Adams—not the prosecutor—who presented the allegations against both Dupuy and Hargis to the grand jury that indicted them on 6 July. Both are on leave without pay, and Hargis has had to step aside as director until the matter is resolved. Adams could not be reached for comment.

While Adams was at VIMS, the Kepone scandal was becoming a major political issue in the southern Chesapeake Bay region, where most of Virginia's population and industry are located and which also relies heavily on fishing and tourism for revenues. When large quantities of Kepone had been found in the James River, VIMS, as the area's leading marine laboratory became a principal source of data on the extent of contamination in the fish and shellfish.

Hargis explains that VIMS maintained a policy of making its findings known to the public. Hence, he would answer reporters' questions about Kepone contamination frankly. Other state officials—including some on Governor Mills E. Godwin's Kepone Task Force—did not like this policy. Hargis and the task force tangled about whether VIMS should release its findings, or whether all statements on Kepone should be screened by the task force first.

Hargis' statements (for example, in January he was quoted as saying the matter was "a serious catastrophe of major proportions") were exceptionally blunt. In the unfolding of the problem, it has been federal, rather than state, officials who have stressed the hazards of Kepone contamination. Godwin has taken some actions; for example, in December he closed the James River to fishing,

Parts of a 1950's vintage diesel engine which Hargis is alleged to have stolen.

but, for the most part, state officials have tried to smooth the crisis over. They may have had a motive for wanting Hargis silenced, but there is no evidence that this was the motive for the prosecution.

The state had planned to attract large numbers of Bicentennial visitors to the historic Williamsburg-Jamestown-Hampton Roads area, but partly because of Kepone, tourism has been half of that anticipated.

In any event, Hargis and VIMS recently have been out of step with most state officials (and previously over the environmental impact of a proposed Portsmouth oil refinery), causing speculation that the indictments were politically motivated. However, Harry Morris, the county prosecutor who is proceeding with the charges, has been quoted as denying any pressure was brought to bear on him to proceed against Hargis. Morris told *Science* that he believes Adams' investigation was a competent one and that the local press has distorted the matter in Hargis' favor. "Anyone can make himself look innocent," he said. Morris has the option of dropping the charges, of conducting his own investigation, or of proceeding on the basis of Adams' findings. He has chosen the latter course.

Neither Hargis' nor VIMS' reputation seems to have suffered during the tense, pretrial period. Those who know Hargis through his NACOA connection, and who are familiar with his 17-year effort to build up VIMS from an obscure fisheries laboratory into a $7 million per year national institution, simply refuse to take the allegations seriously. "The whole thing sounds like a waste of everybody's time and money," says Nierenberg. However VIMS staffers say that morale is low. "Hargis is such a pillar of moral rectitude," says one employee. "If they can do this to someone like that, what about the rest of us?"

It may be significant that that other pillar of moral rectitude, Elliot L. Richardson, Secretary of Commerce, has indirectly expressed confidence in Hargis. NACOA advises the President and the Secretary of Commerce on oceans and climate policy. In August, after reviewing the situation, the Commerce Department went ahead and appointed Hargis to the prestigious Mid-Atlantic Regional Fisheries Council which is to oversee the implementation of the new, 200-mile fishing limit in the Mid-Atlantic States.—DEBORAH SHAPLEY

Laetrile: "Quack" Cancer Remedy Still Brings Hope to Sufferers

Despite governmental efforts to stomp it out and near-zero interest in it on the part of cancer researchers, the banned anticancer drug Laetrile has a steady, and apparently growing, market among cancer sufferers in the United States.

The claims for Laetrile, the substance extracted from apricot pits, are that it enhances well-being, brings relief from pain, prolongs survival, and in some cases brings about total remission of cancer. A vague but oft-repeated estimate is that 20,000 people a year are turning to Laetrile for treatment of cancer; many others take it as a prophylactic in the belief that its alleged nutritional properties will keep them healthy.

Proponents of Laetrile—which is banned from importation and interstate commerce—are engaged in what they perceive as a gargantuan struggle with the Food and Drug Administration (FDA), the agency many tend to regard as the evils of big government incarnate. The pawns in the conflict are thousands of cancer sufferers who see the government as trying to snatch from them what may be their last shred of hope.

