simple example illustrating the kind of difficulties that arise is easily constructed. Consider the nonlinear programming problem of maximizing the function

$$f = c + [1 - (x-a)^2 - (y-b)^2]^{\frac{1}{2}} \quad (17)$$

subject to

$$(x-a)^2 + (y-b)^2 \leqq 1 \quad (18)$$

The graph of Eq. 17 is taken to be the half-sphere with center at the point (a, b, c), and the set of points satisfying inequality 18 lie either on the circumference or in the interior of a circle in the x, y plane with center at the point $(a, b, 0)$. The problem is shown in Fig. 7, and the maximum value of f is assumed over the point $(a, b, 0)$, which is an interior point of the feasible solution set. This illustrates a basic difficulty in nonlinear programming problems: it is not possible to confine one's attention, as in the linear case, to extreme points of the solution set nor even to points on the boundary, for an optimal solution can be any point in the feasible set. Clearly, more powerful analytical methods are needed to deal with such problems.

At the present time, research in many aspects of mathematical programming is continuing at a rapid rate, and the greatest prospects for widening the areas of application still more appear to lie in the further development of the theory of dynamic and stochastic programming, and, of course, in the continuing development of computer technology. Since difficult and unsolved problems are found to be perennially attractive to mathematicians, it is eminently reasonable to be optimistic about the future development of the mathematics of optimal choice under conditions of constraint.

Bibliography

C. E. Bishop, R. A. King, J. G. Sutherland, "Programming resource use and capital investment in agriculture," *Management Sci.* **3**, 173 (1957).

K. Boulding and W. A. Spivey, *Linear Programming and the Theory of the Firm* (Macmillan, New York, 1960).

A. Charnes, W. W. Cooper, B. Mellon, "Blending aviation gasolines—a study in programming interdependent activities in an integrated oil company," *Econometrica* **20**, 135 (1952).

A. Charnes and M. H. Miller, "A model for the optical programming of railway freight train movements," *Management Sci.* **3**, 74 (1956).

G. Dantzig, S. Johnson, W. White, "A linear programming approach to the chemical equilibrium problem," *ibid.* **5**, 38 (1958).

W. S. Dorn and H. S. Greenberg, "Linear programming and plastic limit analysis of structures," *Quart. Appl. Math.* **10**, 155 (1957).

L. C. Edie, "Traffic delays at toll booths," *Operations Research* **2**, 107 (1954).

M. M. Flood, "On the Hitchcock distribution problem," *Pacific J. Math.* **3**, 369 (1953).

L. Gainen, D. P. Honig, E. D. Stanley, "Linear programming in bid evaluations," *Naval Research Logistics Quart.* **1**, 48 (1954).

W. W. Garvin, *Introduction to Linear Programming* (McGraw-Hill, New York, 1960).

S. I. Gass, *Linear Programming* (McGraw-Hill, New York, 1958), pp. 37–49.

A. J. Hoffman and W. Jacobs, "Smooth patterns of production," *Management Sci.* **1**, 86 (1954).

T. C. Koopmans and M. J. Beckmann, "Assignment problems and the location of economic activities," *Econometrica* **25**, 53 (1957).

H. W. Kuhn and A. W. Tucker, "Non-linear programming," in *Proceedings of the Second Berkeley Symposium on Mathematical Statistics and Probability* (Univ. of California Press, Berkeley, 1951).

P. Massé and R. Gibrat, "Applications of linear programming to investments in the electric power industry," *Management Sci.* **3**, 149 (1957).

V. Riley and S. I. Gass, *Linear Programming and Associated Techniques* (Johns Hopkins Univ. Press, Baltimore, 1958) (a comprehensive bibliography).

News and Comment

The Fallout Booklet: It Did Not Aim for a Passionate Response; Decline of the Test Ban

The promised civil defense booklet is now generally available, and despite its weaknesses, indeed partly because of them, it may turn out to be generally acceptable.

