therefrom. So if we administer the second-generation test to our experimental group, resulting scores do not, in fact, yield a comparison with the first-generation sample, but with its own generation, and thereby with itself. If sampling and standardization were adequate, the second-generation sample and its contemporary population should have identical distributions of test scores.

One might argue that one could circumvent this dilemma by choosing measures which reflect basic biological adaptation, such as physiological arousal, speed of motor responses, and so on. However, there are at least three objections to this proposal: (i) Even such basic adaptive mechanisms could be subject to cultural influences, particularly child-rearing practices. (ii) Those who believe a decline in "true" intelligence is taking place may not accept such measures as representative of the functions they have in mind. (iii) Even if such mechanisms showed changes over generations, such changes are neither necessarily maladaptive or correlated with higher mental processes.

I therefore propose that psychological and psychophysiological tests are not proper means to demonstrate changes in "true" intelligence taking place in the general population over a number of generations.

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I have no quarrel with Wolfensberger's point, except as it reflects a misunderstanding of that made in my own letter. Both of us have emphasized in our own ways that purely psychological tests will probably never be refined to the point of measuring the heritable component of intelligence, exclusive of the environmental contribution. It follows from this that the absolute values of scores from such tests, carried out over a number of generations, are not a proper means to demonstrate changes in the hereditary basis of intelligence. On this we are in complete agreement.

The point Wolfensberger has missed is that refinement in assessing a heritable component must depend largely on use of the pedigree method, in addition to any psychological test. For example, where high test scores are achieved by the parents, evidence of the extent of the hereditary component is best sought by observing the offspring to see if they show the parental trait. The evidence improves with increased knowledge of the environments in which members of the family were raised. Thus, in an extreme case where all members of the family achieved high test scores, in spite of great social adversity of a kind normally associated with low scores in the rest of the population (crowding in the home, low socio-economic status, and so on), one might reasonably infer an exceedingly strong hereditary component for high intelligence in these particular parents. If such parents were, in addition, more fertile than average, they might be regarded as contributing disproportionately to the underlying genetic basis of intelligence in the next generation.

Attempts to detect trends in the hereditary component of intelligence are presumably best based, as in the past, on studies of the correlations between fertility and intelligence. Success in such studies must necessarily depend upon use of the pedigree method to assess the hereditary component in test scores of individuals whose fertilities are being investigated.

The main point of my letter was that, although the desired high level of refinement is still a long way off, we have not yet taken some of the obvious first steps in the direction of greater refinement using genetic methods that are now open to us.

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Engineers and Their Efforts

It is difficult to disagree with most of the arguments presented in the fine essay on waste and duplication in scientific research [*Science* **142**, 625 (8 Nov. 1963]. However, the statement concerning engineers and their efforts, even though rather gentlemanly in its wording, is hard to swallow. Among engineering educators the most popular current explanation of the decreasing engineering enrollments (not shared by me) accuses the press and other news media of always talking about "scientific success" and "engineering failure" (especially in the field of space exploration). Is the editor absolutely sure that his words "but there is no reason why we should be blamed when some engineering effort goes awry. 'Scientists fail in effort to orbit space vehicle' is a typical headline" are definitely correct and fair? Besides, I always have been under the illusion that engineers are not second-rate citizens in the AAAS Kingdom, despite the fact that engineering papers or reports practically never can be found in the pages of *Science*.

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Clipping Conflict: Some Solutions

Regarding the recent suggestion by Jensen [*Science* **142**, 341 (18 Oct. 1963)] that articles in *Science* on the same subject should not be on the same sheet, in order to facilitate filing: Such a suggestion is frequently received by editors of technical journals; unfortunately, it does little to solve the real problem, which is that the typical article has several subjects; hence there is always the problem of how to file an article by subject. A makeshift solution for a file indexed by subject is to write the several topics on separate sheets—perhaps with a telegram-style abstract—and file each sheet under its subject.

A better solution is to number articles, index them by concept terms, and retrieve them by so-called "concept coordination" [see R. S. Casey *et al.*, Eds., *Punch Cards—Their Application to Science and Industry* (Reinhold, New York, 1958)]. Cards printed with document numbers in a matrix form, which can be punched manually, are available from several manufacturers. To retrieve any item one makes a little packet of pertinent subject cards and looks for coincidence of holes by holding the packet up to light.

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. . . I offer the simpler solution of printing articles and reports on odd-numbered pages and advertisements in those sections on even-numbered pages. This allows "clippers" to clip as they will and "clip-and-pasters" to do likewise.

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. . . Jensen's alternative will not be satisfactory to everyone, particularly to those with strange multidisciplinary interests. I have found photocopying of overlapping pages of two articles works satisfactorily. . . .

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