vida says that he said as little as possible to the many reporters who contacted him because he felt bound by the broad language of the secrecy order. And the reporter from the Milwaukee *Sentinel*, which first ran the story, already knew about the secrecy order when he first called him, Davida said.

Inman emotionally denied inventor Nicolai's charge, which appeared in an Associated Press story, that the secrecy order "appears part of a general plan by the NSA to limit the privacy of the American people." ("That's false" Inman said emphatically. "There's no general plan, no specific plan, no any kind of plan.") Nicolai had continued, "They've been bugging people's telephones for years and now someone comes along with a device that makes this a little harder to do and they oppose this under the guise of national security." (Rereading this quote aloud, Inman said, "The NSA has never bugged people's—American citizens'—telephones. I have testified about this to Congress.")

NSA has officially stated that it does not "target the communications of American citizens"—although investigations have shown that it kept "watch lists" in the late 1960's of Americans about whom it collected information. Another continuing controversy has been what the NSA does with communications it intercepts when one party is an American or when two foreigners are discussing an American (*Science*, 9 September 1977, p. 1061). The new wiretap bill passed by Congress addresses this.

Inman declined to discuss two other incidents. In one, an NSA employee named Meyer threatened academic scientists with prosecution under the export laws if they discussed their research in cryptography. In another, later confirmed by the Senate intelligence committee, NSA convinced the National Bureau of Standards (NBS) to simplify the key to a data encryption standard NBS was approving for civilian and commercial use (*Science*, 29 July 1977, p. 439 and 30 Sepember 1977, p. 1345).

In general, Inman declined to answer questions regarding what level of cryptographic and communications security devices the NSA would like to see allowed for use by Americans. He said any comment would bear on the "communications security" aspect of NSA operations which he would not discuss.

But on the second issue, of whether first amendment rights can be reconciled with what NSA thinks necessary for national security, the NSA position does not seem so far afield from that sketched by spokesmen for the research community. Inman indicates that NSA would like authority like that the Atomic Energy Commission (AEC) (and its successor agencies) has under the Atomic Energy Act. Under the law, the AEC can classify the work of any American (and in one case they even classified the lecture of a Soviet citizen) that it thinks will jeopardize atomic energy secrets. Such clear authority does not exist, according to Inman, in the cryptologic area. In the past, Defense Department lawyers have told *Science* that such clear authority may not extend to any nonnuclear work with military applications.

Says Werner Baum, the champion of Davida's academic freedom: "It was never our position that there might not be instances in which research should be classified in the national interest. That of course is a very valid point. But if there are such cases, there should also be a burden of proof on the government, and some due process ought to be invoked. The procedure as applied now could be arbitrary or capricious." So it seems the "dialogue" that the NSA chief seeks has already begun its way down an interesting, but unknown and unprecedented, road.—DEBORAH SHAPLEY

Boon or Boondoggle: Bygone U.S. Rubber Shrub Is Bouncing Back

A few months ago, on 19 June, a scientist from Texas A & M University carried into a joint hearing at the U.S. House of Representatives a scruffy-looking plant with steel-gray branches and leaves. It appeared to be a weed. But the scientist explained that the plant had vast potential and that with proper care it might blossom into a multimillion-dollar industry.

By the time other witnesses had given their testimony, the House committees on Science and Technology and on Agriculture had apparently been impressed. The upshot? Congress is now preparing to sink some $30 million into the plant's development. It is no small sum to bestow upon a lowly shrub that grows only in the deserts of Texas and Mexico. But the guayule bush (*Parthenium argentatum*) has a remarkable talent. It makes rubber.

It also promises to make federal research dollars flow into underdeveloped areas of the southwestern United States. Therein, say several scientists and federal officials, lies danger of a megabuck boondoggle that could sidestep the careful research needed to ultimately tap the potential of the guayule bush.

The story is simple, at least in the beginning. Interest in guayule (pronounced wy-OO-lee) is currently riding high because natural rubber shortages are beginning to loom. The World Bank estimates that during the next decade, global supplies of natural rubber (from *Hevea brasiliensis*) are likely to increase at a yearly rate of 3.8 percent—while demand for rubber will increase annually by 5.9 percent. The gap cannot be filled by synthetic rubbers because of their inferiority in elasticity, resilience, and heat resistance. Aircraft tires, for example, must be made almost entirely of natural rubber, and radial automobile tires require 40 percent. In addition, synthetic rubber is made from dwindling supplies of petroleum.

Enter guayule. As a *Hevea* substitute it has been picking up followers for the past few years. In 1975 the National Academy of Sciences (NAS) sponsored a conference in Tucson, Arizona, to investigate guayule's potential (*Science*, 10 June 1977). They came out with a favorable report, *Guayule: An Alternative Source of Natural Rubber*. In some cases as much as one quarter of the plant's total weight is rubber. Furthermore, guayule can be harvested mechanically, in contrast to the *Hevea* rubber trees in the tropics, which are one of the most labor-intensive crops in the world. Defense analysts say guayule could take the edge off an interruption in Southeast Asian rubber supplies, as happened during World War II. The U.S. Bureau of Indian Affairs thinks guayule can promise Indians in the Southwest an economic base for their poverty-stricken reservations.

