*diversification.* None of those contacted were willing to deny, and some actually confirmed, that, by this reasoning, Argonne could be the least likely to survive.

The Argonne spokesmen contacted by *Science*, however, reply that the two lower energy accelerators—Berkeley and CEA—will be, so to speak, at the bottom of the list. They say that their lab is doing very good and useful work, and that their gigantic neighbor, NAL, should not be a factor in a decision concerning Argonne. In addition, one said, "There's always talk like that but I don't take it seriously . . . we're doing better than most accelerators."

At this point in time, the AEC Division of Research is still hoping to satisfy the JCAE request without naming candidates for possible shutdown. They hope to reply "positively" with estimates of "good" levels of funding to keep all six accelerator laboratories viable. They will probably agree with the lab administrators' desire for a step-function increase in funds for fiscal 1973; Panofsky, for example, mentions a need for 15 percent more money, which would mean about 17 million more dollars for high energy physics.

But in a wider context, the JCAE request has set the laboratories' and AEC's officials buzzing over the issue of future funding. But it also points up the weakness of the current system for deciding research priorities. Two additional accelerators, one at Cornell and one at Stanford, are not even being formally considered in this process because they are funded by the National Science Foundation and not reviewed by JCAE. In addition, the $17 million increase which the physicists glibly mention as "adequate" for 1973 is more than four times all AEC funding for computer research and mathematics, and 30 percent more than total support of medium energy physics. Finally, there is a distinct chance that the entire AEC budget may be cut in fiscal 1973, in which case trade-offs will have to be made between reactor development, nuclear weapons, and high energy physics. The Joint Committee has handed the physicists—faced with high unemployment rates and years of declining budgets—a much-longed-for opportunity for special pleading on their own behalf. But it has not opened the way to any broader discussion of priorities in science funding.

—DEBORAH SHAPLEY

# PCB's: Leaks of Toxic Substances Raises Issue of Effects, Regulation

Sharp criticism of federal regulatory agencies has followed in the wake of a bizarre contamination of poultry feed marketed in a part of southeastern United States. The controversy reached full steam on 18 August when the Food and Drug Administration (FDA) meekly acknowledged that a shipment of some 60,000 eggs contaminated with toxic polychlorinated biphenyls (PCB's) escaped federal inspectors and apparently got into the stomachs of Washington, D.C., area residents. The announcement came on the heels of FDA's seizure of another batch of PCB-contaminated eggs (75,000) on 13 August—almost a month after the initial discovery that PCB's had gotten into fish meal eaten by millions of chickens in ten southeastern states.

Besides possibly threatening human health through direct contamination, PCB's are considered a long-term potential hazard to the environment. In the United States, PCB's are produced solely as a heat transfer mechanism and an insulating fluid, particularly in cooling systems and big power transformers. In response to mounting evidence that PCB's are a potential hazard, the single U.S. manufacturer of PCB's, Monsanto Chemical Company, in order to restrict their release into the environment has limited the chemicals' uses to sealed systems. In the past, Monsanto widely produced PCB's as an additive in such things as sealants, rubber, paints, plastics, adhesives, printing ink, and insecticides.

Infiltration of PCB's into the environment occurs mainly in three ways:

- From accidental leaks in industrial equipment, such as heat-transfer systems;
- Through the weathering or friction wearing of the many materials that have PCB's as an ingredient. (Since they are fire resistant, PCB's usually remain intact even as a waste product.)
- Through interaction with food products in their uses as an ingredient in substances like paint and plastic.

Before the fish meal contamination incident, however, PCB's were virtually unknown except to a few scientists and some professional environmentalists. Critics have now become quite vocal in warning about the threat of PCB's, and, more important, they have expressed doubt about the ability and desire of federal agencies to effectively shield the consumer and the environment from the potential long-term dangers of thousands of synthetic chemicals.

The controversy is fueled by a basic disagreement among the participants as to the precise threat PCB's pose to human health and the environment. Federal officials, while acknowledging a problem, do not feel that PCB's are a serious enough hazard to justify major governmental action. Research on composition of PCB's and toxicity is very incomplete. The actual composition of their product is known only by Monsanto. Present evidence indicates that severe injury or death from short-term exposure to PCB's is unlikely. Like so many other environmental hazards, the potential PCB danger is long-term, low-level exposure, perhaps making it difficult for "crisis prone" regulatory agencies to respond in a big way now. Except for isolated accidents, federal officials contend, PCB's in their present application will not get into the environment or the food chain in harmful amounts.

