.D. Member of the Faculty, Department of Nutritional Sciences, University of California. (Tr. 75:8342-8443)
122	2-15	GP 16 (GP Rbtl-3)	James R. Brazzel. Ph.D. Chief, Methods Development Branch, Plant Protection Programs, Animal and Plant Health Service, USDA. (Tr. 76:8553-8607) (Tr. 3:297-369)
123	2-16	GP 17 (GP Rbtl-4)	William F. Gusey Senior Staff Wildlife Specialist, Shell Oil Company, Houston, Texas. (Tr. 77:8621-8746)
124	2-17	GP 18 (GP Rbtl-5)	William H. Butler. M.D. Pathologist, Toxicology Unit, Scientific Staff, Medical Research Council Laboratories, Carshalton, Surrey, England. (Tr. 78:8754-8831)
125	2-17	GP 19 (GP Rbtl-6	Mitchell R. Zavon. M.D. Assistant Health Commissioner for Environmental Control and Consumer Protection, Cincinnati, Ohio; Associate Director, Huntingdon Research Center. (Tr. 78:8832-8895)

CONSOLIDATED HEARING - DDT

LIST OF EXHIBITS

(with Transcript reference)

Case No.	1971 DATE	Party No.	SUBJECT
1	8-17	GP-1	Document by Marshall Laird, entitled "Notes on the Mosquitos of Nissan Island, Territory of New Guinea," a Reprint from Pacific Science, Vol. VI, no. 2, April 1952. (1:36)
2	8-17	GP-2	Document entitled "Some Natural Enemies of Mosquitoes in the Vicinity of Palmalmal, New Britain," by Marshall Laird, from a volume of Transactions of the Royal Society of New Zealand, Vol. 76, Part 3, pp. 453 to 476, dated 1947. (1:38)
3	8-17	GP-3	Document entitled "A Place for Parasites and Invertebrate Predators in Mosquito Control" by Marshall Laird, dated July 1956. (1:42)
4	8-17	GP-4	Document entitled "A Coral Island Experiment," by Marshall Laird, 1967, reprinted from World Health Organization, Chronicle, Vol. 21, No. 1. (1:48)
5	8-17	GP-5	"Vector Ecology and Integrated Control Procedures," by Marshall Laird, Bulletin, World Health Organization, dated 1963, 29 Supplement, pp. 147 to 151. (1:59)
6	8-17	GP-6	"DDT: It is needed against malaria, but for the whole environment...," by James W. Wright, dated 1970, article in the Smithsonian. (1:64)
7	8-17	GP-7	Document entitled "Vector Control Briefs," dated July 23, 1971, represents a service of the United States Department of Health, Education, and Welfare. (1:66)
8	8-17	GP-8	Report entitled "Wildlife Research, Problems, Programs, Progress 1969," U. S. Department of the Interior, Fish and Wildlife Service, Bureau of Sport Fisheries and Wildlife, pp. 55 to 59. (1:73)
9	8-17	GP-9	Document entitled "International Health Regulations (1969)" published 1971, pp. 79 - 81, Annex VI, Recommendations on the Disinsecting of Aircraft Based on the Seventh and Eleventh Reports of the WHO Expert Committee on Insecticides. (1:93)

Case No.	1971 DATE	Party No.	SUBJECT
10	8-18	GP-10	Document entitled "Boll Weevil Eradication Experiment in Mississippi, Louisiana, and Alabama," June, 1961, prepared by Dr. Young. (2:177A)
11	8-18	GP-11	Book entitled "Cotton Insect Control," by David F. Young, Jr., published in 1969. (2:179)
12	8-18	GP-12	Report from the Co-operative Extension Work in Agriculture and Home Economics, U. S. Department of Agriculture, University of California, and County of Kings Cooperating, called "Notes on Changes," dated June, 1971. (2:207)
13	8-18	GP-14	A picture of a Model 47-G Bell helicopter equipped with a microfoil boom. (2:262)
14	8-18	GP-15	A picture of a Cessna Agwagon, Model "B," a fixed-wing aircraft. (2:262)
15	8-19	GP-13	Arizona Rules and Regulations on Application of Pesticides, dated June, 1961. (3:295)
16	8-19	GP-16	A photocopy document of five pages entitled "Selected Research Projects Supported by Cotton Producers (Cotton Incorporated Research Program)" Limited to items designated as 1 through 16. (3:329)
17	8-19	GP-17	Book entitled "Monitoring Agricultural Pesticide Residues 1965-67" by the Agricultural Research Service, U. S. Department of Agriculture, Jan. 1969. References limited to DDT residues. (3:362)
18	8-19	Int. USDA-1	Pamphlet entitled "DDT and Related Insecticides in Milk," by E. F. Knipling, a reprint on the Journal of Milk and Food Technology, Vol. 13, No. 5, Sept.-Oct., 1950. (3:391)
19	8-24	GP-18	A one-sheet document with data on both sides entitled "Control of Chemical Drift," by Robert W. Brazelton, Extension Agricultural Engineer, Davis. In the upper right-hand corner there is a figure OSA #n5 and 7/71. (4:458)
20	8-24	USDA-1	A photocopy identified by the caption "Approved Label for Micronized DDT Dust," stating below USDA Registration No. 10384-1 (4:525)

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21	8-24	USDA-2	Photocopy of a Plant Protection Division registration, entitled "Micronized DDT/Carbaryl Dust," having the identification USDA Reg. No. 10384-2. (4:539)
22	8-24	Int. USDA-2	Document bearing the caption "Alternate Methods in Pest Control," by E. F. Knipling, Entomology Research Division, Agricultural Research Service. (1963) (4:550)
23	8-24	Int. USDA-3	Pamphlet entitled "Alternate Methods of Controlling Insect Pests," by Edward F. Knipling, Ph.D. Published as an FDA paper, February 1969. (4:552)
24	8-24	Int. USDA-4	A brochure entitled "Some Basic Principles in Insect Population Suppression," by E. F. Knipling, March 1966. (4:553)
24A	8-24	Ref. Int. USDA	A group of four pamphlets by Dr. E. F. Knipling which relate to the sterility method for insect population. (4:554)
25	8-25	GP-19	A 23-page statement entitled "Reasons Underlying the Registration Decisions Concerning Products Containing DDT, 2, 4, 5-T, Aldrin and Dieldrin," issued by the Environmental Protection Agency, March 18, 1971. (5:603)
26	8-25	GP-20	Vitae of Dr. T. A. Loomis. (5:606)
27	8-25	GP-21	A two-page letter dated August 6th, 1970, addressed to the Hearing Clerk, HEW, and signed by Robert L. Roudabush, President of the Society of Toxicology. (5:626)
28	8-25	GP-22	A publication by O. Garth Fitzhugh and Arthur A. Nelson, entitled "The Chronic Oral Toxicity of DDT (2, 2-Bis, (p-Chlorophenyl-1, 1, 1-Trichloroethane published in The Journal of Pharmacology and Experimental Therapeutics in 1947, Volume 89, starting with page 18. (5:630)
29	8-25	GP-23	Document entitled "Observations on Inbred Mice Exposed to DDT," by B. E. Bennison and F. K. Mostofi, published in 1950 in the Journal of the National Cancer Institutes. (5:647)