The day may come when Laetrile is dismissed once and for all as a quack remedy, but it seems to be enjoying a much longer run than most. Efforts to stem trade in the substance only seem to stimulate more interest, as did, for example, the indictment of 16 people early this year for running an extensive Mexican-American Laetrile smuggling operation.

Most people get their supplies of Laetrile in Tijuana, Mexico, where pathologist Ernesto Contreras (one of those indicted for smuggling) runs a treatment center called the Del Mar Clinic. But

increasing numbers are getting supplies in this country through an information and referral network that appears to be focused in several national organizations that promote the idea that cancer is a nutritional deficiency disease.

The largest of these is the Committee for Freedom of Choice in Cancer Therapy in Los Altos, California, which was founded in 1972. (The others are the International Association of Cancer Victims and Friends and the Cancer Control Society.) According to Mike Culbert, editor of its newsletter, *The Choice*, the committee has grown by leaps and bounds and now has some 450 chapters around the country. Culbert says its membership of 23,000 includes 800 doctors, including Representative Larry P. MacDonald (D–Ga.), a urologist who has treated many patients with Laetrile. Sixty of these doctors are allowing their names to be used as referrals for patients who want a doctor willing to administer Laetrile. The committee holds several symposia a year where its chairman, Robert William Bradford (recently indicted for Laetrile smuggling), instructs "metabolic doctors" on the role of diet and nutrition in the treatment of degenerative diseases. The committee also conducts meetings for the general public around the country which, according to Culbert, may attract anywhere from a couple of dozen to over a thousand people.

Cost of Laetrile Treatment

While it is impossible to determine just what the pattern of Laetrile use is, Culbert claims that cancer victims usually turn to it only after conventional remedies have failed them. Most obtain it in Tijuana where the Contreras clinic treats perhaps 600 Americans a year. A month-long course of treatment, including food and lodgings, costs between $1500 and $2500. Many patients bring supplies of Laetrile home with them and have it injected by their doctors.

It is easy to produce Laetrile—all it takes to extract amygdalin (the chemical name for Laetrile*) is ether and alcohol—and perhaps ironically, most of the pits are obtained from California. Several fruit packing concerns in the Santa Clara Valley sell a goodly portion of their left-over pits to Cyto Pharma, the Tijuana plant (the rest of the pits are sold to bakers for almond-like flavoring or to be sliced up and put on buns). Figures on the California-Tijuana apricot pit trade are not available, but according to one doctor, it takes 33 kernels to make one 0.5-gram Laetrile tablet and 200 for a 3-gram vial of Laetrile mixed in water. According to Culbert, the Mexicans sell the vials at $9 each (one vial is good for one injection) and there is a 10 percent markup in the United States (although a customs official has been quoted as saying the markups were more like 600 percent). The tablets are sold in the United States, labeled as food supplements, for 65 cents to $1 each.

Legal and functional definitions of Laetrile have proved somewhat elusive, as they have shifted during the cat-and-mouse game Laetrile boosters have been playing with the FDA since the substance was banned from interstate commerce under the new food and drug law in 1963. The FDA has been trying to chase it off the market on the ground that it is neither an approved investigational new drug nor a substance "generally recognized as safe." The proponents of Laetrile counter that amygdalin is found in hundreds of foods and that the substance poses about as much menace to the health of the Republic as sunflower seeds. Actually, people have suffered toxic reactions from eating too many apricot pits, but injections and pills seem to be harmless.

The alleged scientific rationale for the workings of Laetrile fits in with a larger and long-lived school of thought that holds that most human diseases derive from metabolic and nutritional deficiencies that can be corrected by proper diet. The scientific guru of Laetrile is Ernst T. Krebs, Jr., a biochemist whose father, a doctor, first propounded the idea that apricot pits had anticancer properties. The junior Krebs (who is scientific director of the Choice committee) refined the "formula" in the late 1940's and gave it the name Laetrile (because the preparation was levorotatory [left-handed] in polarized light and amygdalin was chemically a mandelonitrile). The Krebs theory is that cancer cells have large quantities of an enzyme called beta-glycosidase which releases the hydrogen cyanide in the amygdalin to kill the cells. He said normal cells were not affected because they have another enzyme, rhodenase, that detoxifies the cyanide.

Nice as this idea is, it has not been confirmed by any scientific research. So, although many people still buy the Krebs theory, the position that Laetrile supporters now fall back on is that Laetrile is important to good nutrition because it contains a vitamin, B_{17}, also referred to as nitriloside.

