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FOREIGN TRIP REPORT

ORNL/FTR-3717

DATE: September 4, 1990

SUBJECT: Report of Foreign Travel of Lawrence W. Barnthouse, Research Staff, Environmental Sciences Division

TO: Alvin W. Trivelpiece

FROM: Lawrence W. Barnthouse

PURPOSE: To participate in 7th International Congress of Pesticide Chemistry as an invited symposium speaker.

SITES VISITED:		
8/8-9/1990	Hamburg, Federal Republic of Germany	Prof. Dr. Werner Klein
8/21/90	Texel, the Netherlands	Dr. H. van der Veer

ABSTRACT: This report summarizes a trip by L. W. Barnthouse of the Environmental Sciences Division (ESD), Oak Ridge National Laboratory (ORNL), to Hamburg, Federal Republic of Germany (FRG), where he participated in the 7th International Congress of Pesticide Chemistry. He chaired a workshop on experimental systems for determining effects of pesticides on nontarget organisms and gave an oral presentation at a symposium on pesticide risk assessment. Before returning to the United States, Dr. Barnthouse visited the Netherlands Institute for Sea Research in Texel, the Netherlands.

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BACKGROUND

Dr. Barnthouse has been corresponding for several years with Prof. Dr. Werner Klein of the Fraunhofer Institute for Environmental Toxicology and Chemistry, Schmallenberg, FRG. He participated in an international workshop, "Advances in Environmental Hazard and Risk Assessment of Industrial Chemicals and Pesticides," held at the Fraunhofer Institute in September 1987. Dr. Barnthouse, Dr. Glenn W. Suter of ESD, and Dr. Klein have since been attempting to set up a collaborative research program on ecological risk assessment of industrial chemicals and pesticides. At the invitation of the West German Umweltbundesamt (UBA), Dr. Suter and Dr. Barnthouse submitted a formal proposal for research support to the UBA in April 1989.

Dr. Barnthouse traveled to Hamburg to participate in a workshop and symposium on health and ecological risks of pesticides organized by Dr. Klein. Travel funds were provided by the Congress Organizing Committee. Dr. Suter had originally been invited but was unable to attend.

For the past 3 years, Dr. Barnthouse has been a co-principal investigator on an ESD project, Compensatory Mechanisms in Fish Populations (COMPMECH). In the course of this work, he has corresponded with Dr. H. van der Veer of the Netherlands Institute for Sea Research, whose research is closely related to work being done in ESD. Before returning to the United States, Dr. Barnthouse visited Dr. van der Veer at the Institute.

SUMMARY OF ACTIVITIES

Seventh Congress of Pesticide Chemistry

On Wednesday, August 8, Dr. Barnthouse chaired a workshop session on test systems for predicting the effects of pesticide applications on nontarget ecosystems. The session was attended by approximately 100 scientists representing the pesticide industry, regulatory agencies, and academic institutions.

Both experimental and modeling approaches to risk assessment were considered. Although all types of systems, ranging from test tubes to field experiments, were included in the scope of the workshop, discussion of experimental approaches centered on microcosms and mesocosms. Aquatic microcosms were defined by Dr. Frieda Taub (University of Washington) as small, enclosed systems of a few liters or less containing complex communities of organisms. Aquatic microcosms support multiple trophic levels. Soil core microcosms often contain only one trophic level but still support a complex microbial community.

Considerable discussion at the workshop focused on the relative merits of using laboratory-reared vs wild-caught organisms for microcosms. Laboratory-reared organisms provide better replicability and facilitate interlaboratory comparisons. Wild-caught organisms provide better

representation of conditions at specific sites and permit the use of species that cannot be cultured.

Mesocosms were defined as larger systems, generally of several cubic meters or more in volume. Such systems are often located out-of-doors. Classic examples of aquatic mesocosms include the pond systems at the University of Kansas and the Columbia National Fisheries Center. The value of using mesocosms in pesticide registration was debated by several workshop participants. Proponents argued that mesocosms provide more realism because they can include a more complex biota and larger organisms (e.g., fish). The additional complexity makes possible observations of indirect effects that can't be seen in microcosms. Opponents argued that replication possible in mesocosm tests is too low and the variability too high to obtain useful results.

Several microcosm vs mesocosm comparisons were described. It was pointed out that, often, comparisons yield similar results. It was suggested that mesocosms may be more useful for validating microcosm systems than for routine pesticide testing.

Models were described as useful for extending and interpreting results of microcosm and mesocosm tests. Dr. Taub described a mathematical model of a microcosm system that she is using to explore alternative test conditions and explained indirect effects observed in her experiments. This model was developed by Dr. K. A. Rose, now an ESD staff member, as part of his doctoral dissertation at the University of Washington.

At the end of the workshop, a question was raised about the meaning of the word "risk." In response to the question, several participants noted that it is never possible to accurately predict the probability of an adverse environmental impact. Therefore, any "risk estimate" must be interpreted as an approximation that itself contains an unknown, and possibly high, degree of uncertainty.

At a reception following the workshop, Dr. Barnthouse and Dr. Klein discussed the prospects for funding of the ESD proposal. Dr. Klein stated that, at the moment, no new initiatives of any kind are being funded. Budgets of all FRG agencies have been sharply reduced to provide emergency financial aid to the German Democratic Republic. Dr. Klein anticipates that following reunification much of the funding that would have been available for environmental research will be reallocated to environmental restoration activities in the East.