From an industrial standpoint, PCB is considered very valuable, mainly for its incredible persistence as a chemical, being capable of withstanding temperatures of up to 1600°F (870°C). Like DDT—another, related chlorinated hydrocarbon—PCB's are fat-soluble but do not dissolve in water. For these reasons, industry holds that PCB's are in fact "safety" chemicals that are needed in populated areas to reduce the chances of accidental explosions, especially in big power transformers. It is this very persistence of PCB's that makes them a



MONS 084435

## NEWS & NOTES

● **ARMSTRONG STEPS INTO ACADEME:** Neil A. Armstrong, the first man to set foot on the moon, will assume the post of full professor at the University of Cincinnati's College of Engineering on 1 October. Armstrong has been NASA's deputy associate for aeronautics since July 1970. In his new job, he will be closely associated with Paul Hergett, head of the university's observatory, who is also a former consultant to the U.S. space program.

● **FDA X-RAY GUIDE:** The Food and Drug Administration has issued a booklet to guide health personnel in the prudent use of diagnostic x-rays. The publication places particular emphasis on factors that doctors untrained in radiology should consider when referring patients for x-rays. *X-Ray Examinations . . . A Guide to Good Practice* was jointly produced by the FDA Bureau of Radiological Health and the American College of Radiology. It is available for 35¢ from the Superintendent of Documents, Government Printing Office, Washington, D.C. 20402.

● **NEW SOCIETY:** Scientists interested in a multidisciplinary approach to health and disease formed a group called the Society for Environmental Geochemistry and Health on 1 July. The object of the society is to further knowledge about the effects of geochemical environment on both plant and animal life. President of the group is Delbert D. Hemphill of the University of Missouri's Environmental Health Center.

● **STANDARD REFERENCE JOURNAL:** The National Bureau of Standards has decided on a new procedure to provide more effective dissemination of the evaluated property data and critical reviews produced by the National Standard Reference Data System (NSRDS). The American Institute of Physics (AIP) and the American Chemical Society (ACS) have agreed to publish jointly the NSRDS output, and the material will appear in the *Journal of Physical and Chemical Reference Data*, to appear quarterly, beginning early next year. Offprints from the journal and book-length compilations will also be published through the new arrangement. Subscriptions will be obtainable through the AIP or the ACS.

great concern to environmentalists. PCB's have been detected throughout the world in fish, birds, waterways, and humans. In a study released by the Environmental Protection Agency (EPA), PCB's were detected in samples of human fatty tissue with concentrations as high as 250 parts per million (ppm).

Despite Monsanto's assurances that the present uses of PCB's are safe, critics say the recent fish meal incident vividly illustrates that use of PCB's in any form is too risky to permit. Leading the fight against PCB's are consumer advocate Ralph Nader and New York Democratic Congressman William Fitts Ryan. They argue that, even if Monsanto can stop PCB's from getting into the environment, products containing them are in wide use and will continue to disperse PCB's in the environment in harmful amounts. The government should act now, Nader asserts, to ascertain where PCB's have been used before they cause serious damage to the environment and get into the food chain.

Besides the fish meal incident, there have been two other hazardous leaks of PCB's in the past 2 years. One of these accidents, in Japan in 1968, resulted in 300 people developing a severe skin disease and in babies showing symptoms of chlorobiphenyl poisoning. Indeed, the preliminary research, though incomplete, makes Nader's anxiety about PCB's potential danger quite plausible. University of California research ecologist Robert Risebrough, one of the foremost authorities on PCB's, says that while the effects of PCB's on humans are undetermined, the contaminants in PCB's are "among the most poisonous compounds known." Tests of PCB's by the Environmental Protection Agency's Florida laboratory revealed the chemical killed one-half of the test population of pink shrimp exposed to 1 ppm and similarly killed samples of white shrimp. These tests, EPA's Thomas Duke told *Science*, indicate that PCB's are a "potential threat to the environment." Monsanto, however, has reported that its own tests have shown "no adverse effects" to rats or other laboratory species fed PCB's in amounts up to 100 ppm. This conflicts with tests repeated by others that have linked repeated dosages of PCB's to liver damage in mice and lower fertility in birds.

In fact, the recent contamination at the North Carolina plant that manufactures fish meal was detected only after the hatchability of eggs from chickens fed the meal began to diminish alarmingly.