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30	8-25	GP-24	A paper entitled "Bioassay of Pesticides and Industrial Chemicals for Tumorigenicity in Mice, A Preliminary Note," by Innes et als; published in the Journal of the National Cancer Institute in 1969, Vol. 42, page 1101. (5:652)
31	8-25	GP-25	A paper entitled "Study of the Potential Carcinogenicity of DDT in the Syrian Golden Hamster," by Agthe, Garcia, Shubik, Tomatis and Wenyon," published in the Proceedings of the Society for Experimental Biology and Medicine, 1970, Vol. 134, pp. 113-116. (5:659)
32	8-26	GP-26	A document entitled "Evaporation of Pesticides," by G. S. Hartley; in Advances in Chemistry Series, No. 86, American Chemical Society, 1969. (6:738)
33	8-26	GP-27	Regulations adopted by Oregon State Department of Agriculture pursuant to State law, and specifically Section 26-550, which describes the restrictions, limitations, and permissible uses of DDT in Oregon. (6:753)
34	8-31	GP-28	Two-page document, a copy of letter-memorandum from Louis M. Rousselot, M.D., Deputy Assistant Secretary of the Office of Assistant Secretary of Defense. 4/28/70. (7:784)
35	8-31	GP-29	Two-page document dated 28 June 1971, which appears to be a memorandum by Harold G. Russell, Chief, Entomology Section, Buildings and Grounds Branch, Facilities Engineering Division: "Use of DDT in Panama." (7:810)
36	8-31	GP-30	A consolidation of orders for DDT which have been processed through the Defense Supply Agency. (7:813)
37	8-31	GP-31	Resumé of Dr. Edward R. Laws, Jr. (7:861)
38	8-31	GP-32	Pamphlet entitled "Men with Intensive Occupation Exposures to DDT," Edward R. Laws, Jr., M.D. Reprinted from the Archives of Environmental Health, December 1967, Volume 15. (7:869)

Case No.	1971 DATE	Party No.	SUBJECT
39	8-31	GP-33	Two-page pamphlet which will be released in September 1971, entitled "Evidence of Antitumorigenic Effects of DDT," Edward R. Laws, Jr. (7:897)
40	9-1	GP-34	Document by Anne R. Yobs, entitled "Mean Levels of Selected Chlorinated Hydrocarbon Pesticide Residues in Adipose of the General Population." June, 1971. (8:968)
41	9-1	GP-35	Copy of paper by H. Keith Sikes which appeared under the heading of "Guidelines for Control of Rabies" in the June 1970 issue, Volume 60, No. 6, American Journal of Public Health, and with particular reference to page 1138 of that exhibit, under the heading "Bats." (8:993)
42	9-1	GP-36	Document published by the U. S. Department of Health, Education, and Welfare, Public Health Service, Health Services and Mental Health Administration entitled "National Communicable Disease Center, Zoonoses Surveillance," dated 1968. (8:1006)
43	9-1	GP-37	Report issued by the World Health Organization under date of 1970. It's identification is WHO/VBC/70.215, basically written by Mr. F. P. Rowe of the Ministry of Agriculture, with particular references to pages 4, 5, 6, and 15. (8:1042)
44	9-1	GP-38	Publication from the World Health Organization Vector Control in 1966, identified as 66:217, page 165, an article entitled "The Resistance of the House Mouse to Anticoagulants," written by F. P. Rowe, and R. Redfern. (P. 165, 166 & 167.) (8:1046)
45	9-2	GP-39	A hardbound book entitled "DDT Insecticides, Volume II, Human and Veterinary Medicine," 1959, with reference to that part of the volume from pages 251 through 504, by Dr. Simmons. (9:1077)
46	9-2	GP-40	Compilation of state pest-control laws. (9:1101)
47	9-8	USDA-3	Map showing current distribution and previous distribution of the gypsy moth. (10:1129)
48	9-8	USDA-4	Prints of seven slides shown and explained by Mr. McIntyre on the Gypsy Moth. (10:1148)

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49	9-8	USDA-5	For identification: EXCLUDED. Copy of press release by N. J. Department of Agriculture citing a situation in that state during past 2 or 3 years; dated 9-8-70. (10:1179)
50	9-8	USDA-6	Pamphlet entitled "Effect of Defoliation by the Gypsy Moth," Neely Turner, Editor, dated June 1963. (10:1184)
51	9-8	USDA-7	A chart depicting amounts of defoliation in different counties of Pennsylvania, entitled "Land Area Comparison, 1971, Gypsy Moth Defoliation, 1971." (10:1194)
52	9-8	USDA-8	Seven volumes of documents put out by the U. S. Department of Agriculture, dated 1957 through 1963, entitled "Insects Not Known to Occur in the United States." Another pamphlet is also included with the same title, marked as Vol. 14-21 and Series 162-189. (10:1223)
53	9-8	USDA-9	Letter dated 24 March 1970, Department of the Air Force, Headquarters, United States Air Force, Subject: Insecticidal Treatment of Cargo Aircraft Departing Vietnam. (10:1251)
54	9-8	USDA-10	Resumé, Robert M. Altman. (10:1259)
55	9-9	USDA-11	Pamphlet entitled "Biology of the European Chafer in Northeastern United States" by H. Tashiro et als; bulletin 828, June, 1969, New York State Agricultural Experiment Station, Cornell University, Geneva, New York. (11:1283)
56	9-9	USDA-12	Document entitled "Abstract, Insecticidal Dusts Against Japanese Beetles and European Chafers for Disensecticization of Transport Vehicles" by J. Fiori et als; Journal of Economic Entomology, Vol. 62, number 1, pp. 8 and 9, February 1969. (11:1286)
57	9-9	USDA-13	Prints of four slides presented by Dr. Haruo Tashiro on the European Chafer. (11:1303)
58	9-9	USDA-14	Pamphlet of the Agricultural Research Service, United States Department of Agriculture, which bears the legend ARS 82-6-4 February, 1971,"List of Intercepted Plant Pests, 1969." (11:1307)

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59	9-9	USDA-15	Two-page document entitled "United States Department of Agriculture Summary of Results of Inspections for Adult Japanese Beetles on Commercial Passenger and Cargo Planes, 1958-63," compiled by R. A. Roberts, Plant Pest Control Division, ARS. (11:1313)
60	9-9	USDA-16	United States Department of Agriculture Handbook number 236 entitled "The Japanese Beetle in the United States," revised August, 1970. (11:1315)
61	9-9	Int. USDA-5	Curriculum Vitae, Jesse L. Steinfeld, M.D. (11:1335)
62	9-9	Int. USDA-6	Publication of the Center for Disease Control called "Malaria Surveillance," May 1971 - An annual report for the year 1970 on malaria in the U. S. (11:1363)
63	9-9	Int. USDA-7A 7B	Two documents from the Center for Disease Control, entitled "Plague Surveillance," dated July 1970 and July 1971, reports number 1 and number 2. (11:1363)
64	9-9	Int. USDA-8	WHO publication No. 467, entitled "WHO Expert Committee on Malaria," Fifteenth Report, dated 1971. (11:1363)
65	9-9	Int. USDA-9	Publication entitled "Safe Use of Pesticides in Public Health," WHO Technical Report Series No. 356. Sixteenth Report of the WHO Expert Committee on Insecticides, dated 1967. (11:1363)
66	9-9	Int. USDA-10	Publication entitled "Insecticide Resistance and Vector Control," WHO Technical Report Series No. 443, the Seventeenth Report of the WHO Expert Committee on Insecticides, 1970. (11:1363)
67	9-9	Int. USDA-11	Copy of document entitled "Workshop on Monitoring of Human Mutagenesis," H. E. Sutton, 1969. (11:1393)
68	9-14	R-1	Curriculum Vitae, Lorenzo Tomatis. (12:1416)
69	9-14	R-2	The 1970 Annual Report of the World Health Organization entitled "International Agency for Research on Cancer," Lyon, France. With particular reference to pages 66 to 70. (12:1418)
70	9-14	R-3	Seven sheets, "Summary of Data from the Experimental Study on DDT in Lyon," by Lorenzo Tomatis for the Scientific Council in June, 1971. (12:1418)

