be for peaceful purposes, and no one blast shall exceed 150 kilotons. Salvos are allowed if no one explosion exceeds 150 kilotons and if the total yield is no greater than 1500 kilotons, or 1½ megatons. The on-site inspection arrangements apply to salvos, and are optional in the case of 100- to 150-kiloton explosions. Under the treaty, all peaceful explosions are to be preannounced, with information as to time, location, yield, and local geology provided to the other side.

The inspection agreements in PNET however, are the outgrowth of the limits of each side's teleseismic monitoring networks. Officials explain that the American seismic network (run by the Air Force and called the Atomic Energy Detection System) can detect movements of the earth's surface as small as 10 angstroms. But the remote seismic stations have difficulty discriminating explosions that occur within a few seconds of each other—the instruments may just add up the shocks and record them as a single, larger blast. Thus, the American negotiators convinced their Soviet counterparts that, if salvos were to be allowed, on-site inspection would be necessary as well. The Soviets clearly wanted to keep open the option of very large total yields since their technical literature often mentions huge planned PNE's in the several megaton range for gargantuan projects—such as one to divert the Pechara River southward into the Volga to ultimately raise the sinking waterline of the Caspian Sea.

Advocates of arms control outside the government have been strongly critical of the verification arrangements in the PNET. When the United States, the Soviet Union, and the United Kingdom signed the 1963 limited test ban treaty banning nuclear explosions everywhere except underground, they committed themselves to seek a comprehensive, or absolute, test ban. When American officials talked of on-site inspection to police such a ban, they had in mind granting inspectors wide-ranging access to the other side's territory, so they could journey somewhere to check up on some announced events that seemed ambiguous to the remote sensing networks. Inspection, they believed, should be a right, rather than the privilege conferred in the PNET for inspectors to travel to prearranged test sites, "along agreed access routes," with their cameras safely packed away in "secure storage" most of the time. Nongovernment arms control advocates have argued that if the Soviets wanted to keep their PNE options open so very badly, the American PNET negotiators could perhaps have driven a better bargain.

These and other criticisms will doubtless be raised when the Senate begins hearings on the two treaties later this year. It remains to be seen whether the critics will carry the day—or whether the spectacle of identical crates arriving at Moscow airport will become a reality after all.—DEBORAH SHAPLEY

# Cosmetic Standards: Are Pesticides Overused for Appearances Sake?

The unblemished tomato and the flawless orange are dear to the American consumer, but the methods employed to produce such impeccable fruit and vegetables, particularly the heavy use of pesticides, are being questioned by environmentalists and coming under the scrutiny of federal rulemakers. Currently, a draft report on the relationship between so-called cosmetic food standards* and pesticides has become the center of controversy. The report was prepared for the Environmental Protection Agency by a Berkeley study group; EPA officials say it has generated more paper and more work for the agency than any previous pesticides study.

A major line of argument pursued in the report is that the overuse of pesticides is encouraged because mass buyers, notably supermarket chains, stress cosmetic criteria for produce. Consequently, there is heavy pressure on the grower to achieve the right kind of color and blemish control and he responds almost automatically by applying heavy doses of pesticide. The report argues that the consumer should have the option of buying less perfect fruit at lower prices. "Reduction of cosmetic quality standards," says the report, "would result in saving to both the grower, who would use less pesticide, and the consumer."

Analysis of the extent to which pesticides are used specifically for cosmetic purposes is relatively new, but at least one study done by researchers at Berkeley's agricultural research station near Fresno indicates that pest control tactics planned by well trained advisers could reduce the use of pesticides on tomatoes grown for canning by more than 50 percent.

The main theme of the report is that the use of pesticides for cosmetic purposes works against the strategy called "integrated pest management." This strategy does not exclude the use of pesticides but attempts to take into account "all the factors that impinge on the ecosystem," and, according to the report, "implies that, in addition to the immediate welfare of the grower, the welfare of other groups in society should be considered in pest management decisions."

