literature concerning the effects of brain lesion on learning and memory is virtually ignored.

Mechanisms of Memory should be read, and no doubt will be read, by all who are working in this field, and will serve other biologists and psychologists as a highly stimulating introduction to the subject. The level of difficulty varies somewhat from chapter to chapter, but that is not a glaring weakness. The book should be extremely useful in senior and graduate courses in learning and memory. It will undoubtedly take its place alongside the writings of D. O. Hebb and Karl Lashley as one of the most influential treatises dealing with the problems of memory.

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ABM: In the Public Domain

Debate the Antiballistic Missile. EUGENE RABINOWITCH and RUTH ADAMS, Eds. Published for the *Bulletin of the Atomic Scientists* by the Educational Foundation for Nuclear Science, Chicago, 1967. vi + 172 pp., illus. Cloth, $5; paper, $1.50.

This book, for the most part a collection of papers reprinted from the May and June 1967 issues of the *Bulletin of the Atomic Scientists,* deals with a vital issue that should still be a subject for debate, despite Secretary McNamara's announcement, on 18 September 1967, of the decision to deploy a "thin ABM for protection against a Chinese attack." In addition to the arguments against an ABM deployment presented then by McNamara, the papers in *Debate the Antiballistic Missile* convincingly state most of the others. The few arguments for deployment are also contained in this collection. There is little that is new for those who have followed the subject closely, but even for the experts the book serves the useful purpose of assembling these thoughtful papers in convenient form. Its chief value is that it puts forth the issue as a subject to be debated in the public arena. The foreword makes this point explicitly:

> The technological details of the system and its effectiveness are indeed hidden by security restrictions, but the political and psychological aspects, equally if not more importantly, are in the public domain. *It is the responsibility of citizens to see that the subject is openly and intensively debated* [italics added].

The book presents technical features of the problem in a general way in McNamara's Posture Statement of 23 January 1967 and in an article excerpted from "Nike, the Winged Goddess: Can She Defend Us?," a publication of the Committee for Nuclear Information, St. Louis. The article raises the very serious question whether the Nike-X system can be effective, requiring as it does extraordinary reliability and coordination on the part of many intermeshing components of the system—a point also made in the paper by Oran R. Young.

Dealing with the economics of ABM, McNamara says that an ABM system intended for use against Soviet ICBM's would cost $40 billion over a ten-year period. Substantial updating costs would also be a certainty. Furthermore, additional expenditures would be required for defense against manned bombers, for a fallout shelter program, and for warfare against missile-launching submarines. Wiesner points out that "the operating and maintenance costs of the new system would add several billion dollars a year to the defense budget." These authors and many of the others note that it is much easier for the offense to keep ahead of the defense on both technical and economic grounds.

The only authors supporting an ABM deployment are Freeman J. Dyson and D. G. Brennan. Dyson's support for Nike-X comes in an addendum to an article that originally appeared in the June 1964 issue of the *Bulletin.* In the original article, Dyson acknowledges that there is no defense that can offer any real security against nuclear weapons. "The most important factor for the layman to understand about the technology of BMD [ballistic missile defense]," he says, "is that the race between offensive and defensive systems is a never-ending one" and "It is generally agreed among experts that a limited or token deployment of BMD in the U.S. would be politically impossible." He recognizes "the intense political pressure that exists in both countries to duplicate whatever the other side does," concluding by saying, "The American people must become accustomed to the idea that they may be better off without an ABM system, even if the Soviet people believe they are better off with one." In the addendum, Dyson indicates his preference for Nike-X *rather than* a massive escalation of offensive forces. It is not clear whether he would support Nike-X if that decision had no effect on the question of a drastic increase in offensive forces. The same choice is put somewhat differently by Laurence W. Martin, in suggesting that, on political grounds, West Europeans would be less critical of a restrained U.S. investment in ABM than of a substantial increase in strike forces.

Brennan's arguments are based on the belief that "there are important possibilities in which BMD could play a constructive role, possibilities that support the traditional arms control objective of mitigating the consequences of war if it occurs, without conflicting with the objectives of reducing the likelihood of war and reducing the burden of the arms race." Brennan is interested in the "mix" of strategic forces, as between offense and defense, rather than in the absolute scale of the forces. Using a cost exchange ratio of unity (cost of the offsetting offensive forces equals cost of the defenses that are offset), he argues for a greater proportion of investment in "damage-limitation." But from the tables in McNamara's 1967 Posture Statement, which Brennan cites, it may be seen that the assumed cost exchange ratio becomes unity only when the number of estimated U.S. fatalities is close to the number to be expected if we have no defense. McNamara puts the latter figure at 100 million. By spending as much on defense as the other side would have to spend to offset it, we might hold the level of fatalities at 90 million. As one tries to limit the fatalities to less than this number, the cost advantage shifts to the offense. It is hard to believe that the choice can realistically remain an "either-or"; an initial choice to add to one component of the mix will almost certainly alter the absolute scale of the forces. If, as most of the authors and other experts feel, an intensified offense-defense arms race would ensue from any U.S. antiballistic missile deployment, all the arms control objectives listed by Brennan would be in danger. An intensified arms race would yield less security, the possibility of increased destruction, greater tension, and therefore a greater likelihood of war, and obviously an increased burden on the nations involved.