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71	9-14	Int. USDA-12	Curriculum Vitae, John Higginson. (12:1445)
72	9-14	Int. USDA-13	Pamphlet entitled "Present Trends in Cancer Epidemiology," by John Higginson, 1968. (12:1453)
73	9-14	Int. USDA-14	Two-page document, a photocopy of an article entitled "Retention of Pesticides in Human Adipose Tissue--Preliminary Report," by Deichmann et als. (12:1473)
74	9-21	Int. Cannon-1	A one-sheet document dated July 1969, entitled "The Vegetable Grower's News," Volume 24, No. 1, "The Persistence of Pesticides in Soil," D. E. Greenwood, Entomologist, Virginia Truck Experiment Station. (13:1611)
75	9-21	Int. Cannon-2	Vitae, Paul P. Burbutis. (13:1625)
76	9-21	Int. Cannon-3	Six photoprints identical with the six slides which were shown and explained in the record. Each photoprint contains a number and the initials "PPB," which stands for Paul P. Burbutis. (13:1631)
77	9-21	Int. Cannon-4	Series of documents "Status of the European Corn Borer," 1965, 1966, 1967, 1968, 1969 and 1970. (13:1633
78	9-21	Int. Cannon-5	Six-page document entitled "Sweet Pepper and Corn Studies--1970, Delaware," by Paul P. Burbutis et als, with specific reference to Table 3, which bears the title "European Corn Borer Moth Flights, Egg Masses, and % Fruit Infested, on Sweet Peppers, Bridgeville, Del., 1970." (13:1637)
79	9-21	Int. Cannon-6	Four-page document "The Re-Introduction and Recovery of Lydella stabulans grisescens, a Parasite of the European Corn Borer in Delaware," by R. S. Van Denburgh et als, Journal of Economic Entomology, Vol. 55, No. 1, February 1962. (13:1654)
80	9-22	Int. USDA-15	T. H. Jukes, Bibliography. (14:1695)
81	9-22	Int. USDA-16	Biographical Sketch, Kenneth R. Hill. (14:1714)
82	9-22	Int. USDA-17A	Seven-page document "Report for Pesticide Residues Committee, Agricultural Research Institute, National Academy of Sciences, National Research Council," K. R. Hill, March 12, 1968. (14:1732)

Case No.	1971 DATE	Party No.	SUBJECT
83	9-22	Int. USDA-17B	Pamphlet bearing the legend "ARS-33-63, December 1960," "Pesticide Residues in Meat and Milk, A Research Report, Agricultural Research Service, United States Department of Agriculture," (14:1732)
84	9-22	Int. USDA-18	Pamphlet "Survey of Chlorinated Insecticide Residue Analyses in Soils." (14:1740)
85	9-22	Int. USDA-19	Four-page document "Residues of Aldrin, Dieldrin, Chlordane and DDT in Soil and Sugarbeets," Jerome A. Onsager et als, The Journal of Economic Entomology, Volume 63, no. 4, pp.. 1143 to 1146, August 1970. (14:1747)
86	9-22	Int. USDA-20	Pamphlet "IUPAC Commission on Terminal Residues," by K. R. Hill, dated January 21, 1970, Journal of the Association of Official Analytical Chemists, Vol. 53, September 1970. (14:1757)
87	9-22	Int. USDA-21	Document "IUPAC Commission on Terminal Residues by K. R. Hill. (14:1768)
88	9-23	Int. USDA-22	Pamphlet of the United States Department of Agriculture, Technical Bulletin 1122, "The Acute Toxicity of Chlorinated Hydrocarbon and Organic Phosphorus Insecticides to Livestock," by R. D. Radeleff et als. (15:1780)
89	9-23	Int. USDA-23	A ten-page document "Restricting the Uses of Insecticides--What Are the Alternatives?" by C. H. Hoffmann, April, 1970. (15:1863)
90	9-23	Int. USDA-24	Four pages from National Academy of Science publication 1695, 1969, "Insecticides - History and Princip[illegible] of Insecticidal Control." (15:1871)
91	9-23	Int. USDA-25	A one-page document from Agricultural Chemical, December 1970, "Crop Protecting Chemicals Must Be Used to Improve Food Supplies," by C. R. Hoffmann et als, (15:1894)
92	9-23	Int. U3DA-26	Document issued by the United States Department of Agriculture, Economic Research Service, Agricultural Economic Report No. 158, "DDT Used in Farm Production." April 1969. (15:1902)

Case No.	1971 DATE	Party No.	SUBJECT
93	9-28	Int. USDA-27	Pamphlet, "An Epidemiologic Application of the Study of DDE Levels in Whole Blood," by John E. Davies et als, American Journal of Public Health, Vol. 59, No. 3, March, 1969. (Figure page 436.) (16:1979)
94	9-28	Int. USDA-28	Document, "Strategy on Pesticide Epidemiology," prepared by Dr. Davies. (16:2022)
95	9-29	Int. USDA-29	Black and white prints of slides that were shown by Dr. Davis: Nos. A, B, F, G, I, K, L, M, N, O, R, S, T, U, and V. The following were EXCLUDED: Nos. C, D, E, H, J, P, and Q. (17:2061)
96	9-29	Int. USDA-30	Curriculum Vitae, Donald Pryse Morgan. (17:2067)
97	9-29	Int. USDA-31A	Pamphlet from Archives of Environmental Health, March 1971, Volume 22, consisting of pages nos. 301 through 308, "Absorption, Storage, and Metabolic Conversion of Ingested DDT and DDT Metabolites in Man," by Donald P. Morgan et al. (17:2079)
98	9-29	Int. USDA-31B	Pamphlet from Archives of Environmental Health, March 1971, Volume 22, consisting of pages 309 through 315, "Urinary Excretion of DDA Following Ingestion of DDT and DDT Metabolites in Man," by Donald P. Morgan et al. (17:2079)
99	9-29	Int. USDA-32	Pamphlet from Archives of Environmental Health, April 1970, Volume 20, consisting of pages 452 through 457, "Chlorinated Hydrocarbon Pesticide Residue in Human Tissues" by Donald P. Morgan, et al. (17:2080)
100	9-29	Int. USDA-33	Curriculum Vitae - Clifford Creighton Roan. (17:2128)
101	9-30	Int. USDA-34	Curriculum Vitae, Wayland J. Hayes, Jr. (18:2196)
102	9-30	Int. USDA-35	Document, from official records of World Health Organization, No. 190, "The Place of DDT in Operations Against Malaria and Other Vector-Borne Diseases," April 1971. (18:2199)

Case No.	1971 DATE	Party No.	SUBJECT
103	9-30	Int. USDA-36	Document "Toxicity of Pesticides to man: risks from present levels" by W. J. Hayes, Jr., 1967. (18:2204)
104	9-30	Int. USDA-37	A hard bound book of pages 11 through 247, which is in evidence as GP-39. This document is a volume bearing the title "DDT Insecticides, Vol. 2, Human and Veterinary Medicine," by W. J. Hayes, Jr. et als. (18:2212)
105	9-30	Int. USDA-38	Document "Table 1, Dosage-Response of DDT in Man." The identical table is shown as Table 4 on page 180 of Exhibit Intervenor USDA-35. (18:2221)
106	9-30	Int. USDA-39A	Document "The Effect of Known Repeated Oral Doses of Chlorophenothane (DDT) in Man" by Dr. Wayland J. Hayes, Jr., et als. (18:2227)
107	9-30	Int. USDA-39B	Pamphlet, pages 119 through 135, a reprint from the Archives of Environmental Health, January 1971, Volume 22, "Evidence of Safety of Long-Term High Oral Doses of DDT for Man," by Wayland J. Hayes, Jr., et als. (18:2227)
108	9-30	Int. USDA-40	A one-page document, by Dr. Hayes, just prior to 1970, "Table 2. Effect of DDT in Relation to Its Concentration in the Brain." (18:2251)
109	10-6	Int. USDA-41	Curriculum Vitae, Lloyd W. Hazleton. (20:2456)
110	10-6	Int. USDA-42	A one-page exhibit by Dabney S. Wellford, September 27, 1971. "U. S. Fiber Consumption, 1970." (20:2512)
111	10-6	Int. USDA-43	A handwritten sheet prepared by Dr. Thomas H. Maren, which reflects identically the chalk on the blackboard, from which he testified. (20:2557)
112	10-6	Int. USDA-44	A one-page document reprinted from 14 May 1971, volume 172, pages 728-729, Science, by Thomas H. Maren et als. (20:2551)
113	10-6	Int. USDA-45	Document "Coprecipitation of Carbonic Anhydrase by 1, 1-Bis (p-chlorophenyl)-2,2,2-trichloroethane, 1, 1-Bis (p-chlorophenyl)-2,2-dichloroethyiene, and Dieldrin." Pocker et als, 1971. (20:2553)