And the tire giants, the ultimate consumers, are also interested. Goodyear has made a small trial planting of guayule

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shrubs at its experimental farm in Litchfield Park, Arizona. Firestone and Uniroyal are also testing the plant. Goodrich says it will cooperate with any government-sponsored guayule program. And, surprising as it may seem, even the rubber republics of Southeast Asia are all sweetness and light on the subject. Says a spokesperson for the Malaysian Rubber Bureau: "We welcome it. With natural rubber shortages predicted for the 1980's, guayule rubber will complement *Hevea*, not threaten it."

In January 1942 the first auto tire made entirely of guayule rubber was presented to Secretary of Commerce Jesse Jones. By 1946 the Emergency Rubber Project was producing 15 tons of guayule rubber per day in factories at Salinas and Bakersfield, California. [*Wide World Photo*]

Stretching It

There is, however, a major stumbling block to guayule's development, and the plant's advocates have descended upon Capitol Hill in search of a solution—more specifically, in search of funds. The United States, unlike Mexico, has few wild stands of guayule, so that cultivation will be necessary. And if the shrub is to compete successfully against imported natural rubber, it must first be developed to bear higher per-acre yields of latex.

During the Emergency Rubber Project, from 1942 to 1946, the cultivation question was tackled by the federal government with a team of 1000 scientists and 9000 field-workers. The cost of the guayule they produced, however, was never competitive, and after the Southeast Asian rubber-producing countries were freed from Japanese control, U.S. farmers burned their then useless guayule crop. An estimated 21 million pounds of rubber went up in smoke, and most of the seed from the project's genetic-improvement program along with hundreds of millions of seedlings were scrapped.

To ensure a self-sufficient industry in today's competitive market, the NAS guayule panel called for long-term breeding and plant selection programs so that higher yields of latex would be produced. Harvard botanist Reed C. Rollins, head of the NAS panel, believes it should be possible within 5 to 10 years to determine whether guayule farming is practical.

The clamor in Congress, however, is for quick results. The Native Latex Commercialization Act, introduced by Rep. George E. Brown (D-Calif.), calls not only for a program of plant breeding and selecting but for demonstration projects and pilot factories as well. Speaking at a House hearing in June, Brown said: "What we need is to plant about 50,000 acres of guayule and get the practical experience in the economics of it, the processing problems. We have not developed full-scale processing plants. We do not know how to dispose of the residues and gases and resins and so on. We do not know the marketability of them, and we are not going to find out until we plant the guayule, build the plants, and gain some practical experience."

But U.S. Secretary of Agriculture Robert Bergland in a letter to the House Committee on Science and Technology said the legislation does not accord with the step-by-step "spirit" of the NAS report. Other critics point to a pilot processing plant in Mexico that is already funneling information to the U.S. through a cooperative agreement between the governments. Several scientists also expressed concern that a full-scale U.S. demonstration project would lock guayule technology at a low level, before high-yield cultivation was worked out. James F. Bonner, a Caltech biologist who worked on the Emergency Rubber Project during World War II and who was also a member of the NAS panel, says guayule hybridizations with larger-but-related species were done in 1946 but were terminated before high rubber content was achieved. That potential must again be explored, he says, before the end stages of commercialization are worked out. Harvard botanist Rollins feels that processing would even be handled by profit-hungry companies once the shrub was bred into a proven producer. "But when congressmen get interested in this type of thing, they go whole hog," he says. "They just want activity in their own districts."

Representative Brown and the plant-guayule-now advocates disagree, of course. They point to experiments conducted by the U.S. Department of Agriculture that already show a twofold-to-sixfold increase in latex production in the shrub. Planting and commercialization should start now, they say, before the pinch on natural rubber hits in the 1980's.

To wit, the House in September voted to sink $55 million into guayule development over the next 4 years, with no clear instructions on how much goes to basic and how much to applied research. The Senate on 6 October hit on a compromise version calling for $30 million. That bill is now being passed back through the House in a last-minute attempt to put it on the President's desk before Congress adjourns. If not passed, the bill's proponents say they will reintroduce the legislation next session.

If passed, some of the biologists fear that the full-speed-ahead philosophy will not produce a self-supporting product by the time initial funding runs out, and that a backlash will then sweep guayule out of the picture for good. To them, the specter of the aborted World War II project still haunts the issue.

In replying to gung ho guayule testimony at a Senate hearing last March, Senator Lloyd M. Bentsen (D-Texas) said much the same thing. "I think it is going to take you some time to prove this is a project that will pay off. . . . I don't recall how successful the program was before. I have memories that it wasn't very successful. It turned into a boondoggle. I don't want to see that happen again." It is now up to Congress.

—WILLIAM J. BROAD