The PCB's were traced to a leak in a pipe in the cooling system at the fish meal plant. Although the leak began in late April, PCB's were allowed to drip into the fish meal until the defect was discovered in mid-July. In the intervening period of 2½ months, approximately 16,000 tons of fish meal had been distributed to more than 60 companies in ten states. One of the purchasers of the fish meal, Holly Farms, the nation's largest poultry producer, voluntarily slaughtered 77,000 fowl after discovering PCB's in amounts above those deemed safe, reportedly as high as 40 ppm. In the meantime, the U.S. Department of Agriculture undertook its own tests of poultry that had been fed the fish meal. On 29 July, USDA said that its tests turned up no evidence that chickens given the contaminated meal were unsafe. The chickens in the ten-state area, USDA reported, were "wholesome," and the consumer could continue to eat chickens "with confidence." But this did not explain why chickens at Holly Farms contained unsafe amounts of PCB's. In response to this apparent discrepancy, Harry Mussman, director of USDA's laboratory service division, told *Science* that the department "surmised" that Holly Farms got an "extremely contaminated" batch of fish meal while the other producers did not.

### Contaminated Eggs Seized

Two weeks later, on 13 August, FDA, under prodding from associates of Nader, revealed that it had seized over 75,000 eggs because tests had detected excessive amounts of PCB's in eggs from chickens that had consumed the contaminated fish meal. On 16 August—a month after the leak was detected—USDA took its turn and "detained" more than 50,000 pounds of frozen-egg products in which the level of PCB's was high. When FDA seized the 75,000 contaminated eggs, a spokesman said they knew of no incident in which contaminated eggs had reached consumers but could offer no assurances that this had not happened. Unwilling to stop there, associates of Nader and Ryan conducted their own ad hoc investigation and, to their dismay, discovered that contaminated eggs had reached the consumer. The FDA, on 18 August, confirmed that a shipment of 60,000 contaminated eggs had reached the retail market and apparently had been consumed in the Wash-



MONS 084436

ington, D.C., area after this information had been released by Ryan's and Nader's associates.

The disclosure prompted both Ryan and Nader to blast the government's handling of the entire fish meal incident as one of the most flagrant examples of mismanagement by federal agencies.

In denying that it has lagged on PCB's the FDA points out that since January it has been conducting studies to determine the toxicity of PCB's and their effect on humans. An FDA spokesman said that the test results should be known "within a year." For its part, EPA is doing some research at two field laboratories. Since the beginning of the year USDA, according to Mussman, has conducted a routine surveillance of poultry for PCB's and other related chemicals.

Perhaps some of the difficulties in regulating PCB's can be attributed to the confusing, overlapping jurisdictions of federal agencies. For example, FDA has jurisdiction over PCB's in whole shell eggs and in fish meal, USDA has control over cracked eggs and their products—such as mayonnaise—and poultry, and EPA is in charge of PCB's once they get into the air and water.

In the recent incident, FDA had to recall the contaminated fish meal and locate where it was sold and then, in turn, supply USDA with a list of the fish meal purchasers, so that USDA could check the affected chickens. When associates of Nader raised the possibility of contamination of egg products, they had to go to FDA for testing whole eggs and to USDA for cracked eggs and frozen poultry products.

Such a confusing arrangement makes it almost inevitable that some of the contaminated eggs would slip through this network. As for the eggs that did reach the consumer, an FDA spokesman says there is no immediate danger since "any potential health hazard would come from continued consumption of PCB's over an extended period of time."

PCB's intrusion into the environment is difficult to regulate because of a lack of federal laws and because no one is quite sure how much PCB's have been produced. EPA and FDA officials point out that at present they have no legal authority to halt Monsanto's present uses of PCB's. Last year PCB's in pesticides were banned by USDA's pesticide regulation division, now a part of EPA. According to a spokesman, FDA has, in the past, indicated to Monsanto that it would not allow PCB's to be used in food as an additive.

It is virtually impossible to determine the exact amount of PCB's already present in the environment and where the chemical might be concentrated because no one, except Monsanto, knows what amounts of PCB's have been made. A National Academy of Sciences panel estimates that, in 1968 alone, 5 billion grams of PCB's were produced in the United States, in addition to those made by PCB's manufacturers in Europe, the Soviet Union, and Japan. Monsanto has refused repeatedly to make available, even to government officials, production and sales figures for PCB's because it regards this information as a "trade secret." Monsanto is backed up by its industrial counterparts and by a law that permits a company in certain situations to withhold information that might seriously jeopardize its competitive advantage. A National Academy of Sciences panel, in disagreeing with Monsanto's refusal to release the important figures, noted "it is not only competitive concerns alone that determine the less than candid posture assumed by industry concerning production figures." A bill now before Congress would give federal agencies the authority to get production figures from companies manufacturing hazardous chemicals.