The pamphlet has been criticized by supporters of civil defense for being written in too pedestrian a way to get its message across to the general public as clearly as might have been done, and by opponents of the program for not making clear enough the real meaning of a nuclear attack.

Both criticisms are valid enough in the view of Administration officials—it is easy to see how the pamphlet could have been written in a way calculated to arouse more enthusiastic preparation by the public, although hard to see how this could have been done without, for example, giving the impression that war soon is likely if not inevitable, or that the whole business would be a grand adventure to be looked forward to by every red-blooded citizen, or both. On the other side, the pamphlet could have given a more graphic account of what a nuclear war would be like, but at the risk of making people feel there is really not much point in doing anything.

The pamphlet is therefore aimed at a very modest goal, but one achieveable, the Administration hopes, without either misleading or terrifying the public. This involves winning public support for the Administration's program of marking and provisioning shelter areas in existing buildings, encouraging the preparation of more elaborate shelter areas in new buildings, encouraging (but not urging) the preparation of modest home shelters, and perhaps most important, giving the public some elementary information about what it should do if an attack should come.

The whole program is on a modest scale—about equal to next year's federal budget for health research, and less than 1/50 of the defense budget. The pamphlet, and the program generally, is based on the probability that the nation could emerge in significantly less bad shape if modest precautions were taken before an attack and if the citizens were supplied with a general idea of how to behave. The Administration's defense against its critics is principally to argue that among a range of alternatives, all of which are far from satisfactory, the best that can be done is to choose the least unsatisfactory.

Advertising of Shelters

An important sidelight on the shelter question is the advertising for fallout shelters, which has generally tended to give an impression quite different from what Civil Defense officials have been giving. Very often the shelters have been advertised as sort of homey playrooms in peacetime, which would provide nearly complete protection in the

event of an attack. The problem has lessened sharply in the last few weeks, because not many people seem to be buying individual fallout shelters and the volume of advertising has fallen off. It will pick up again if prospects of shelter sales pick up.

The cumulative effect of a great deal of misleading shelter advertising would be both to misinform a large part of the public and to add to the revulsion of the substantial part of the public that regards the whole business as unsound anyway. In an attempt to get control of the advertising problem, the Federal Trade Commission, working with the Civil Defense office, has put out an unusually strict guide for advertising fallout shelters. For example: *nothing* shall be described as a "blast shelter," although the terms "blast-resistant" or "limited blast resistant" can be used if the shelter meets the CD requirements for such shelters. Any advertisement for a shelter which does not meet these requirements must contain an affirmative disclosure that the structure has not been designed to protect against blast. If a shelter does meet the requirements the ad must disclose the distance from an explosion of a given-sized bomb at which the shelter might be effective. These disclosures are to be in "clear and conspicuous terms," and in no case can an advertisement imply that it gives complete protection from either blast or fallout.

The guide goes on for five pages of similar regulations, and adds up to a code a good deal stricter than any that has been applied to advertising in this country. But it does not by any means guarantee that a serious problem will not come up, for the guide, like others issued by the FTC, is not enforceable except through very involved legal procedures.

In the area of public health, for example, where the government has considerably greater power to stop misleading advertising, there has not only been no success in putting a stop to quackery, particularly on nutrition, but even the limited success the government has had has not been sufficient to keep the total flow of misleading information publicized through advertising from virtually swamping the efforts of private and government authorities to give the public accurate information.

The FTC's hope, though, is that there will be an unusual amount of popular support for efforts to control misleading shelter advertising, and that once the advertising media are informed on what the ads should and should not contain, there will be an unusually high willingness on the part of the media to cooperate in enforcing the code by refusing to accept advertising that fails to meet the code. It is also probable, again in view of the special nature of the problem, that, if necessary, the FTC could get a bill through Congress giving it special powers in this area.