Scientists at the National Cancer Institute state categorically that there is no such vitamin. The trouble is, no one has really been able to prove it.

If there is any scientific basis for claims about Laetrile, it is not likely soon to be discovered, for research on the substance has all but ground to a halt. In 1970 Andrew R. L. McNaughton, a peripatetic English-born Canadian who runs an equally peripatetic foundation for "Laetrile research," applied to the FDA for permission to run clinical trials with the drug. But the agency, after an extensive review prompted by all the publicity surrounding the "drug," turned him down. Since then, one study, conducted in the early 1970's by Kanematsu Sugiura at the Sloan-Kettering Institute for Cancer Research, indicated that Laetrile helped inhibit the spread of spontaneous breast tumors in mice. But efforts to replicate these results, as well as research with transplanted tumors, conducted by three other institutions, have revealed no positive results. An NCI official says the institute funded studies on Laetrile with eight different tumor systems, and the chemical showed no activity even with tumors known to respond to other types of therapy. Sloan-Kettering is having a final go at the question in conjunction with Catholic Medical Center, although Chester Stock of Sloan-Kettering says "without this controversy Sloan-Kettering would have stopped work a year or so ago." The first set of experiments went badly because of clumsy injection procedures, and Stock, although he believes it would be worthwhile to get the matter resolved, did not sound optimistic about getting any definitive results.

Quick Fix Nixed

Three years ago Sloan-Kettering's director Lewis Thomas was quoted (*Science*, 7 December 1973) as saying "this institution can answer the Laetrile question fairly quickly." That statement now seems to have been something of a miscalculation.

Laetrile's jousts with the law, while resulting in cutting off of some distribution channels, seem only to have stiffened the spines of its promoters. In addition to the smuggling indictments, the conflicts have also culminated in the FDA obtaining court injunctions against several health food distributors forbidding them to buy or sell Laetrile across state lines.

There have also been several suits of another kind, brought by cancer patients who have asked courts for judgments to permit them to bring in supplies from

*Amygdalin, says the FDA, is a cyanogenic glucoside that can be hydrolized to glucose, benzaldehyde, and cyanide. Laetrile is ground, defatted apricot pits.

Mexico. Last January the FDA lost its first such case when a U.S. District Court judge in Oklahoma ruled that the federal food and drug law was denying a group of cancer patients their constitutional right to obtain their drug of choice. About 17 people have been allowed to bring Laetrile into the country under this judge's ruling, which is now being appealed by the FDA. Another little chink was driven into the law in August when a judge in Huntington, West Virginia, issued a temporary order allowing a cancer patient 10 days to go to Mexico and get himself a permanent supply of the substance he believes is keeping him alive. The case is yet to come to trial.

Finally, in an action the FDA finds "very unfortunate," the Alaska legislature last spring passed a law prohibiting hospitals and health centers from forbidding doctors to give patients Laetrile on request, providing the state medical board did not object. Alaska Governor Jay Hammond listened to all the medical evidence against it, but decided not to veto the bill because of his "strong personal conviction" in "the individual's right to decide on a course of conduct or a mode of treatment given the alternatives available."

Paul Sage of the FDA's litigation and recall division says the Alaska law will not have much practical effect since they don't grow apricots there, but he fears that it will generally encourage use of the substance. (Technically, it would be legal for a company to manufacture Laetrile in the United States if it acquired all the necessary ingredients and did all its business within the state. In reality, though, the government would inevitably be able to nab it on some interstate violation.)

The Freedom of Choice committee sees the Alaska law as only the beginning of a trend. There are reports that Nevada will be the next forum for attempts to pass such a bill, and Culbert claims there are movements in at least 12 states, including Michigan and Louisiana, to get similar legislation. "The FDA is going to be left with its tongue waving if all 50 states legalize it," says Culbert, who says an anti-Laetrile law is "like a national law against masturbation."

Certainly, Laetrile is filling a need, if only the need for hope. It is also filling a vacuum. Where traditional remedies fail, unorthodox ones rush in, and the fact is, despite advances in cancer therapy, three out of four people who get cancer are still dying of it. The fact that scientists are not able to definitively refute the nutritional claims about Laetrile also points up the broad gaps that still exist in knowledge about nutrition.