Case No.	DATE	Party No.	SUBJECT
114	10-6	Int. USDA-46	A 13-page document "Economic Effect of Restricting the Use of DDT on Cotton," prepared in the Production Resources Branch, Farm Production Economics Division, Economic Research Service, USDA, Oct. 13, 1970. (20:2573)
115	10-7	Int. USDA-47	Biographical sketch, Norman E. Borlaug. (21:2600)
116	10-7	Int. USDA-48	Document "The Basic Concepts Which Influence the Choice of Methods for Use in Breeding for Disease Resistance in Cross-Pollinated and Self-Pollinated Crop Plants," by Norman E. Borlaug; pages 327 through 347 with specific reference to pages 329, 331, and 335. (21:2621)
117	10-7	Int. USDA-49	EXCLUDED. Title: "Lecture on the Occasion of the Award of the Nobel Peace Prize 1970, Oslo, Norway, Dec. 11, 1970, entitled " 'The Green Revolution, Peace and Humanity' by Norman E. Borlaug." (21:2635)
118	10-8	Int. USDA-50	Sketch by Dr. Davison, an explanation of the definition of para-para-prime DDT. (22:2715)
119	10-8	Int. USDA-51	Document "Dieldrin and p,p' - DDT Effects on Egg Production and Eggshell Thickness of Chickens," by K. L. Davison, and J. L. Sell. (22:2726)
120	10-8	Int. USDA-52	Document, a reprint from Agricultural and Food Chemistry, Volume 19, No. 1, page 58, January - February 1971, "Aniline Hydroxylase, N-Demethylase, and Cytochrome P_{450} in Liver Microsomes of Hens Fed DDT and Dieldrin," by Kenneth L. Davison et al. (22:2747)
121	10-14	Int. USDA-53	Document, "Review of DDT and Alternatives for Control of Cotton Insect-Pests," by R. L. Ridgway and others, September 16, 1970. (24:2896)
122	10-14	Int. USDA-54	Selected Vitae - William B. Jackson (24:2962)
123	10-15	Int. USDA-55	Document, "DDT Residue Disappearance from Field Sprayed Lettuce," by Stuart Race et al; from the Bulletin of the Environmental Contamination in Toxicology, Volume 5, No. 1, 1970, and the pagination appears to be 30 through 33. (25:2992)

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124	10-15	Int. USDA-56	A photo-print marked "Model Ecosystem designed by Robert L. Metcalf, presentation by Gary M. Booth, Oct. 15, 1971." (25:3037)
125	10-15	Int. USDA-57	A photo-print on the back of which has been written, "Radiogram of samples of water and organisms spotted on a thin layer chromatograph plate showing the distribution of the DDT metabolites by using x-ray film, G. M. Booth, October 15, 1971." (25:3045)
126	10-15	Int. USDA-58	Document "Summary of DDT Ecosystem Experiment." (25:3048)
127	10-20	Int. USDA-59	PR Notice 69-17, 11/20/69 - Notice to Manufacturers, Formulators, Distributors, and Registrants of Economic Poisons. (26:3083)
128	10-20	Int. USDA-60	Page 18827 of Federal Register, Vol. 34, No. 226, 11/25/69 - Economic Poisons Containing DDT for Certain Uses. (26:3083)
129	10-20	Int. USDA-61	Two charts - "Table 1, Chlorinated Hydrocarbons in Atlantic Ocean Organisms;" and "Chlorinated Hydrocarbons in North Atlantic Organisms." (26:3087)
130	10-20	Int. USDA-62	Ned D. Bayley, Biographical sketch. (26:3104)
131	10-20	Int. USDA-63	Letter, Bayley to Johnson. 12/30/70. (26:3113)
132	10-21	GP-41	80 prints of slides shown during the testimony of Dr. David Young. 8/17/71. (27:3129)
133	10-21	R-4	Resume, William L. Reichel. (27:3134)
134	10-21	R-5	Document "Identification of Polychlorinated Biphenyls in Two Bald Eagles by Combined Gas-Liquid Chromatography-Mass Spectrometry" by G. E. Bagley, W. L. Reichel, and E. Cromartie. (27:3136)
135	10-21	R-6	Table captioned "The Interference from PCB Compounds in the Determination of p, p'-DDE." (27:3141)
136	10-21	R-7	Curriculum Vitae, Jerry A. Burke. (27:3151)
137	10-21	R-8	Vita, July 1971, David L. Stalling. (27:3178)
138	10-21	R-9	Document "Pesticide Monitoring-Fish, 1970, Samples for Laboratory Cross-Checks, Fish-Pesticide Research Laboratory." (27:3181)

EXH. NO.	DATE	ADMTY NO.	EXHIBIT
139	10-21	R-10	[illegible] "Analysis of Organochlorine Residues in Fish: Current Research at the Fish-Pesticide Research Laboratory" by David L. Stalling, Jan. 11, 1971. (27:3184)
140	10-22	R-11	Background Summary, Dr. H. P. Nicholson. (28:3279)
141	10-22	R-12	Personnel Data Record, Tony J. Peterle. (28:3285)
142	10-22	Resp. Ref.-1	"DDT in Marine Mammals." Fourteen separate articles as reference material. (28:3305 - 3307)
143	10-26	R-13	Resumé - John B. Dimond. (29:3461)
144	10-26	R-14	Document "DDT Residues in Robins and Earthworms Associated with Contaminated Forest Soils," by John B. Dimond, Glenn Y. Belyea, Raymond E. Kaduncé, A. Stanley Getchell, and John A. Blease, Maine Agricultural Experiment Station, University of Maine, Orono. Vol. 102, No. 9, Sept. 1970. (29:3466)
145	10-26	R-15	"DDT Residue Persistence in Red-Backed Salamanders," J. Dimond, Natural Environment, Vol. 3, No. 4, 1968. (29:3471)
146	10-26	R-16	"Persistence of DDT in Crayfish in a Natural Environment." Vol. 49, No. 4, Early Summer, 1968. (29:3473)
147	10-26	R-17	Dr. Dimond's paper entitled "Persistence of DDT in Wild Populations of Small Mammals," Vol. 221, No. 5179, pp. 486-487, Feb. 1, 1969. (29:3476)
148	10-26	R-18	Dr. Dimond's paper entitled, "DDT Persistence in Wild Hares and Mink," (J. A. Sherburne and J. B. Dimond). (29:3479)
149	10-26	R-19	A paper by Kendall Warner and Owen C. Fenderson entitled "Effects of DDT Spraying for Forest Insects on Maine Trout Streams." (29:3484)
150	10-27	R-20	A 13-page document entitled "Resumé - Philip C. Kearney, Leader, Pesticide Investigations-Behavior in Soils, Crops Research Division, USDA." (30:3521)
151	10-27	R-21	Paper entitled "Insecticide Residues in Soils," by C. A. Edwards Reprint from Residue Reviews, Vol. 13, 1966. (30:3528)