In a further effort to cut down on PCB's released into the environment, Monsanto recently built a special incineration unit at Sauget, Illinois, to destroy waste PCB's. It has also told government officials that it will not sell PCB's for use in power transformers and cooling systems that will be used near foodstuffs. In the fish meal plant, Monsanto reportedly claims that it was misled by the name—East Coast Terminal, Inc.—into believing that the PCB's sold for cooling purposes would not be used near food products. Monsanto now refuses to comment on PCB's for publication. The reason, a company spokesman told *Science*, is that there are "many investigations under way" of Monsanto and PCB's, and the company does not want "misinterpretations" about Monsanto's production of PCB's.

Associates of Nader and Ryan admit, in part, that their strong criticism of the federal handling of PCB's via the fish meal incident stems from their disagreement with the way federal agencies respond to environmental problems. They dislike what they feel is the slow response of federal agencies to potential hazards like PCB's. The

## EPA Moves on Refuse Act

The Environmental Protection Agency (EPA) has told its regional offices to notify laggard industries that they face possible legal action if they fail to explain why they haven't applied for waterway discharge permits under the recently resuscitated Refuse Act of 1899.

The deadline for filing permit applications was 1 July. Detailed follow-up data are required by 1 October. But so far, says EPA administrator William Ruckelshaus, applications received by the Army Corps of Engineers (which administers the program) have leveled off at about 18,000, although at least 40,000 firms are supposed to be affected by the permit program.

The EPA is still conducting the industrial waste studies on which to base the standards it had planned to have ready in early July. Officials explain that this task has taken longer than expected because it was found that laying down specific limitations on effluents for each of the 20 designated industrial categories would be too complex and rigid. Instead, the agency is working on more flexible "guidelines," which will aid regional EPA directors in interpreting federal-state water quality standards and in advising companies on how to conform.

Meanwhile, Ruckelshaus has urged regional offices to proceed with enforcement actions, using the knowledge and equipment already available to them.

Ruckelshaus told *Science* recently that press reports to the effect that EPA was backing down on its standards were wrong. Nevertheless, he said, some industries "read these stories and think we're easing off. Then we have to start all over rattling sabres at them."—C.H.



MONS 084437

government is geared more to acting to a crisis, they hold, than to taking the type of preventive action necessary to head off disasters before they occur. Federal officials point out that, as far as they are concerned, PCB's are a rather new problem that they do not consider as "top priority." Since PCB's had not in the past caused any major catastrophes that can be likened even to the fish meal incident, most government officials were not aware of PCB's until recently.

The FDA regards the fish meal contamination as an accident that is not likely to occur again, blaming FDA for the fish meal incident is "like asking a police department to be responsible every time a crime occurs," one FDA official told *Science*. But critics claim that federal agencies have had sufficient warning about PCB's. In the last year, they say, Campbell Soup Company, a New Jersey firm, discovered soups contaminated with PCB's, and certain Ohio dairymen lost their licenses to sell milk when PCB's found their way into silage consumed by their cows.

### Might Enter Food Chain

Risebrough points out that in "our throwaway society" PCB's, because of their past wide use, will eventually become wastes and thereby enter the environment. It is believed that the PCB's could make their way to the sea through drainage systems, spillages, and the like, and eventually into the food chain.

No tolerance levels have been determined, Risebrough says, for human food supplies. As an interim guideline, FDA set PCB limits of 5 ppm as safe for human consumption of poultry, and USDA pronounced that chickens below this level in the fish meal incident were "wholesome." Critics claim the 5 ppm guideline is "unfounded" and "arbitrary." "Five parts per million is just a number," Risebrough told *Science*. "I'm sure FDA pulled it out of the air."

FDA officials reply that the interim guideline is based on the "best scientific information available." The guideline was set for the fish meal contamination, FDA says, and can provide an adequate "margin of safety" for the "short-term exposure expected to occur."

"It's not complete," an FDA official told *Science*. "But you got to go on what you have. We can't be held accountable for every goddam chemical!"