Test Ban

Meanwhile, amid the fuss over Goa, the Congo, Berlin, and, in this country, civil defense, the test ban seems to have dropped off the front pages with almost striking speed. Briefly, this is what has happened since the last review in these pages six weeks ago. In early November, the U.N. General Assembly adopted a neutralist-sponsored resolution calling for a resumption of the broken moratorium on testing. All of the nuclear powers voted against the resolution, the Russians on the grounds that the test ban now could be considered only in the context of an agreement on general disarmament, the Western powers on the grounds that they could not, in the face of Russian actions, accept another indefinite moratorium without controls. The General Assembly next adopted a second resolution, this one sponsored by the U.S. and Britain, calling for a treaty with controls. This supplemented rather than superseded the earlier resolution calling for a moratorium until a treaty could be signed. The West, of course, supported this one; the Russians, of course, opposed it, again on the grounds that a treaty was possible only in the context of a general agreement on disarmament. The U.S. and Britain then invited the Russians to resume the Geneva negotiations. The Russians, somewhat surprisingly, accepted the invitation.

The night before he flew back to Geneva, Ambassador Dean, the chief American negotiator, held a press conference in which he reiterated what the Americans had been saying all along, inside and outside the U.N.: we could not accept a further unpoliced moratorium. Dean said that whether the tests were announced or not, the U.S. would "absolutely" continue underground testing during the negotiations. Dean also announced that the total number of Russian tests we had detected was "around 50," about 20 more than we had formally announced. The rather large number of detected, but not announced, tests was a slight surprise, but the fact that we were not announcing each Soviet test detected had already been revealed. The reason, presumably, for the reticence was that we had no desire to provide the Russians with detailed information on just what tests we could detect and, by inference, what tests we could not detect.

Dean then flew to Geneva, where, after several days of desultory talks, the Russians offered a four-point proposal bearing a superficial resemblance to the proposal the U.S. and Britain had made just after the Russians resumed testing. Like the Anglo-American proposal, it called for an immediate agreement banning tests which could be detected reasonably well without a formal inspection system, particularly tests in the atmosphere. But it also called for a moratorium on underground tests pending the working out of a control system as part of an agreement on general and complete disarmament. The Western powers promptly turned it down, both on the grounds that it involved an indefinite further unpoliced moratorium on underground tests and on the grounds that, even without the moratorium, the Russians were now proposing, rather brazenly, that the West, *after* the Russians had completed their extensive series of tests, should now accept an agreement that the Russians themselves had refused to accept when they had just begun their tests. This proposal, and the Western response, promptly put an end even to any pretense of serious negotiations at Geneva. Dean came home, and although the talks still continue in other hands, no one has been paying any attention to them.

The U.S. meanwhile continued underground tests, announcing several of them, and continued its announced preparations for a resumption of atmospheric testing in case such a resumption should be judged necessary. At the Bermuda meeting, Kennedy and Macmillan announced they were in complete agreement on atmospheric testing, and that the British would support an American decision to go ahead.

None of this has attracted any great attention either here or abroad. One reason, presumably, is that on the Soviet side the Russians have been doing nothing of an affirmative nature since they ended their test series, and it is

affirmative action, or announcements of intention to take affirmative action, that spurs great protests. On the Western side, there have been a number of affirmative actions and statements, but in the face of what the Russians did during September and October, and of their attitude since then, it has been hard for even the most ardent opponents of testing to feel that the Anglo-American response has been entirely unreasonable. Additionally, in this country, the civil defense program has provided a substitute for people who were mainly seeking an outlet for their disgust over the arms race in general.

The change from great public interest up to the point where the U.N. resolutions were adopted to rather general apathy almost immediately thereafter was foreshadowed by the attitude on the resolutions within the U.N. The feeling at the U.N. was reported in some detail here (3 November). It was generally that the U.N. had to ask the nuclear powers to resume the moratorium, but that there was no likelihood that the resolution would have any effect, since, aside from the Russian opposition, if the U.S. and Britain felt their security would be threatened by a new unpoliced moratorium, they could not be expected to abide by the resolution. The resolution was not regarded as a prelude to a resumed moratorium, but as a moral statement which no one expected to have much effect on the countries concerned. It was mainly a formal reflection of despair at the way things were going, and once having formally registered its despair, that is, having done all it could do, the U.N., and it seems nearly everyone else, turned its attention and its despair to other matters. Even at the time the U.N. was debating the question so ardently, there seemed to be not only no expectation that the resolution *would* be obeyed, but not even any great feeling that it *ought* to be obeyed. At the time of the debate, this reporter asked a Canadian, a Russian, a Pole, a Pakistani, and an American not connected with the American delegation whether, in view of the Soviet handling of the test-ban issue, they thought, off the record, that the U.S. and Britain ought to abide by a U.N. resolution calling for a new moratorium. They all gave nearly identical answers. All thought the U.N. had to pass such a resolution; none would say that the U.S. and Britain ought to accept it.—H.M.