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152	10-27	R-22	Document entitled "Persistence of Some Chlorinated Hydrocarbon Insecticides as Influenced by Soil Types, Rate of Application and Temperature," by E. P. Lichtenstein et al, a reprint from the Journal of Economic Entomology, Vol. 52, No. 1, pages 124 through 131, dated February 1959. (30:3529)
153	10-27	R-23	A 6-page document entitled "Curriculum Vitae, Charles Deane Gish." (30:3569)
154	10-28	R-24	Curriculum Vitae, Philip A. Butler (31:3694)
155	10-28	R-25	"Fixation of DDT in Estuaries," Philip A. Butler. (31:3698)
156	10-28	R-26	Document "Pesticides in the Marine Environment," Philip A. Butler, June 1966. (31:3698)
157	10-28	R-27	Document "The Significance of DDT Residues in Estuarine Fauna," Butler, 1970. (31:3698)
158	10-28	R-28	Document "Monitoring Pesticide Pollution," Philip A. Butler. 1969. (31:3698)
159	10-28	R-29	Document "The Association of DDT Residues with Losses in Marine Productivity," Butler, 1970. (31:3698)
160	10-28	R-30	Document "Influence of Pesticides on Marine Ecosystems P. A. Butler, 1971. (31:3698)
161	10-28	GP-42	Chart entitled "Residue Decline Plot from Data in USDI Circular 335, August 1970. (Gulf Breeze Lab, Florida Progress Report FY 1969) p. 20, "Chemical Assays" by A. J. Wilson, Jr. et als. (31:3780)
162	10-28	R-31	Resumé, Robert E. Reinert. (31:3807)
163	10-28	R-32	Document "Pesticide Concentrations in Great Lakes Fish," Reinert, 1970. (31:3811)
164	10-28	R-33	Document "Insecticides and Great Lakes Lake Trout and Coho Salmon" Progress Report for Annual Meeting, Great Lakes Fishery Commission, June 1970. (31:3814)
165	10-29	R-34	Biographical sketch - Kenneth J. Macek. (32:3862)
166	10-29	R-35	Document "Biological Magnification of Pesticide Residues in Food Chains," Macek. (32:3864)

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167	10-29	R-36	Document "The Uptake, Distribution and Elimination of Dietary ^{14}C-DDT and ^{14}C-Dieldrin in Rainbow Trout," Macek et als, 1970. (32:3864)
168	10-29	R-37	Document "Reproduction in Brook Trout (Salvelinus fontinalis) Fed Sublethal Concentrations of DDT," Macek, 1968. (32:3864)
169	10-29	R-38	Document "Growth and Resistance to Stress in Brook Trout Fed Sublethal Levels of DDT," Macek, 1968. (32:3864)
170	10-29	R-39	Curriculum Vitae - Umberto Saffiotti, M.D. (32:4003)
171	11-2	R-40	Document "Federal Environmental Pesticide Control Act," March 23, 24, 25, and 26, 1971. (Accepted only as to the recommendations on pages 1 and 2, and para. II on page 9.) (34:4282)
172	11-1	Int. USDA-64	Document "Effect of DDT on Reproduction in the Rat," Ottoboni, 1968. (33:4102)
173	11-2	R-41	Resumé - Don William Hayne. (34:4217)
174	11-2	R-42	Biographical sketch - Dr. Mark M. Luckens. (34:4251)
175	11-2	R-43	Document, "Bats: Sensitivity to DDT," Luckens, et al, 1964. (34:4253)
176	11-2	R-44	Document, "Toxicity of Dieldrin and Endrin to Bats," Luckens et al, 1965. (34:4253)
177	11-2	R-45	One-page typewritten document entitled, "DDT: Seasonal Changes in the Sensitivity of the Big Brown Bat to DDT, Luckens, 1971. (34:4254)
178	11-2	R-46	Biographical sketch - Croswell Henderson. (34:4292)
179	11-2	R-47	Document "Relative Toxicity of Ten Chlorinated Hydrocarbon Insecticides to Four Species of Fish," Henderson et al, 1959. (34:4294)
180	11-2	R-48	Document "The Toxicity of Organic Phosphorus Insecticides to Different Species of Warmwater Fishes," Henderson, et al. 1962. (34:4294)
181	11-2	R-49	Document "The Toxicity of Organic Phosphorus and Chlorinated Hydrocarbon Insecticides to Fish," Henderson et al. 1959. (34:4294)

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182	11-2	R-50	Document "The Acute Toxicity of Some Pesticides to Fish," Henderson, et al. 1966. (34:4294)
183	11-2	R-51	Document "Organochlorine Insecticide Residues in Fish (National Pesticide Monitoring Program)," Henderson, et als. 1969. (34:4305)
184	11-2	R-52	Document "Organochlorine Insecticide Residues in Fish - Fall 1969, National Pesticide Monitoring Program," Henderson, et als. 1971. (34:4305)
185	11-4	R-53	Resume of William H. Stickel. (35:4351)
186	11-4	R-54	Document, "Studies on the Effects of DDT on Birds," Bernard. 1963. (35:4358)
187	11-4	R-55	Document "Lethal Mobilization of DDT by Cowbirds," Van Velzen, et als. 1971. (35:4364)
188	11-4	R-56	Testimony of William H. Stickel, Patuxent Wildlife Research Center, entitled "Direct Mortality of Birds from Heavy Applications of DDT." 1971. (35:4377)
189	11-4 (For identification.)	R-57	EXCLUDED. Document "Dutch Elm Disease Program in Michigan," Wallace. 1961. (35:4388)
190	11-4	R-58	Statement of Qualifications - Robert G. Heath. (35:4445)
191	11-4	R-59	Document "Marked DDE Impairment of Mallard Reproduction in Controlled Studies." Heath, et als. 1969. (35:4447)
192	11-4	R-60	Document "Effects of Polychlorinated Biphenyls on Birds," Heath, et als. 1970. (35:4467)
193	11-4	R-61	Table entitled, "Shell Thicknesses (mm) of Eggshells Sampled from Mallards Fed Mercury Compounds at 5 ppm Hg in Dry Feed." Heath. 1971. (35:4474)
194	11-11	R-62	Vita - Jerry R. Longcore. (38:4616)
195	11-11	R-63	Document "DDE Thins Eggshells and Lowers Reproductive Success of Captive Black Ducks," Longcore, et als, 1971. (38:4618)

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196	11-11	R-64	Photograph of "Eggs with thinned and crushed shells from black ducks fed 3 ppm DDE (wet weight) in the diet," signed by Jerry R. Longcore and dated November 8, 1971. (38:4621)
197	11-11	R-65	Resume - Richard D. Porter. (38:4663)
198	11-11	R-66	Document "Dieldrin and DDT: Effects on Sparrow Hawk Eggshells and Reproduction," Porter, et al. 1969. (38:4665)
199	11-11	R-67	Document "DDE Thins Eggshells of Captive American Kestrels." Porter, et als. 1970. (38:4665)
200	11-16	R-68	Curriculum Vita - Lawrence J. Blus. (39:4729)
201	11-16	R-69	Document "Measurements of Brown Pelican Eggshells from Florida and South Carolina." Blus. 1970. (39:4731)
202	11-16	R-70	Chart entitled "Association of DDE Residues in Brown Pelican Eggs from Nine Colonies in Florida, Two Colonies in South Carolina, and One Colony in California, with the Percent of Pre-1947 Eggshell Thickness," McLane and Blus. 1971. (39:4735, 4742, 4779)
203	11-16	R-71	Three charts and table entitled "PCB's (PPM) - Association of PCB Residues in Brown Pelican Eggs from Nine Colonies in Florida, Two Colonies in South Carolina, and one Colony in California with the Percent of Pre-1947 Eggshell Thickness." McLane and Blus. 1971. (39:4742, 4779)
204	11-16	R-72	Table re estimate number of young each nesting pair of brown pelicans must produce each year in order to maintain a stable population. Blus, et al. 1971. (39:4764)
205	11-16	R-73	Three-page table entitled "Residues of Environmental Pollutants in Brown Pelican Eggs ppm (Fresh wet weight)." Blus. 1971. (39:4779)
206	11-16	R-74	Tables entitled "Brown Pelican Eggs Florida and South Carolina 1969." Blus, 1969. (39:4779)
207	11-16	R-75	Biographical sketch - James O. Keith. (39:4809)