—JOE PICHIRALLO

# APPOINTMENTS

**Edward J. Bloustein**, president, Bennington College, to president, Rutgers University. . . . **Stanley S. Bergen, Jr.**, senior vice president for medical and professional affairs, New York City Health and Hospital Corporation, to president, College of Medicine and Dentistry of New Jersey. . . . **Richard J. Grosh**, dean, Schools of Engineering, Purdue University, to president, Rensselaer Polytechnic Institute. . . . **John D. Isaacs**, professor of oceanography, Scripps Institution of Oceanography, University of California, San Diego, appointed director, university-wide Institute of Marine Resources. . . . **J. Thomas Grayston**, dean, School of Public Health and Community Medicine, University of Washington, to head, Health Sciences Center and vice president for Health Affairs at the university. . . . **Thomas P. Logan**, assistant professor of dentistry, Meharry Medical College, to dean, School of Dentistry at the college. . . . **William C. Wesley**, professor of education, University of Evansville, to dean, School of Education at the university. . . . **John C. Guyon**, chairman, chemistry department, University of Missouri, Columbia, to chairman, chemistry department, Memphis State University. . . . **Thomas H. Kirschbaum**, professor of obstetrics and gynecology, University of California, Los Angeles, to chairman, obstetrics, gynecology and reproductive biology department, Michigan State University. . . . At Iowa State University, **Robert F. Brodsky**, manager of systems test and deployment, Aero Jet-General Corporation, California, to chairman, aerospace engineering department and **Richard G. Barnes**, professor of physics, to chairman, physics department. . . . **James A. Luker**, acting dean, College of Engineering, Syracuse University, appointed dean of the college. . . . **Alfred A. H. Keil**, head, ocean engineering department, M.I.T., to dean, School of Engineering at M.I.T. . . . **Charles A. Berg**, associate professor of mechanical engineering, M.I.T., to chairman, mechanical engineering department, University of Pittsburgh. . . . **Max R. Culver**, vice president for academic affairs, Kansas Wesleyan University, to chairman, sociology department, Capital University. . . . **Stanley Deutsch**, professor of anesthesiology, University of Chicago Pritzker School of Medicine, to head, anesthesiology department, University of Oklahoma Medical Center. . . . **Guido H. Daub**, acting chairman, chemistry department, University of New Mexico, appointed chairman of the department. . . . **Willis E. Sibley**, professor of anthropology, Washington State University, to chairman, anthropology department, Cleveland State University. . . . **Robert M. Boynton**, director, Center for Visual Science, University of Rochester, to chairman, psychology department at the university. . . . **John W. Schermerhorn**, dean health sciences division, Northeastern University, to dean, School of Allied Health Professions, University of Texas Southwestern Medical School. . . . **John W. Warner**, Undersecretary of the Navy, appointed director, Office of Ocean Affairs, Department of Defense. . . . **Warwick E. Kerr**, professor of genetics, University of São Paulo, Brazil, appointed president, board of directors, Brazilian Association for the Advancement of Science. . . . **Paul D. Hurd, Jr.**, former professor of entomology, University of California, Berkeley, to chairman, entomology department, Smithsonian Institution. . . . **Hubert L. Rosomoff**, chairman, neurological surgery department, Albert Einstein College of Medicine, to chairman, neurological surgery department, University of Miami School of Medicine. . . . **David A. Prince**, acting chairman, neurology department, Stanford University School of Medicine, elevated to chairman of the department. . . . **Paul D. Sturkie**, professor of physiology, Rutgers University, to chairman, environmental physiology department, College of Agriculture and Environmental Science, at the university. . . . **Robert Rothstein**, professor of biology, Agricultural and Technical College, State University of New York, Farmingdale, to chairman, medical laboratory technology department at the college. . . . **Joseph F. Traub**, professor of computer science, University of Washington, to head, computer science department, Carnegie-Mellon University.

*Erratum:* In a footnote to the review of M. M. Gerasimov's *The Face Finder* [173, 212 (1971)], the misspelling of Julius Kollmann's name as it is commonly attributed in a bibliography (1962) by W. M. Krogman. The error occurs in a citation authority's work. Kollmann established methods (1898) for building on a skull a face recognizably correct.

*Erratum:* In the report "DDT administered to neonatal rats induces persistent estrus syndrome" by W. L. Heinrichs *et al.* [173 Aug., p. 652, line 4 in the last paragraph of column 1, p. 653, should read "secretion of luteinizing hormone (LH)."



MONS 084438