lion for operating and maintenance, $1.0 billion for procurement of new material, as well as $500 million for atomic energy activities.

Greenberg makes much of the problem of estimating the number of weapons deployed in American strategic forces, and in this exercise draws generously from the Air Force release ("A Response to Professor Melman and 'Overkill'," 2 March 1964) prepared by Murray Green. In the name of this analysis (soon nullified by the data on U.S. arms superiority from Defense Secretary McNamara, 14 April, and President Johnson, 3 May) we are accused of "casual treatment of numbers." We used the best available nongovernmental estimates of American and Soviet strategic forces and gave the counts of U.S. military power a conservative bias by excluding from calculation the largest number of aircraft, all the intermediate and short-range missiles, and all the other devices that are useful for delivering nuclear warheads. To this partial statement of U.S. forces we applied an attrition factor of 50 percent to allow for losses of weapons from all causes. For Soviet cities of 100,000 population and over, the estimated overkill was 1250 times.

After this was published several people suggested that 50 percent attrition was not a sufficient allowance. I responded by allowing for 90 percent loss of aircraft and 75 percent loss of intercontinental missiles. The warhead power remaining after such extreme losses would amount to a factor of 231-times overkill on the industrial-population system of the U.S.S.R. These estimates were submitted in statements to the Armed Services Committees of the House and the Senate. The same analyses were published in the New York *Herald Tribune* (7 July 1963), but were not mentioned by your writer. Neither were these estimates mentioned in the 69-page Air Force "Response," which is nullified by the estimate of massive overkill after 90 and 75 percent attrition.

5) Large overkill *after* 90- and 75-percent attrition rates vitiates the meaning of the Air Force dispute as to how many missiles of each sort were in place in April 1963. Greenberg writes, "No more than half the bombers in Melman's retaliatory total are on short alert—and prudence therefore calls for considering the remainder unusable." During international crises the number and proportion of armed forces that are put on the highest levels of alert are dramatically increased. But suppose Greenberg's comment were correct, and suppose that meant a reduction of residual overkill capability by as much as 50 percent, to 115 times: between overkill magnitudes of 1250, 231, 115, and 1, there is no meaningful difference.

6) Greenberg writes, "Melman is satisfied that no defense is possible against missiles." I have no record or recollection of such a statement. Rather, we noted that destructive power can now be delivered by a great variety of weapons and that "all defensive strategies and technologies can be saturated, overwhelmed, or evaded by variety and quantity of offensive power. A 99 percent effective defense against overkill of more than 100 leaves overkill." Further large-scale military research or production is an exercise in futility. That is the reasoning which led us to recommend a military research budget of $262 million against the proposed budget of $7262 million.

7) Greenberg simply omitted reference to the largest part of the contents of our report—the nine papers (of eleven) concerned with depletion in various aspects of American life—traceable to our concentration of capital and technical talent on military work—and the discussion of what may be done to remedy these conditions.

8) The essential point is this: There is no conceivable technology for destroying a person or a society more than once. Accordingly, as a first step toward a rational security policy we should stop the research and production that piles up overkill, and turn these resources to productive use for our people.

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Since military technology changes rapidly, the unilateral elimination of virtually all U.S. military research and development, as proposed by Melman, is a "disarmament proposal," no matter how he dresses it up under the label of "maintenance of present forces." His contention that existing forces could be maintained despite a $22-billion reduction is so nonsensical that not even its imaginative author attempts to substantiate it. Furthermore, what's wrong with disarmament proposals?

Melman's analysis of the difficulties in assessing the fatalities at Hiroshima is touching, but tardy. *A Strategy for American Security* simply refers to "The bomb dropped on Hiroshima, which killed 100,000 people. . . ."

The "warhead power" described by Melman might indeed produce the "overkill" that he calculates—if it were directed at Soviet population centers. But if our warheads are aimed—as Secretary McNamara says they are—at military rather than civilian targets, Melman's arithmetic is of dubious validity. Soviet missile sites, airbases, and communications centers are presumably in lightly populated areas.

Melman suggests that during international crises more than half our bombers are on airborne alert. But what if war should occur without the warning of an international crisis? He doesn't say.

Although Melman says he has no "record or recollection" of having cast doubt on the possibility of defense against missiles, on page 3 of *A Strategy for American Security* he wrote: "Offensive capabilities have become so varied and deadly that there is no basis for assuming the feasibility of constructing reliable defensive methods against all possible warhead delivery systems."

Finally, Melman's goal of a disarmed world is admirable; his tactics are not, and can serve only to bring disrepute to a worthy cause.—D.S.G.

Overlooked Volcano

There have been a number of papers recently in *Science* (29 May, p. 1121) and elsewhere which attribute brilliant sunsets and allied phenomena to dust from Mount Agung in Bali.

I have no objection to attributing brilliant sunsets to Mount Agung, but I suggest that to attribute all these phenomena to it alone may indicate too restricted a view. Volcán Irazú in Costa Rica is a lot closer to us and has been in more or less constant eruption, emitting vast quantities of dust, since March 1963. I wonder if Agung is not being overworked and Irazú neglected.

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