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208	11-16	R-76	Document "Annual Progress Report, Wildlife Research Work Unit, Denver Wildlife Research Center, Calendar Year 1967, Kinetics of Pesticides in Natural Marsh Ecosystems." Keith et als. (39:4813)
209	11-16	R-77	Paper entitled "Reproductive Failure in Brown Pelicans on the Pacific Coast." Keith, et als. 1970. (39:4822)
210	11-17	Int. USDA-65	Document "Section of Pesticide - Wildlife Ecology," Finley. 1971. (14 pages; 11-14 from Keith data) (40:4898)
211	11-17	R-78	Resume - Thomas J. Cade. (40:4910)
212	11-17	R-79	Document "DDE Residues and Eggshell Changes in Alaskan Falcons and Hawks." Cade, et als. 1971. (40:4932)
213	11-17	R-80	Document "Peregrines and Pesticides in Alaska." Cade et als. 1967. (40:4932)
214	11-17	R-81	EXCLUDED. Document "Decrease in Eggshell Weight in Certain Birds of Prey," Ratcliffe. 1967. (40:4949, 4951)
215	11-17	R-82	EXCLUDED. Document "Changes Attributable to Pesticides in Egg Breakage Frequency and Eggshell Thickness in Some British Birds." Ratcliffe. 1970. (40:4949, 4951)
216	11-18	R-83	Curriculum Vita - Joseph J. Hickey. (41:5009)
217	11-18	R-84	Document "Eggshell Changes in Certain North American Birds." Hickey, et al. 1970. (41:5014)
218	11-18	R-85	Document "Table 1. Selected Statistically Significant Eggshell Changes Since 1946." Hickey. 1971. (41:5022)
219	11-18	R-86	Document "Residue Levels of Chemical Pollutants in North American Birdlife," Keith, et al. 1970. (41:5025)
220	11-18	R-87	Chart concerning the Hawk Mountain Sanctuary Association, Kempton, Pennsylvania. Hickey. 1971. (41:5035)
221	11-23	R-88	Curriculum Vitae - David B. Peakall. (43:5176)

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222	11-23	R-89	Document "p, p' - DDT: Effect on Calcium Metabolism and Concentration of Estradiol in the Blood." Peakall. 1970. (43:5182)
223	11-30	R-90	Resumé - Robert R. L. Guillard. (44:5193)
224	11-30	R-91	Document "DDT Reduces Photosynthesis by Marine Phytoplankton." Wurster. 1968. (44:5208)
225	11-30	R-92	Document "Marine Phytoplankton Vary in Their Response to Chlorinated Hydrocarbons," Menzel, et als. 1970. (44:5208)
226	11-30	R-93	Resumé - Herman O. Sanders. (44:5298)
227	12-1	R-94	Ronald Eisler, Curriculum Vitae. (45:5342)
228	12-1	R-95	Document "Acute Toxicities of Organochlorine and Organophosphorus Insecticides to Estuarine Fishes." Eisler. 1970. (45:5346)
229	12-1	R-96	Resumé - Stephen Williams Hitchcock. (45:5418)
230	12-2	R-97	Vitae, July 1971, Blake F. Grant. (46:5448)
231	12-2	R-98	Curriculum Vitae of John Murray Anderson. (46:5522)
232	12-2	R-99	Document "Effect of DDT on Temperature Selection by Young Atlantic Salmon, Salmo salar," Anderson, et al, 1964. (46:5526)
233	12-2	R-100	Document "II. Sublethal Effects and Changes in Eco-systems. Assessment of the Effects of Pollutants on Physiology and Behavior," Anderson. 1971. (46:5526)
234	12-2	R-101	Document "Effect on Adult Returns of Exposure of Native Wild Smolt to Sublethal DDT." Anderson et al. 1971. (46:5546)
235	12-2	R-102	Four-page document of figures on residues prepared by Grant, Dec. 2, 1971. (46:5611)
236	12-3	R-103	Thomas W. Duke, Rejumé. (47:5628)
237	12-3	R-104	Biographical Information for Clarence M. Tarzwell. (47:5676)

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238	12-3	R-105	Document "Effects of Routine DDT Mosquito Larviciding on Wildlife." Tarzwell. 1948. (47:5679)
239	12-7	R-106	Resumé - George E. Burdick. (48:5728)
240	12-7	R-107	Document "The Accumulation of DDT in Lake Trout and the Effect on Reproduction." Burdick, et als. 1964. (48:5731)
241	12-7	R-108	Document "DDT: The Effect of Time and Rate of Feeding on the Reproduction of Salmonid Fishes, Reared and Held Under Controlled Conditions." Burdick et als. 1971. (48:5736)
242	12-7	R-109	Resumé - Howard E. Johnson. (48:5835)
243	12-7	R-110	Document "Coho Salmon Mortality and DDE in Lake Michigan." Johnson, et al. 1969. (48:5841)
244	12-8	R-111	Biography - Steven George Herman. (49:5881)
245	12-8	R-112	Document "Pesticides and the Western Grebe - A Study of Pesticide Survival and Trophic Concentration at Clear Lake, Lake County, California." Herman et als. 1969. (Pages 24, 25 and top half of page 26 is not a part of this exhibit.) (49:5891)
246	12-8	R-113	Table entitled "Western Grebe: Egg Residues of DDD (TDE) and Reproduction 1963-1970 at Clear Lake, Lake County, California. Herman, Dec. 8, 1971. (49:5899)
247	12-8	R-114	Resumé - Denzel E. Ferguson. (49:5963)
248	12-8	R-115	Document "Characteristics of three aquatic ecosystems containing insecticide-resistant fish populations." Finley. 1970. (49:5967, 5973. 55:6272)
249	12-9	R-116	Resumé - Dr. Joel Bitman. (50:6004)
250	12-9	R-117	Document "DDT Induces a Decrease in Eggshell Calcium. Bitman et als. 1969. (50:6009)
251	12-9	R-118	Photographs of normal eggshells and thin eggshells caused by organochlorine insecticides and viewed by the scanning electron microscope. McFarland, et als. 1971. (50:6018)

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252	12-9	R-119	Document "DDT Induced Inhibition of Avian Shell Gland Carbonic Anhydrase: A Mechanism for Thin Eggshells." Bitman et als. 1970. (50:6023)
253	12-9	R-120	Curriculum Vitae, David Pimentel. (50:6099)
254	12-10	Int. Cannon-7	Document "Release: September 8, 1971, 3:00 p. m., EDT, Acreage and Indicated Production of Principal Crops, September 1, 1971," USDA. (51:6132)
255	12-10	Int. Cannon-8	Document "1970 Annual Summary - Acreage - Yield - Production - Value, December 17, 1970," USDA. (51:6132)
256	12-10	R-121	Resumé - William Vernon Campbell. (51:6145)
257	12-14	R-122	Resumé - Joseph Charles Headley. (52:6170)
258	12-17	R-123	Biography - Robert Van Den Bosch. (55:6276)
259	12-17	R-124	Resumé - Mr. Everett Joseph Dietrick. (55:6301)
260	12-20	R-125	Resumé - Charles Gatewood Lincoln. (56:6446)
261	12-21	R-126	Resumé - Robert Lee Metcalf. (57:6469)
262	1-4-72	Int. EDF-1	Curriculum Vitae - Marvin Arthur Schneiderman. (58:6525)
263	1-4-72	Int. EDF-2	Document "Federal Environmental Pesticide Control Act," March 23, 24, 25, and 26, 1971. (Accepted only as to Appendix III, beginning on page 11.) (See Exh. R-40) (58:6538)
264	1-4-72	Int. EDF-3	Document "Food and Drug Administration Advisory Committee on Protocols for Safety Evaluation: Panel on Carcinogenesis Report on Cancer Testing in the Safety Evaluation of Food Additives and Pesticides. August, 1970. (58:6552)
265	1-4-72	Int. EDF-4	EXCLUDED. "Safety - Testing of Carcinogenic Agents." Mantel, et al. 1961. (58:6577)
266	1-4-72	Int. EDF-5	EXCLUDED. Document "The concept of threshold in carcinogenesis." Mantel. 1962. (58:6577)
267	1-4-72	Int. EDF-6	Appendix C, pages 492 - 495 of document entitled, "Report of the Secretary's Commission on Pesticides and their Relationship to Environmental Health," Parts I and II, U. S. Department of Health, Education, and Welfare, December 1969, Schneiderman. (58:6588)