According to proponents quoted in the report, integrated pest management "represents a change in the philosophy of pest control: it utilizes and builds upon the natural mortality that affects any pest population, it [permits economically tolerable] densities of pests and it augments natural control with a variety of techniques that are tailored to be minimally disruptive."

The report contains heavy criticism both explicit and implicit of the status quo in pest control management and has come under attack not only from the agricultural trade press but from agricultural scientists who charge that, among other things, the report understates the need for chemical control of insects and overstates the present adequacy of integrated pest management techniques available for use with most crops. Some agricultural scientists argue that present cosmetic standards are justified because they prevent the marketing of produce with blemishes associated with pathogens or toxins dangerous to health, but which consumers would not recognize.

These differences of opinion have brought the report an unusual amount of attention. The head of the study team

*Cosmetic damage to produce, according to the report, "refers to superficial damage to the exterior appearance of the commodity, which damage does not significantly affect the taste, nutrition or storage capacity of the produce."

which prepared the draft report, Robert van den Bosch, a professor of entomology at the University of California, Berkeley, has charged that he and his colleagues have been subjected to "stonewalling, deceit, treachery and harassment" throughout the study.

One of van den Bosch's charges is that the Council for Agricultural Science and Technology (CAST) violated the confidentiality of the peer review process by making available to the agricultural trade press copies of a review of the report prepared by a CAST task force. This became an issue in the vote by members of the Entomological Society of America on whether to join other scientific societies as CAST members (*Science*, 20 August). Spokesmen for CAST reject the charges, insisting that it is CAST policy and EPA policy as well to give maximum public access to reviews and that the van den Bosch report was treated no differently from many other CAST publications. Van den Bosch's main complaint seems to be that the version was, after all, a draft, and shouldn't have been treated like a completed study.

For EPA, the report, which is still not out of the draft stage, has elicited exceptional interest and intensity of feeling. EPA officials hope that the report will provide "background for rulemaking" in an area which is regarded as important but where little analytical work had been done. The contract, worth $54,701, was awarded to the van den Bosch group effective June of 1974. EPA officials soon became aware that the matter was a complex and controversial one and circulated the draft widely for review across the full spectrum of pro-pesticide and anti-pesticide interest. Although the title of the report is "Investigation of the Effects of Food Standards on Pesticide Use," it is concerned specifically with "cosmetic damage which is actually caused by or attributed to insect pests" and deals almost exclusively with insecticides. It concentrates on California agriculture.

In the report the authors argue that state and federal quality standards reinforce the cosmetic requirements imposed by the big buyers of produce. A major legal mechanism underlying the system is the marketing orders which set criteria on quantity and quality for fruits and vegetables. Under these orders, limits can be set on the total quantity of a particular variety to be marketed over a season or a shorter period. Market advisory committees make the decisions and can set standards for quality as well as quantity. The system operates through the vote of producers and handlers.

The report contends that existing food quality standards and the quality standards imposed by growers cooperatives achieve high cosmetic standards at the cost of unnecessarily heavy use of insecticides. The authors also say that the standards restrict the volume of produce reaching the market, thus raising prices and benefiting growers more than consumers.

The van den Bosch group acknowledges that consumers are conditioned to "equate size and color with good taste and quality," but argue this connection is not necessarily valid and that consumers could be educated to accept less impeccable fruit at lower cost and with lighter use of pesticides. Some agricultural scientists argue that the consumer penchant for unflawed produce is a cultural preference with deep roots, but the subject is not discussed in any detail in the report.

Similarly, in discussing processed food, for which standards are set by the Food and Drug Administration, the report argues that there would be no hazard to health if levels of "insect debris" permitted to be left in processed food were to be raised somewhat. The argument again is that consumers would benefit from the reduced use of insecticides by growers, but the report's statement that the "long history of human ingestion of insects suggests this food is nontoxic to humans" is unlikely to make many instant converts.

