around-the-clock supervision, and failed. He was subsequently told to leave research in general. Two retractions, one from Simpson and one from Lipmann's lab, were published in late 1961. Sometime later it was discovered that the student's undergraduate college in Massachusetts had no record of his ever receiving a degree.

Since that time, revelations of cheating—but not necessarily cheating itself—seem to have slowly but steadily increased. The cause? According to Robert H. Ebert, former dean of the Harvard medical school, part of the reason may be increasing pressure. Writing in the *New York Times* about the fabrication of data by John Long at Mass General,

MX Lobotomized by Air Force, Critic Says

The Air Force is merely doing a little budget trimming, according to spokesmen. But Richard Garwin, IBM scientist, consultant to the Pentagon, and a frequent critic of the Air Force, says there is more than this in a recent cutback ordered on the MX missile program.

Garwin says there may be a special policy slant in the decision announced 12 March to cancel work on part of the electronic brain of the MX. The Air Force wants to base this newest and biggest nuclear weapon on land in America's southwestern deserts. Garwin argues that it makes more sense to put the MX in the ocean, and he thinks that the program cut will make it difficult to keep the sea-based option available.

Defense Secretary Caspar Weinberger has said that he wants to keep open all the options for siting the missile bases. President Reagan also has suggested that he is ready to scrap the basing scheme chosen by the Air Force. A group of 15 civilian weapons specialists has been convened to reconsider all the proposals and report back to the secretary of defense by July. They may find that the Air Force has decided already what the outcome will be.

The MX contract in question called for the Charles Stark Draper Laboratory of Cambridge, Massachusetts, which is affiliated with MIT, to design two things: part of the missile's inertial guidance system and a radio receiver that could be used to read signals from a network of satellite beacons known as the NAVSTAR Global Positioning System. The Navy uses NAVSTAR as a navigational aid. By interpreting the Doppler shift of the radio signal, one can obtain a precise fix on one's location and direction anywhere on the globe.

Garwin is enthusiastic about giving missiles the capacity to receive NAVSTAR signals. Doing this would greatly increase confidence in missile accuracy, he says, and it would bring about a big change in strategic planning. In land-based missiles, the improvement would be important, but only incremental. In missiles for submarines or other compact mobile systems, it would be revolutionary, Garwin says.

The potential improvement in guidance could make submarine-launched missiles as accurate as land-based missiles. This would transform the submarine in strategic terms from a blunt retaliatory weapon into a precise instrument of war. Because missiles at sea would be both accurate and invulnerable to attack, they would become more important than land missiles, according to Garwin. This shift of emphasis would demolish the theory that the Soviets might be tempted to launch a surprise attack on bases in the United States in order to knock out America's most threatening missiles. Garwin says that the Air Force ought to put a NAVSTAR receiver on the MX to make the best use of the missile and keep options open.

The Draper laboratory heard formally in December that it had won the $41-million contract to design part of the guidance system and a NAVSTAR receiver for the MX. The radio system is known officially as the Missile Accuracy Evaluator (MAE). According to the Air Force, it was meant to be a tracking mechanism that would let observers follow the course of the MX in tests, supplementing data given by radar tracking stations. According to Garwin and other experts, MAE has another value: it could serve as the first generation of a radio link with NAVSTAR, and be used eventually to help guide a missile to its target.

Early this year the Air Force told Draper laboratory to reduce expenses on the project. Then in March the Air Force ordered work to stop on the MAE system, even though MAE had proved viable and was ready for flight packaging. This decision may have saved the Air Force about $22 million. The planned cost of the total MX project, including bases, is more than $34 billion.

If the MX were based at sea, says one of the nation's top specialists in missile guidance (not Garwin), it would be useful to have a link between NAVSTAR and the missile in order to help it get its bearings. "But this wouldn't be the only way to do it," he said. One could also build the necessary guidance control systems into the ships that carry the missiles, but that would take up space aboard the ships and be "very expensive."

Colonel Neil Buttimer of the Air Force's Ballistic Missile Office in San Bernardino, California, says the decision to cancel work on MAE has nothing to do with basing options. An "updated assessment" of the quality of the missile's primary guidance system "indicates that the likely error sources for MX would be sufficiently integrated so that the MAE program would be of only marginal value." Other sources of flight data could be used in place of MAE, the Air Force has decided.

In basic terms, Buttimer says, "Our budget was cut by Congress. We were looking for ways to save money, and we lined up our programs and asked what are the most important and what can we get rid of with the least injury?" As it happened, MAE came out at the very bottom. Buttimer adds, "If it were important, which it isn't, it wouldn't be difficult to start it up again. . . . We'll know by June or July which way we're going to go" on missile basing.

Wouldn't it make sense to trim the budget somewhere else, rather than to call off work on what could be a very useful innovation in missile guidance? Buttimer says the Air Force does not want to rely on NAVSTAR for missile guidance in any case. It is too vulnerable to radio jamming or preemptive attack by the Soviets.

Garwin, who regularly finds himself disputing official wisdom, claims there is no technological threat to the NAVSTAR link that cannot be solved relatively cheaply.

—ELIOT MARSHALL