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268	1-5	Int. EDF-7	Curriculum Vitae - Marvin Seymour Legator. (59:6640)
269	1-5	Int. EDF-8	Document "Chemical Mutagenesis Comes of Age - Environmental Implications." Legator. 1970. (59:6647)
270	1-5	Int. EDF-9	Document "Mutagenic Effects of Environmental Intrusions." Legator. 1970. (59:6674)
271	1-5	Int. EDF-10	Document "Cytogenetic Effects of DDT and Derivatives of DDT in a Cultured Mammalian Cell Line." Legator et als. 1971 (59:6679)
272	1-5	Int. EDF-11	Document "Cytogenetic and Mutagenic Effects of DDT and DDE in Vitro." Legator, et al. 1971. (59:6687)
273	1-5	Int. EDF-12	Document "In Vivo Cytogenetic Analysis - A Collaborative Study." Legator, et al. 1972. (59:6699)
274	1-5	Int. EDF-13	Table "Proportion of Females with One or More Dead Implantations," Legator. Jan. 5, 1972. (59:6767)
275	1-6	Int. EDF-14	Curriculum vitae - Robert W. Risebrough. (60:6786)
276	1-6	Int. EDF-15	Document "DDT Residues in Pacific Sea Birds: A Persistent Insecticide in Marine Food Chains." Risebrough, et als. 1967. (60:6794)
277	1-6	Int. EDF-16	Document "Pesticides: Transatlantic Movements in the Northeast Trades." Risebrough, et als. 1968. (60:6797)
278	1-6	Int. EDF-17	Document "Airborne Particulates in Pittsburgh: Association with p,p'-DDT." Antommaria, et als. 1965. (60:6805)
279	1-6	Int. EDF-18	Document "Chlorinated Hydrocarbons in Antarctic Birds," Risebrough, et al. 1972. (60:6805)
280	1-6	Int. EDF-19	Document "Determination of Polychlorinated Biphenyls in Environmental Samples." Risebrough. 1971. (60:6812)
281	1-6	Int. EDF-20	Graph from "Reproductive Failures of Ospreys, Pandion haliaetus." Risebrough, et als. 1972. (60:6817)

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282	1-6	Int. EDF-21	Document "Reproductive Failure of the Brown Pelican on Anacapa Island in 1969." Risebrough, et als. 1971. (60:6825)
283	1-6	Int. EDF-22	Document "Reproductive Status of the California Brown Pelican in 1970, with Notes on Breeding Biology and Natural History," Gress. 1970. (60:6829)
284	1-6	Int. EDF-23	(Three two-page documents.) "California Brown Pelican Survey," West Anacapa Island. Gress. April and June 1971. (The following parts of Int. EDF No. 23 for identification were EXCLUDED: a two-page document, "California Brown Pelican Survey," Anacapa Island, July 27, 1971. Howard R. Leach; and letter of 10 December 1971 from Daniel K. Odell to Howard Leach.) (60:6837)
285	1-6	Int. EDF-24	For identification: EXCLUDED. Document "The Truth About the California Brown Pelicans," Dr. J. Gordon Edwards. (60:6844)
286	1-6	Int. EDF-25	Document "Studies of the Brown Pelican Pelecanus occidentalis. Risebrough, et al. 1972. (60:6850)
287	1-6	Int. EDF-26	Document "Effects of Various Chlorinated Hydrocarbons." Risebrough et als. 1970. (60:6854)
288	1-6	Int. EDF-27	Document "Concentrations of Heavy Metals in Some Antarctic and North American Sea Birds." Risebrough, et als. 1971. (60:6860)
289	1-6	Int. EDF-28	(One-page table.) "Heavy Metal Concentrations in femurs of Brown Pelicans from California and Florida and of a White Pelican from California." Risebrough, et als. 1972. (60:6860)
290	1-6	Int. EDF-29	Document "Effects of Environmental Pollutants upon Animals Other Than Man," Risebrough. 1971. (60:6866)
291	1-7	Int. EDF-30	Document "Chlorinated Hydrocarbons in the Marine Environment," a report prepared by the Panel on Monitoring Persistent Pesticides in the Marine Environment of the Committee on Oceanography. Risebrough, member of panel. 1971. (61:6912)
292	1-7	Int. USDA-66	"DDT in Agriculture." Jukes. 1971. Being pages 540 to 542 of an Article appearing in Environmental Affairs, Vol. 1, No. 3, Nov. 1971. (61:7002)

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293	1-11	Int. EDF-31	Resume' - Dennis L. Meadows. (62:7019)
294	1-11	Int. EDF-32	For identification: EXCLUDED. Title: "System Simulation to Test Environmental Policy: DDT," Meadows, et al. 1971. (62:7042)
295	1-11	Int. EDF-33	Curriculum Vitae - Lawrence Robert Cory. (62:7051)
296	1-11	Int. EDF-34	Document "Distribution Patterns of DDT Residues in the Sierra Nevada Mountains." Cory, et als. (62:7054)
297	1-11	Int. EDF-35	Document "Environmental DDT and the Genetics of Natural Populations." Cory, et als. 1971. (62:7054)
298	1-12	Int. EDF-36	George Masters Woodwell - Biography. (63:7194)
299	1-12	Int. EDF-37	Document "The Energy Cycle of the Biosphere." Woodwell. 1970. (63:7202)
300	1-12	Int. EDF-38	Document "The Persistence of DDT in a Forest Soil." Woodwell. 1961. (63:7209)
301	1-12	Int. EDF-39	Document "Effect of DDT on Cone Production, Germination, and Seedling Survival in the Boreal Forest." Woodwell. 1962. (63:7210)
302	1-12	Int. EDF-40	Document "Persistence of DDT in Soils of Heavily Sprayed Forest Stands." Woodwell, et al. 1964. (63:7212)
303	1-12	Int. EDF-41	Document "DDT Residues in an East Coast Estuary: A Case of Biological Concentration of a Persistent Insecticide." Woodwell, et als. 1967. (63:7214)
304	1-12	Int. EDF-42	Document "DDT Residues Absorbed from Organic Detritus by Fiddler Crabs." Woodwell, et als. 1969. (63:7219)
305	1-12	Int. EDF-43	Document "Toxic Substances and Ecological Cycles." Woodwell. 1967. (63:7223)
306	1-12	Int. EDF-44	Document "Effects of Pollution on the Structure and Physiology of Ecosystems." Woodwell. 1970. (63:7226)

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307	1-13	Int. EDF-45	Curriculum Vitae - A. Dexter Hinckley. (64:7250)
308	1-13	Int. EDF-46	Document "Male Gypsy Moth Dispersal on Long Island (Lepidoptera: Lymantriidae)." Hinckley. 1970. (64:7253)
309	1-13	Int. EDF-47	Document "A Strategy for Gypsy Moth Control." Hinckley. 1972. (64:7257)
310	1-13	Int. EDF-48	For identification: EXCLUDED. Pp. 1 through 4; 6 through 8; and 31 through 33; of multiple-page document entitled, "USDA Draft Environmental Impact Statement on the 1972 Cooperative Gypsy Moth Suppression and Regulatory Programs." (64:7259)
311	1-14	Int. EDF-49	Resumé - Samuel S. Epstein. (65:7302)
312	1-14	Int. EDF-50	Document "Control of Chemical Pollutants." Epstein. 1970. (65:7312)
313	1-14	Int. EDF-51	Document "Statement of Samuel S. Epstein, M. D. on Adverse Human Effects Due to Chemical Pollutants" - April 1971 - Before U. S. Senate Subcommittee on Executive Reorganization and Government Research of the Committee on Government Operations, 92d Congr., First Session. (65:7312)
314	1-18	Int. EDF-52	Curriculum Vitae - Alan B. Steinbach. (66:
315	1-18	Int. EDF-53	EXCLUDED. "Effects of DDT on the Nervous System of the Rat." Woolley. 1969. (66:7485)
316	1-18	Int. EDF-54	Sketch depicting chalk drawn and used by Dr. Steinbach during his testimony, 1-18-72. (66:7498)
317	1-18	Int. EDF-55	Curriculum Vitae - Jerry L. Mosser. (66:7501)
318	1-18	Int. EDF-56	Document "Polychlorinated Biphenyls: Toxicity to Certain Phytoplankters." Mosser. 1972. (66:7505)
319	1-18	Int. EDF-57	Document "PCBs and DDT Alter Species Composition in Mixed Cultures of Algae," Mosser et als. 1971. (66:7515)