But it has really become more of a political than medical issue. Its promoters tend to entwine their medical arguments with vehement denunciations of the medical establishment and governmental intervention into private affairs, and some of the most prominent names associated with Laetrile are also associated with the John Birch Society. The issue has also borrowed steam from another popular movement—the search for nonrational and simplistic remedies for ailments both physical and spiritual, as manifested through interest in the occult, faith healing, astrology, UFO's, and so forth. Congdon C. Wood of the American Cancer Society says, "I'm amazed at the way the (Laetrile) activity has been on the increase." He says a recent ACS inventory of unorthodox drugs and

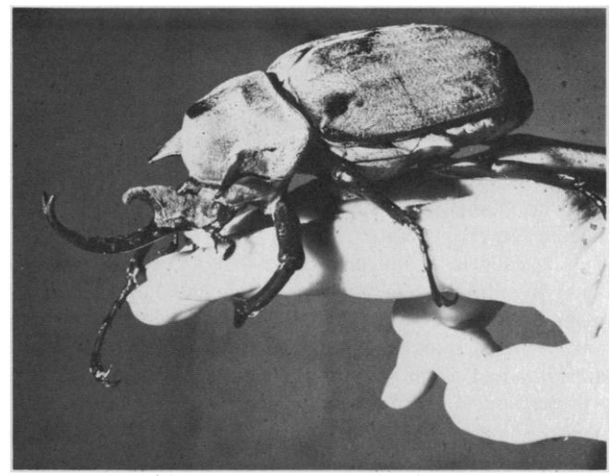
Smithsonian Insect Zoo: A Murmurous

Some say bugs are going to outlast all of us on this planet. The Smithsonian Institution's newly opened Insect Zoo gives some clues as to why. The zoo is the country's first permanent exhibition of insects and other arthropods, ranging from microscopic mites to fist-sized beetles to the Japanese king crab which, with its 4-meter leg span, is the largest of all arthropods. This crab is mounted on a wall, but most creatures are presented live, demonstrating the vast array of life-styles and adaptive mechanisms that show how, as one entomologist said, "insects are the most successful of all animals."

Indeed, the theme of the zoo is "success through diversity." Aside from the exoskeletons and jointed feet that all arthropods have in common, the diversity is stunning. The arthropod phylum has five main classes: insects, arachnids (spiders, scorpions, mites), crustaceans (crabs, shrimp), millipedes, and centipedes. They fly, creep, swim, and burrow. They suck, sting, bite, pierce, chew, and sponge. They live alone, in swarms, and in highly structured societies; reproduce sexually and by parthenogenesis; are phytophagous, fungivorous, or predacious. And they live everywhere.

Life spans of the bugs vary greatly, from up to a dozen years for the tarantula to a week for some butterflies. The zoo population therefore enjoys a fairly brisk turnover, with replacements coming from field trips, supply houses, contributing professors, and insect cultures nurtured in the zoo's "rearing room," where are also grown plants for food and habitat.

Among the more elaborate feeding styles is that of fungus ants. At the zoo they live in a glass box on the wall that is connected by a transparent plastic tube to a pot of flowers. The ants travel through the tube and fetch petals. They defecate on them to inoculate them with fungus spores and then feed off the resulting "fungus garden."



A Rhinoceros beetle from South America

(Officials have not quite got this exhibit under control—it was recently discovered that the ants were transferring all their operations to the flowerpot where they could not be seen by visitors.)

Another intriguing way of life is that of dung beetles

medical treatments has uncovered perhaps a dozen "new" ones. These include a new anticancer drug called Tekarina, which is made from Mexican seaweed, and courses of treatment combining diets, astrology, and faith healing promoted by various "doctors." One of these has fooled a couple of state governors into declaring "national cancer day" to collect money for an undefined enterprise; another has been contacting cancer patients and offering them a $1200 cure that combines astrology and numerology.

The legal status of Laetrile is forcing it into some rather poor company. The result is a pro-Laetrile contingent made up of a coalition of desperate people and practitioners, medical, and otherwise, whose judgment may leave something to be desired. An FDA lawyer, speaking of Laetrile promoters, puts it more strongly: "I worked in law enforcement for 10 years, and these people look, act, smell, and think just like all the con men I dealt with for 10 years."