One section of the long report (323 pages in typescript) is devoted to a review of the results of exposure of farmworkers to pesticides. The authors argue that because pesticides for cosmetic purposes are often applied shortly before harvesting in order to prevent the presence of insect debris in the produce, farmworkers are particularly vulnerable to their use.

The report is sharply critical of the in-

## Checking on Nuclear Blasts

In July, the teleseismic network by which the United States monitors Soviet underground nuclear explosions registered two Soviet blasts, each of which appeared to be 200 kilotons in yield—or well above the 150-kiloton limit agreed to in a pair of treaties signed but not yet ratified by both sides. The Soviets have denied that they exceeded the 150-kiloton limit, but, nonetheless, political shock waves have been felt in the United States, amplified by the President's campaign defensiveness about détente. The incident illustrates the problems of verifying the 150-kiloton limit set by the threshold test ban treaty and its companion, the Peaceful Nuclear Explosions Treaty.

Since the disclosure, government seismic experts have begun admitting that methods for estimating underground nuclear blasts are so imprecise that they cannot tell whether each blast was indeed 200 kilotons, or some other yield, possibly as low as 100 kilotons or as high as 400 kilotons. Work is under way to narrow the range of the estimate, but experts say it is unlikely it will be narrowed by very much. The geology of a blast site affects the magnitude of the shock waves the blast transmits through the earth; hence, there are inherent uncertainties in estimating the yield of a given blast. This problem highlights the usefulness of the local geological information which each side must provide to the other in advance of any blast under both treaties (see page 743).

In the meantime, these uncertainties pose difficulties in accusing the Soviet Union of a violation, even if the Administration wanted to make such a charge. Perhaps reflecting its embarrassment on this point, the Energy Research and Development Administration, which has always estimated yields of Soviet detonations, has suddenly changed its policy and is now keeping this information secret.

A seismic expert who did not participate in the negotiations notes that, scientifically, a more precise limit would have been the size of the shock wave produced, which can be measured with great accuracy. But, however attractive technically, this approach was rejected for political reasons because the geology of the two countries' weapons test sites is different. Hence, the two sides could fire explosions of different yields, yet produce shocks of the same magnitude. Whether the fuzziness of measuring the 150-kiloton yield limit makes the two treaties unenforceable and unacceptable is for the Senate to judge when it considers ratification later this year.—D.S.

# Entomologists Vote to Join CAST

The Entomological Society of America (ESA) has decided to join the Council for Agricultural Science and Technology (CAST) by a vote of 1086 to 802. ESA has over 7000 members eligible to vote. The question of affiliation with CAST had been warmly debated within ESA (*Science*, 20 August) because CAST, which operates as a nonprofit, educational organization, receives substantial support from the pesticide industry.

CAST's primary function is the production of reports on agricultural science subjects by task forces whose members are drawn mainly from scientific societies affiliated with CAST. Affiliation will entail financial contributions to CAST by ESA, but the ESA board has determined that the money will not come from ESA general funds. It is expected that ESA members interested in supporting CAST work will be asked to add a sum—probably $1—to their dues voluntarily.—J.W.

adequacy of research and record keeping on pesticide poisoning among farmworkers and asserts there is evidence that there is much more illness than is treated, let alone reported. The authors also claim that there are signs that pesticide effects are especially serious for the young, the old, persons in ill health, and pregnant women, groups heavily represented among field-workers.

The report acknowledges that pesticide regulation in recent years has limited the use of some pesticides and improved pesticide application methods, but argues that the system, which relies mainly on a network of pest control advisers and on an inadequate inspection and enforcement system, needs substantial improvement and, particularly, that advisers need better training to wean them from an "uncritical chemical approach" to pest control.

In their recommendations, the authors urge that pest control advisers not be directly or indirectly employed by agricultural chemical companies as many of them now are. They recommend also that the advisers not profit personally from application of any pest control method whether it be chemical control or biological control.

The main thrust of the recommendations is that integrated pest management techniques be given broader scope through better training of pest control advisers, revision of laws which affect food quality standards, and education of consumers in the options that would be available if cosmetic food standards were modified.