"Population Explosion": U.N. Postpones Debate

Debate on a proposal for the U.N. to provide population-control assistance for lesser-developed nations has been put off until the next session.

The proposal is a particularly ticklish one for the Administration, which has openly expressed concern about the effects of rapid population growth on the economic development of these nations. Because of domestic political sensitivities, the Administration would happily see population-control assistance become a U.N. concern, but not at the expense of arousing further antipathy to that troubled organization.

The proposal is contained in a resolution which was offered jointly by Sweden and Denmark. Its most significant part is a section which invites nations seeking "technical assistance with regard to problems of population" to request such assistance from the U.N. Implicit in this invitation is the suggestion that the U.N., which now offers some help in population control through its technical assistance programs, should make available a great deal more.

The resolution was placed on the agenda of the second economic committee last fall, but, without any noticeable disappointment on the part of the United States, was one of a number of remaining items when the session was recessed last month.

In the last days of the session, it was voted to place the resolution on the agenda of the committee's next session. Virtually all the predominantly Catholic nations abstained on this vote. The United States, which generally follows a policy of accepting any proposed subject for debate, voted in favor.

Administration officials say that the resolution in its present form may be a bit too strong for domestic political consumption. Wording of a somewhat more subtle nature, they suggest, would ease the way for the United States to deliver its support.

The resolution in some respects is stronger than the so-called Draper Report of 1959, produced by the President's Committee to Study the United States Military Assistance Program. The report was followed by an angry statement from the Catholic bishops of the United States, who warned that American Catholics will not "support any public assistance, either at home or abroad, to promote artificial birth prevention, abortion, or sterilization, whether through direct aid or by means of international organizations."

The current Administration has shied away from what might be considered provocative policy statements, while at the same time it has virtually abandoned the Eisenhower policy of indifference to population problems. The Administration's concern over the U.N. resolution boils down to a desire for action unaccompanied by proclamations that may arouse spirited retorts and make population-control assistance a lively political issue. The Catholic Church, which is not unaware of the Administration's active interest in population matters, has had nothing to say publicly on the matter for some time now, and the Administration has no desire to spur it into activity.—D.S.G.

Educational TV: Los Angeles Next?

The Federal Communications Commission, which was instrumental in bringing educational television to the New York metropolitan area, is looking into prospects for an ETV channel in Los Angeles.

The FCC's interest in Los Angeles has been aroused by unconfirmed reports that one of the area's commercial stations may be put up for sale. At present, the very-high-frequency band, which is the standard band for television reception, is fully occupied by commercial stations in the Los Angeles area. The only possibilities for ETV are to acquire a channel by purchase from one of the commercial operators, or broadcast on the virtually empty ultra-high-frequency band. ETV groups have generally been reluctant to undertake UHF operations because relatively few sets are equipped to receive UHF signals.

If the New York case, involving WNTA, channel 13, is any precedent, the FCC is likely to play an aggressive role in behalf of ETV if a Los Angeles station should go on the market. When channel 13 was put up for sale, FCC Chairman Newton Minow made it clear that the FCC was cool to the prospect of continued commercial operation of the station. Armed with its licensing authority, the FCC offered little encouragement to commercial interests, while it showed brotherly concern for the ETV group that was bargaining for the station.

FCC officials said that the Los Angeles situation was uncertain at present, but they indicated that they are ex-