Unquestionably, there are well-motivated people among the promoters, but it is difficult to find a doctor who believes in the efficacy of Laetrile who also separates fact from dogma. The most respectable-sounding medical name among Laetrile supporters was that of Dean Burk, retired head of the cytochemistry division at the National Cancer Institute. Attempts to reach him were unsuccessful, but at last report he was working with a group called the National Health Federation, which is trying to get Congress to repeal fluoridation.

The prevailing view in government and among cancer clinicians is that to divest Laetrile of its criminal aura would be to encourage its use at the expense of proven cancer therapies. An FDA official says that legalizing the substance, even under a name that did not have anticancer associations, would create "total chaos in the medical marketplace as to what's effective and what isn't."

But there are a few who disagree. Chester Stock, for one, says he would have no quarrel with allowing a patient to take Laetrile, if he desired, in conjunction with conventional therapy. And George Crile, a breast cancer specialist at the Cleveland Clinic, thinks that allowing patients to have Laetrile would diminish the number of those who chose to rely on it solely for cure. In a letter published in the *New England Journal of Medicine*, Crile wrote: "Every three or four months I see a woman with an advanced and usually inoperable breast cancer that had been present for months or years while the patient was receiving no treatment except Laetrile. I note no tendency for the frequency of such unfortunate cases to diminish." Crile contends that public education on Laetrile simply makes more people think the medical profession is withholding it so it can make money off standard therapy. He proposes that doctors be allowed to administer it if it is asked for while advising the patient that it is worthless. "Although the Laetrile would do no good" writes Crile, "at least the patients would no longer be in the care of quacks."

Most doctors agree that Laetrile is harmless, if worthless. Therefore, were it not for the anticancer mystique that surrounds it, it could quietly take its place on the shelves of health food stores alongside any number of other oddities whose nutritional value is equally questionable.—CONSTANCE HOLDEN

Microcosm Does Its Thing on the Wing

(scarabs) who spend their days, Sisyphus-like, crawling up and down a little brown hill behind glass rolling up balls of cow dung in which the females then lay their eggs.

There is a little section at the exhibit dubbed, euphemistically, "insects that live with man," where can be seen termites, sowbugs (crustaceans), potato bugs, pill bugs, and cockroaches. These last creatures are presented, behind red glass to make them think it is night, in disgusting realism, their props being bits of garbage and a kitchen sink.

The zoo also has a fully operative bee hive, a vertical affair enclosed in glass connected to the outdoors with a plastic pipe that goes out of the window. A Smithsonian official says this is a "weak" hive, and the supposition is that the honey mostly comes from spilled soft drinks the bees pick up on the mall.

Terry Erwin, the zoo's science director, says this is the first attempt to combine a "museum-type script" with live bugs so visitors can learn as well as look. He makes it clear that putting together a workable and interesting collection was no easy task. "We needed to find exhibitable species," he says—those that would feel compatible with the light and humidity conditions, would not go into hiding, would not knock themselves out against the glass, and "would do something besides sit there." A particular challenge was orchestrating the contents, both animal and vegetable, of a 50-foot-long "flight cage" where hundreds of species are doing their own thing, including eating each other. Erwin says he is still "waiting for it to get balanced out."

The specimens themselves are not expensive—the most expensive were parasitized crabs, costing about $5 apiece, that are hosts to barnacles (which are also arthropods). Three full-time zoologists are needed though, and the zoo also has 70 to 100 volunteers to keep things going. The potato bugs, for example, need a fresh plant every day.

Egg Uses Moth to Make More Eggs

It is somehow bizarre to realize that the busyness and sophistication of all these creatures is directed to one end: self-propagation. Take the silk moth which, after hatching, spends 2 months as a caterpillar, eating continuously. It then spends 9 months as a pupa while it undergoes a complete transformation—and for what? A brief month-long fling as a moth, when it does nothing but mate and lay eggs, whereupon it dies.

From the standpoint of other creatures, of course, insects play a weighty role in the ecosystem, recycling organic matter, pollinating crops, serving as food for other animals, enriching the soil, and generally contributing to the balance of nature. Their combined presence is staggering—one estimate is that there are about 10^{18} insects in the world and their weight exceeds that of the human population by a factor of 12.

Perhaps it is time for insects to get attention more in proportion to their presence in the ecosystem. And what with all the bad publicity they have been getting as destroyers of crops and livestock, it would seem the new zoo is an appropriate way to remind people of their constructive side, as well as their flexibility, ingenuity, and infinite variety.—C.H.