One weakness of the report stems from the lack of solid data on the portion of pesticide use which can be attributed specifically to cosmetic requirements. Van den Bosch claims, however, that the group was hindered throughout the study by the suspicion and hostility of growers and processers. He insists there were attempts to influence university officials to block the study. He also claims that a survey of growers, counted on to provide information on the matter of cosmetic use, was stopped on order of the Office of Management and Budget. EPA officials say that the survey was not in the original plan and not necessary to the study as designed, and that OMB was simply applying the rules. Van den Bosch, however, charges that the survey was blocked because a representative of canning interests brought the survey to the attention of a senior figure in the university agricultural science community, a consultant with EPA, who raised the issue with OMB. The person named flatly denied the allegation. Van den Bosch says he dropped the matter of the survey to prevent embarrassment of EPA officials.

The question of the amount of pesticide use attributable to cosmetic requirements was raised in the 55-page CAST critique of the report, which noted a "failure to make sufficient connection between the effect of food standards on the use of pesticides." The CAST review found the report unbalanced because it dwelt on "negative impacts to public health and environmental quality," and commented that "instances of substantial inaccuracy, misinformation, and incomplete information abound."

In a page-by-page exegesis, the review takes issue with the report on both fact and interpretation. One representative section takes issue on a major point as follows.

"The proposal that 'integrated pest management' is 'the' alternative is presented as though it were readily available. In no case has the integration of the factors then listed . . . taken place. The idealized concept is fine, but it should be presented as the research approach (which it is), and it should be made clear that the ideal exists nowhere at present and is scarcely 'the' alternative. . . ."

The CAST review spurred van den Bosch's counterattack in the ESA affiliation debate and led to a stiff exchange in

# Briefing

## Science Adviser Installed

H. Guyford Stever, unofficially engaged to be President Ford's science adviser for some months now, finally said "I do" in a brief ceremony in the White House cabinet room on 12 August. (The Senate confirmed him following hearings on 28 July.)

In attendance at the low-key ceremony were a modest gaggle of White House and National Science Foundation employees, as well as HEW health secretary Theodore Cooper, who had just attended a White House signature session to launch the swine flu program. Only two reporters were present.

Although he may soon be doing battle with a scientifically literate opponent, Ford did not exploit the opportunity to sing paeans to science. He merely noted that he had had a "great interest in science and technology," particularly the space program, since his first days in Congress and that he had been on the committee that put the "S" in NASA. He noted that the country was "very, very fortunate to have a man like Guy Stever" to bring science back to the White House.

Vice President Nelson Rockefeller, who has been a big science adviser booster, was called on to administer the oath to Stever because all the Supreme Court justices were on vacation.

Following the ceremony Stever and his wife departed for New Hampshire to go fishing.

The next day the White House announced the appointment of Simon Ramo, the "R" in the aerospace firm of TRW Inc., to the chairmanship of the new President's Committee on Science and Technology, which is to conduct a 2-year study of the federal science establishment.—C.H.

correspondence involving van den Bosch and the chairman of the CAST task force, Martin M. Barnes, a professor of entomology at the University of California at Riverside.

Van den Bosch is known to his colleagues at Berkeley and to entomologists generally as something of a maverick. His professional standing with his peers is high, but he has a reputation for combativeness and polemical resources which have made him conspicuous in California pesticide controversies, where, as one observer put it, "they play hardball." (Van den Bosch is known as an expert in biological control of insects and this, along with his membership in the Environmental Defense Fund and open espousal of reducing use of pesticides, does not endear him to pro-pesticide forces.) In a letter to Barnes, van den Bosch added this P.S.: "In my vocabulary of epithets I am a gutter fighter. That's where the opposition holds forth and I fight by its rules."