Martin explores European perceptions of the issue. He feels that many Europeans find ABM destabilizing, that they see it as reinvigorating the arms race, increasing the tension between the Soviet Union and the United States, and making war more likely. Martin himself seems to think that the fears of a runaway arms race may be excessive. He raises a question about the dynamics of the arms race: whether it is driven

by technological advances, or is politically inspired. If the former, he suggests, such a race may not play the same role in international politics as in the past and might not be a signal of, or a cause for, heightened political tension. He regards Europe as simply indefensible at present and therefore regards as academic the question of a European ABM, raised by Jeremy J. Stone in his paper "ABM: The next MLF?" He thinks that an argument for ABM based on meeting a potential Chinese attack is almost certain to be counterproductive with the European allies, while at the same time it is European opinion that the present Soviet ABM deployment requires little U.S. response. Any serious deployment of ABM by the U.S. and the U.S.S.R. may be expected to have disruptive effects upon alliances, with the natural conclusion being drawn that an undefended Europe would be the probable battlefield for future U.S.–U.S.S.R. conflict. This point is also made by Young and by J. I. Coffey.

With the exception of some mention of China in the papers by Coffey, Martin, and David R. Inglis, *Debate the Antiballistic Missile* is devoted to the question of a ballistic missile defense against possible Soviet attack. The argument has been made that it would be fairly easy to penetrate a thin ABM deployment, even for the Chinese. The strongest answer to the threat of a Chinese nuclear attack remains the strength of the U.S. deterrent forces. The only rejoinder to this is to raise the specter of rash behavior on the part of the Chinese, although it is generally agreed that, as McNamara said in his speech of 18 September, "China has been cautious to avoid any action that might end in a nuclear clash with the United States." The best McNamara could do was to come to the marginal conclusion that a light deployment of U.S. ABM's against possible Chinese irrational behavior was prudent. The same marginal grounds for a decision to upgrade the thin deployment will exist as Chinese nuclear strength or ability to penetrate our defenses develops. Once deployment is started, there will be increasing momentum for a deployment that will appear threatening to the Soviet Union. It is therefore proper to consider at this juncture the question of a ballistic missile defense against possible Soviet attack as well.

The basic disagreements are largely tied to political judgments. There is little argument with regard to the technical questions. At the AAAS annual meeting in New York last December, Hans A. Bethe discussed the "kill" mechanisms to be employed against incoming nuclear warheads and the penetration aids that might be employed to overcome an antiballistic missile system. (His views have since been published in an article in the March 1968 issue of *Scientific American,* "Anti-ballistic-missile systems," by Richard L. Garwin and Bethe.) His conclusion that an effective area defense was beyond assurance was not contested during the two-day symposium on Ballistic Missile Defense, nor has it been since. This raises again the issue of civil defense, dismissed by Brennan as being unnecessary with an area-defense system. Both proponents and opponents of ABM agree that to the extent that ABM would safeguard deterrent forces on both sides, it might contribute to a more stable strategic situation. Again, there is general agreement on the potentially destabilizing threat of the introduction of MIRV (Multiple Independent Reentry Vehicles). It should be recognized that this destabilizing threat has evolved out of concern for offsetting ABM even before any decision to deploy was reached. In the light of this and other research-and-development efforts to negate the defense, it is difficult to see how an offense-defense race can be avoided once ABM's are deployed. Nevertheless, it is on precisely this point that the differences arise. The proponents of ABM contend that some degree of "damage limitation" could be pursued without evoking an effort by the other side to restore the previous level of "assured destruction." This contention is based on the view that it is rational to desire somewhat lower potential damage to both sides. That is indeed rational, but if rational behavior can be counted on, the route to lowered potential damage is through arms reduction. Leonard S. Rodberg's paper deals effectively with the conflict between ABM and arms control and reduction. It is in the perception of how governments and forces within governments might act that opinions diverge. Nearly everyone agrees that there is no real security in the world as now armed, with or without ABM.

Except for some mention by Betty Goetz Lall, in "Congress debates," nothing is said about the relevance of the ABM issue to national and international economics. Perhaps it is considered trite and obvious in sophisticated analysis to question the sense of priorities that contemplates spending tens of billions of dollars to pursue the dangerous will-of-the-wisp of a ballistic missile defense when far more urgent needs go unattended at home and abroad. But that such questions are being raised elsewhere is evident from the crisis of confidence in the dollar, which is partly a reflection of European judgment of the poor purposes to which American money is already being put.

At the time the thin ABM was decided upon, it was widely felt that the decision was made more to defuse a possible '68 election issue than on the basis of military considerations (see James Reston, "The anti-Republican missile," New York *Times,* 22 Sept. 1967). An informed public might have precluded such a possibility. Given the present likelihood of a new administration in 1969, it may not be too late to debate the antiballistic missile.

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Adsorption

Electrosorption. ELIEZER GILEADI, Ed. Plenum, New York, 1967. xiv + 221 pp., illus. $12.50.

This book arose out of a series of seminars delivered at the University of Pennsylvania in J. O. M. Brockris's laboratory. There are seven chapters and seven authors. In the main, however, the authors use the same general approach, which leads both to some cohesiveness and to a considerable amount of repetition. In some instances different symbols and terms are used for the same quantities in different chapters.

In the first four chapters there is a continual comparison made between adsorption from electrolytic solutions (electrosorption) and gas adsorption. There is a tendency to depreciate the present knowledge of adsorption on solid metals, which is probably not justified in the light of recent work. Throughout the book the attempt is made to deal with solid electrodes, rather than mercury. There is no real description of present-day experimental solid surfaces in solution, however, and the rather complex theories almost neglect the character of the metal surface.

The fifth chapter gives a very good treatment of the potential of zero charge, especially as applicable to mercury. The data on solids are both variable and questionable, particularly in view of the little attention that has been