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320	1-20	R-127	Copy of Public Notice #1538, State Game and Fish Commission, Jackson, Mississippi, signed by Billy Joe Cross, Executive Director; and for purposes of the deposition of said Billy Joe Cross taken on Monday, January 10, 1972, this exhibit bore the following identification: "DEP-RES-EPA #1, 1-10-72, Elizabeth S. Evans." (67:7626)
321	1-20	Int. EDF-58	Resumé - Frederick W. Plapp, Jr. (67:7640)
322	1-20	Int. EDF-59	EXCLUDED. Title: Genetic Control of House Fly NADPH-Dependent Oxidases: Relation to Insecticide Chemical Metabolism and Resistance." Plapp et al. Reprint, Journal of Economic Entomology, October 1969. (67:7651)
323	1-20	Int. EDF-60	EXCLUDED. Title: "Induction by DDT and Dieldrin of Insecticide Metabolism by House Fly Enzymes." Plapp et al, August 1970. (67:7660)
324	1-20	Int. EDF-61	EXCLUDED. Title: "Possible Pleiotropism of a Gene Conferring Resistance to DDT, DDT Analogs, and Pyrethins in the House Fly and Culex Tarsalis." Plapp et al, June 1968. (67:7669)
325	1-20	Int. EDF-62	"Comparison of Insecticide Absorption and Detoxification in Relation to Insecticide Resistance in Larvae of Heliothis zea and H. virescens." Plapp. 1971. (67:7674)
326	1-20	Int. EDF-63	"Insecticide Resistance in Heliothis: Tolerance in Larvae of H. virescens as Compared with H. zea to Organophosphate Insecticides." Plapp, 1971. (67:7678)
327	1-20	Int. EDF-64	"Laboratory Tests of Alternate Insecticides for the Control of Methyl Parathion-Resistance Tobacco Budworms." Plapp. 1971. (67:7678)
328	1-20	Int. EDF-65	"DDT Residues in Fish from the Brazos River Basin in Central Texas." Plapp et al, 1971. (67:7683)
329	1-20	Int. EDF-66	"Organochlorine Insecticide Residues in Snakes." Plapp et als. 1971. (67:7686)

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330	2-1	GP Rbtl-1	Resumé, Virgil H. Freed (68:7727)
331	2-1	GP Rbtl-2	Document "Vaporization and Environmental Contamination by DDT." Freed, et als. 1971. (68:7754)
332	2-1	Int. EDF-67	"Organochlorine Pesticides in Rainwater in the British Isles." Tarrant and Tatton. 1968. (A reference cited in Exhibit GP Rbtl-2) (68:7878)
333	2-2	USDA Rbtl-1	Vita, Waldemar Klassen (69:7898)
334	2-7	R-128	Document "Table 1. DDE residues and related shell thicknesses of mallard eggs from pen experiments, 1967-1970." Heath. (70:7962)
335	2-7	R-129	Document "Table. Percent of Estuarine Mollusc Samples Containing DDT residues." Gulf Breeze Lab, EPA. 1971. (70:7963)
336	2-7	R-130	3rd par. on p. 533 "Characteristics and Significance of Resistance to Insecticides in Fishes." Ferguson. 1967. (70:7987)
337	2-8	USDA Rbtl-2	Scientific Research Career, Stanford H. Smith. (71:7999)
338	2-8	USDA Rbtl-3	Document "Factors of Ecologic Succession in Oligotrophic Fish Communities of the Laurentian Great Lakes." Smith. Jan. 1972. (71:8008)
339	2-8	USDA Rbtl-4	Group of charts in re Great Lakes Fish. Smith. 1972. (71:8008)
340	2-8	USDA Rbtl-5	Group of charts in re Fish Catch in Great Lakes. Smith. 1972. (71:8008)
341	2-10	Int. EDF-68	Curriculum Vitae, George B. Craig. Jr. (73:8078)
342	2-10	USDA Rbtl-6	Document "Eggshell Thickness Study in Ducks." Davison. Oct. 1971. (74:8168)
343	2-11	USDA Rbtl-7	Curriculum Vitae, Bruce Corneille Switzer (74:8215)
344	2-11	USDA Rbtl-8	Document "Shell thickness, DDE levels in eggs, and reproductive success in common terns (Sterna hirundo), in Alberta." Switzer et al. 1971. (74:8225)

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345	2-11	USDA Rbtl-9	Pages 9, 10, and 11 of document "Effects of DDE on Reproductive Success in Common Terns, (Sterna hirundo), at Chip Lake, Alberta." Switzer et als. Jan. 1972. (74:8230)
346	2-11	USDA Rbtl-10	Document "Pesticide Residues in a Marine Population of Double-Crested Cormorants." Kury. 1969. (74:8245)
347	2-11	USDA Rbtl-11	EXCLUDED. Document "Pesticide Section Canadian Wildlife Service Manuscript Reports No. 20, Toxic Chemicals and Declining Bald Eagles and Cormorants in Ontario." Postupalsky. 1971. (74:8245)
348	2-11	USDA Rbtl-12	Chart "Assumptions underlying the correlation of DDE with some eggshell parameter." Switzer. Feb. 1972. (74:8272)
349	2-14	GP Rbtl-3	E. L. Robert Stokstad - Curriculum Vitae (75:8343)
350	2-14	GP Rbtl-4	Document "The Effect of DDE and DDT on the Egg Shell Thickness of Japanese Quail." Chang. 1971. (75:8349)
351	2-14	GP Rbtl-5	Document "A Survey of Chlorinated Pesticide Residues in Black Duck Eggs." Reichel and Addy. 1968. (75:8400)
352	2-15	Int. EDF-69	EXCLUDED. Sheaf of 33 documents that pertain to questions addressed to Witness Risebrough to which objections were sustained. (76:8550; 8552)
353	2-16	GP Rbtl-6	Resume, William F. Gusey. (77:8623)
354	2-16	GP Rbtl-7	Document "Petroleum Production and Fish and Wildlife Resources, The Gulf of Mexico, Louisiana, Environmental Conservation Department, Shell Oil Company, New York, New York." (77:8633)
355	2-16	GP Rbtl-8	Document "United States and Regional Fishery Statistics, 1939-1969, Environmental Conservation Department, Shell Oil Company, New York, New York." (77:8633)

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356	2-16	GP Rbtl-9	EXCLUDED. Document "Wildlife Utilization of Crops in Alabama, Crop - Cotton," and concerning other states. (77:8666)
357	2-16	GP Rbtl-10	"Waterfowl Breeding Population and Breeding Ground Survey Summary, 1954-1970." Jan. 1971. (77:8698)
358	2-16	GP Rbtl-11	As to pages 7, 9, 11, 42-44 of document "United States Department of the Interior, Bureau of Sport Fisheries and Wildlife, Migratory Game Bird Briefing Book, Prepared by Division of Management and Enforcement. January 1971." (77:8701)
359	2-16	GP Rbtl-12	"Summary of Raptor Migration at Hawk Mountain Sanctuary, Pennsylvania, 1934-1942; 1946-1969." (77:8705)
360	2-17	GP Rbtl-13	Curriculum Vitae - William Hope Butler (78:8756)
361	2-17	GP Rbtl-14	Document "Pathology of Liver Cancer in Experimental Animals." Butler. 1971. (78:8759)
362	2-17	GP Rbtl-15	Curriculum Vitae - Mitchell Ralph Zavon (78:8834)
363	2-17	GP Rbtl-16	EXCLUDED. Document "Storage of DDT and DDE in People with Different Degrees of Exposure to DDT." Hayes, et als. 1958. (78:8871)
364	3-14	R-131	Aggregate of three items: Fitzhugh study of August 1969; Davis memorandum of January 30, 1969; and Gross memorandum of September 15, 1969.
365	3-14	GP Rbtl-17	Environmental Defense Fund document entitled "DDT: Light at the End of a Long, Dark Tunnel?" February 2, 1972.