Barnes and others have raised the question of the credentials of some members of the group which included several graduate students and persons with educational backgrounds outside that usually associated with a study of the type carried out. Van den Bosch readily admits that the group was a "raiders type group," similar to the study groups mustered by Ralph Nader and dubbed "Nader's raiders," but argues that group members with training in fields such as law, journalism, and agricultural economics were desirable because there was enough scientific strength among the authors and consultants who assisted the group.

What is next for the report is not altogether certain. The comments and criticisms collected by EPA, as well as EPA's own remarks, are now on the way back to van den Bosch. The message to the group is likely to be along the lines suggested in a sympathetic but certainly not uncritical review letter from David Pimentel of Cornell. Pimentel, also an entomologist, said his impression is that the report is too long, covers too many topics, has some statements which "are stronger than can be supported by the data presented," and would profit from careful editing. He suggests that a much shorter paper "that carefully and concisely documents the cosmetic problem" should be prepared. Pimentel, who with a group at Cornell has been engaged in a similar study, does, however, support the van den Bosch thesis that "large quantities of insecticides are being used needlessly because of 'cosmetic standards.' "

That the van den Bosch report has attracted so much attention is in part a result of special circumstances prevailing now. Many pesticides that have been in use for a long time are coming up for reregistration and growers and pesticide manufacturers may have seen the criticism of cosmetic use as the opening of a new front against them. Furthermore, the Federal Trade Commission is looking hard at marketing orders which undergird the cosmetic standards, with FTC staff suggesting that marketing orders may be in restraint of trade.

The furor surrounding the report does have some ironies, especially for its critics. As Pimentel and other observers note, the van den Bosch report is likely to have greater impact because of the controversy than it ever would have, had it never been challenged.—JOHN WALSH

# Biomedical Training: Time for a Slowdown

A committee of the National Academy of Sciences (NAS) has issued a startling report that calls for a "modest but significant" *reduction* of federal support of students in the basic biomedical sciences and a "significant reorientation" of government sponsorship of training of individuals in the behavioral sciences. Considering how dear training grants are to the hearts of researchers throughout America, certain features of the report, "personnel needs and training for biomedical and behavioral research,"* come as something of a surprise.

The report is the first substantive statement of the Committee on a Study of National Needs for Biomedical and Behavioral Research Personnel that was created, as a result of the National Research Act of 1974 (*Science*, 2 August 1974), to help the government decide just how many individuals the country needs to keep the research enterprise alive and reasonably well. Committee chairman Robert J. Glaser, president of the Henry J. Kaiser Family Foundation in Palo Alto, says the report represents an attempt to be "realistic" about what is fiscally possible these days—and realistic it is. The Glaser committee recognizes limits.

Training grants and fellowships became a subject of intense concern to the biomedical community in 1972 and 1973 when the Nixon Administration tried hard to do away with all federal support of training in biology and medicine. Training grants support not only individual students but also institutions, and deans and department chairmen became distraught at the thought of losing that source of money. Committees were formed, letters were written, congressmen were petitioned, and always the message was the same. Young postgraduate students are the very lifeline of the biomedical research enterprise. For it to continue to flourish, there must be more training grants for more students, not fewer.

And now, the Glaser committee comes along and says, Well, maybe more is not really the answer. It's refreshing, if nothing else. The committee looked at quantities of available data on manpower and, while acknowledging that there are not as much really solid data as one might like, concluded that there is no pressing need to substantially increase the number of individuals doing pre- or postdoctoral research in biomedical or behavioral sciences. In fact, it decided that a slight decrease in numbers in some fields is in order.

The committee's judgments seem to be based, in large part, on a practical assessment of the world as it is in 1976, rather than on a vision of a world as they might like it to be. Which is to say, as Glaser did, "The committee has been very sensible in realizing that there will continue to be restraints on funds and that if our work is going to be useful, we have to try to establish some priorities."

The committee defined four broad areas of research—basic biomedical sci-

*Available from the Commission on Human Resources, National Academy of Sciences–National Research Council, 2101 Constitution Avenue, NW, Washington, D.C. 20418.