On Thursday, August 9, Dr. Barnthouse participated in a symposium on exposure and risk estimation for pesticides. The other speakers included Dr. Clair Franklin, Department of National Health and Welfare, Environment Canada; Dr. Frieda Taub, University of Washington; and Dr. Michael Matthies, Gesellschaft fur Strahlen- und Umweltforshung mbH, Munich (GSF). The symposium was organized as a series of 40-min lectures with no time allotted for discussion.

Dr. Franklin discussed approaches used in Canada to quantify exposures of agricultural workers to pesticides. Dr. Taub discussed a variety of topics related to pesticide risk assessment. (She was substituting for an EPA scientist who was supposed to talk about groundwater transport models.) She gave a brief overview of EPA's work in this area but spent most of her lecture describing her own work on microcosm systems. She presented some results from her collaborative modeling work with Dr. Rose. Dr. Matthies presented an overview of the environmental transport modeling being performed at the GSF. This includes developing and validating models for pesticide and chemical transport in all environmental media. Some of this work has benefitted from collaboration with Dr. S. M. Bartell of ESD, who has visited GSF several times. Dr. Barnthouse presented an overview of ESD's work on ecological risk assessment, emphasizing research on methods for (1) estimating long-term effects of contaminants on populations and ecosystems from short-term experiments on individual organisms and (2) quantifying regional risks of contaminant exposures.

Netherlands Institute for Sea Research

At the Netherlands Institute for Sea Research, Dr. Barnthouse met with Dr. Henk van der Veer, a fisheries biologist at the Institute. Dr. van der Veer is one of the world's leading authorities on the influence of the environment on the survival and growth of plaice, sole, and other flatfishes. In November 1990, he will chair an international workshop on flatfish biology, to be hosted by the Institute.

The work done by Dr. van der Veer is directly relevant to ESD's COMPMECH Project. Winter flounder, a species closely related to those studied by Dr. van der Veer, is one of three fish species being actively studied as part of COMPMECH. The research approach adopted by COMPMECH involves establishing collaborative relationships with empirical researchers who have independent funding support. Quantitative expertise, including mechanistic simulation models, is provided by ESD staff; empirical data and insights into the biology of the organisms being studied are provided by the collaborating individuals and institutions. It would be highly beneficial to COMPMECH if such a relationship could be established with Dr. van der Veer. Interaction with van der Veer is especially attractive because he is now engaged in a long-term research program to compare North Sea flatfish populations with populations in the southeastern United States. He is collaborating in this program with Dr. John Miller at North Carolina State University, Raleigh, and Dr. John Dean at the University of South Carolina, Columbia.

Dr. K. A. Rose of ESD has developed a mathematical model of reproduction, growth, and survival in winter flounder that could be easily modified for application to other species. Dr. Barnthouse took with him a diskette containing a preliminary version of the model, including a menu interface that facilitates use by nonmodelers. He and van der Veer discussed the ways in which such a model could be modified to represent different flatfish species and agreed that it could be valuable to a large number of researchers. Dr. van der Veer will be in the United States in October

1990 to meet with his collaborators in Raleigh and Columbia. Dr. Barnthouse invited him to visit Oak Ridge at this time.

Future Cooperation

New cooperative environmental research activities with scientists in the Federal Republic of Germany appear unlikely at this time. Once financial stability of the reunified Germany has been achieved, cooperation will probably be both possible and desirable because (1) Germany has the same environmental problems as encountered in the United States, (2) the German government has made commitments to environmental quality similar to those of our government, and (3) a strong scientific infrastructure exists there to perform environmental research.

Collaboration with Dr. van der Veer would greatly benefit the COMPMECH Project and should be pursued without delay. In the event that Dr. van der veer is unable to extend his U.S. trip to come to Oak Ridge, ESD staff involved in COMPMECH should consider traveling to Raleigh or Columbia to meet with him and his U.S. collaborators.

APPENDIX A

Itinerary for L. W. Barnthouse

8/6-7/90	Travel to Amsterdam, the Netherlands
8/8	Travel to Hamburg, Federal Republic of Germany
8/8-9/90	Pesticide Congress, Hamburg
8/10-20/90	Vacation in Paris, France, Bern, Switzerland, and Cologne, Federal Republic of Germany
8/21	Netherlands Institute for Sea Research, Texel, the Netherlands
8/22-23/90	Return to Oak Ridge, Tennessee

Primary Contacts

Hamburg: Prof. Dr. Werner Klein

Texel: Dr. H. van der Veer

APPENDIX B

Articles Obtained at the Netherlands Institute for Sea Research

Bergman, M. J. N., H. W. van der Veer, A. Stam, and D. Zuidema. 1989. Transport mechanisms of larval plaice (Pleuronectes platessa L.) from the coastal zone into the Wadden Sea nursery area. Rapp. P.-v. Reun. Cons. Int. Explor. Mer. 191:43-49.

van der Veer, H. W., L. Pihl, and M. J. N. Bergman. 1990. Recruitment mechanisms in North Sea plaice Pleuronectes platessa. Mar. Ecol. Prog. Ser. 64:1-12.

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