Letters

Growth of the University

Gallant and Prothero's article, "Weight-watching at the university: The consequences of growth" (28 Jan., p. 381) applies obsolete methods to policy analysis. It does not take future evolution into account and draws many of its limited inferences from a master plan that could not be implemented because it, in turn, does not take external stresses into account.

I was alerted to the underlying problem when, in 1950, I visited a dozen universities in the United Kingdom and discussed growth in higher education with their department heads. Each argued that any growth beyond 10 to 20 percent of the existing size of his institution would be intolerable, unworkable, and obviously wasteful. But the sizes of the universities varied by a factor of 4. I recognized then that I was encountering rationalizations put forward by members of the existing power structure in the institutions. Those outside the power structure were oblivious to the question of optimum size, since other features, quite unrelated to size, were far more significant.

The multiversity needs to be thought of as relevant preparation for life in the already evolving megalopolises, Big government, and the multinational corporations. It is a staging area for students, faculty, and administrative staff, who typically are in residence from 3 to 10 years. One cannot change the direction of these dominating trends by manipulating the size of institutions. The multiversity, when "extended," is also now becoming the heart of a central cultural district (paralleling the long-established central business district) for a region, and every urban planner notes the strong attraction it has for ultramodern, communications-oriented activities.

As the overall society shifts toward inevitable physical and demographic equilibrium, human interest is diverted to ideas and images. Higher education facilities and their immediate milieu provide an obvious locus for such exchange. Adjustments leading to physical equilibrium will require repeated redirections of individual careers; much of the retraining must be done around the university. Faculty members must give up their near monopoly of sabbaticals; almost all organization men will need them too.

In the future, many university communities will probably demand larger and more elaborate services. Enrollment statistics are already a poor indicator of university complexity, and are rapidly getting worse; we should start counting residential populations and something like "participant-days" for central institutions and their ancillaries —public, private, cooperative, and otherwise. It seems likely that participant days in university districts will have to grow in order to speed up the approach to steady state in society as a whole.

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I agree heartily with Gallant and Prothero's general conclusions. However, their tables 5 and 6, which describe the relation between the size of a department and excellence, do not support the conclusions given in the article. The conclusions are true only if, for a given subject, there are equal point probability masses for faculty sizes between the critical mass and the saturation point; that is, there are equal numbers of departments (the sum of those rated both excellent and those not rated excellent) for all sizes of faculties considered.

As a concrete counterexample, if there are twice as many departments of philosophy with 10 members as with 20, but both groups contain three departments rated excellent, then it is not true that the excellence of the departments is unrelated to their size; a department with 20 members is twice as likely to be rated excellent as one with 10 members. Similarly, the rank-order test is also not valid, because it only ranks excellent departments, rather than all departments, thus favoring departments of the size that have the most representatives.

Quick research has not uncovered any statistics that directly give the distribution of faculty size, although one would suspect that the distribution would peak about a central value and tail off to either side. An indirect confirmation that the number of departments does vary with faculty size is provided by the number of schools with a given enrollment as shown in Gallant and Prothero's table 1, although the student-teacher ratio may vary, as could the number of departments per school. However, the existence of approximately three times as many schools in the 10,000 to 19,999 category as in the 20,000 to 29,999 category should indicate that there are more departments in the first group than in the second. In this case, the criteria would be weighted against the larger school. A more valid measure would be, for a specific subject, the fraction of departments of a given size that attained excellence.

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Gallant and Prothero urge that increased attention be paid to the dysfunctional aspects of university growth. While a number of the analogies which they draw are striking, the lack of a well-defined model of a university leads them to a conceptual opacity that will ultimately hinder their further progress. They will need to make a clear and careful distinction between the inputs to the university and the outputs it produces. They will also need to distinguish most carefully between the dysfunctions of growth itself and those dysfunctions which are the result of size alone.

The importance of clearly specifying the inputs and outputs can be illustrated in the following fashion. Data on the 100 largest universities in the United States suggest that these institutions can be reliably modeled as production units, which, with minor diseconomies of scale, transform student and faculty hours into degrees (*1*). From this point of view, a university that performs splendidly on the basis of costs per credit hour delivered may, on average, produce as few as one degree for each 12 full-time students enrolled. Degree production costs aside, the human and

opportunity costs of such protracted agony or unnecessary babysitting seem unbearable.

Furthermore, in such a model, the number of degrees produced per student enrolled is a function not only of university size but of the student-faculty ratio as well. Thus, the effects of diseconomies of scale can be largely offset over a considerable range of size increases by optimal downward adjustments in the student-faculty ratio. In fact, from both the humanistic and the economic point of view, a strong case can be made for considering optimality in terms of student-faculty ratios rather than in terms of scale. A simulation of the 100 largest universities suggests that if the student's time is considered to be worth about $8000 per year, the cost per degree increase brought about by a reduction of the student-faculty ratio of 22 to 1 to 16 to 1 is nearly offset by the shorter time it takes to get the degree (*2*).

A fear that legislative attention to the degree measure of university output would exert pressures on universities to become diploma mills should not prevent the study of the behavior of degrees nor the search for additional reliable output measures.

Finally, consider the dysfunctions of growth as opposed to those of scale to which Gallant and Prothero have drawn our attention. Growth refers properly to rates of change over time and can be accompanied by various forms of instability. As the authors have pointed out, many institutions of higher education have experienced extraordinary rates of growth as a result of the postwar baby boom. These high rates of growth may have been accompanied by overshooting in numerous forms. The clearest example of overshooting is surely the case of Ph.D. production. Somewhat more subtle difficulties may have also arisen. For example, the rate at which faculty can be graciously and nondisruptively absorbed into existing structures may be much lower than the growth rate experienced by some institutions in recent years. There is some evidence that those institutions which have resisted growth have been least disrupted by the events of recent years. It would be a serious mistake to prematurely conclude that obesity is the problem when overindulgence is the real difficulty.

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References

1. R. R. Hough, in *The Outputs of Higher Education* (Western Interstate Commission on Higher Education, Boulder, Colorado, 1970).
2. ———, *What Economists Do* (Harper & Row, New York, 1972), pp. 69–99.

The rank-order test is valid within the limited domain of highly rated departments which we tabulated. That is, the number of departments in each size increment was approximately constant in the sample we used. Van Nostrand is, however, correct in suggesting that a survey of all departments in the world would be more illuminating.

As weight-watchers, we agree with Hough's distribution between obesity and overindulgence. (The scale principle in biology pertains to the former, rather than the latter.)

Meier has put a backhanded finger on a fundamental problem which underlies the questions raised in our article: the application of the scale principle to *all* social institutions. We limited ourselves to the narrow context of university growth, but universities have not been alone in the recent trend toward expansion and centralization. If the scale principle does apply to social institutions, then dysfunctions of scale should also be identifiable in Big megalopolis, Big government, and Big multinational corporation.

Meier suggests that Big university should be thought of as "relevant preparation" for these other constellations. Indeed it is, and that is what worries us. Before hastening to slot the university neatly into this big "brave new world," we think it prudent to ask, first, whether the entire trend is adaptive for society and healthy for human beings.

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Organic Gardening

Emmanuel Epstein (Editorial, 21 Apr., p. 235) refers to "an amazing recrudescence of quaint lore about 'organic' gardening and food production that reveals an almost total ignorance . . . of the most basic facts concerning the nutrient elements of plants and their absorption."

An example of such ignorance was revealed on a recent television program, when the author of a best-selling