# PROGRAM DECISIONS AT NAL

by

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Experiments in high energy physics have continuously increased in size, complexity and cost. The problem of proposing, approving, and scheduling experiments has increased even more dramatically. The question for good experiments used to be "when? and how?" It is about to become "whether?" Startup of the new accelerator at Batavia forces an answer to the question soon. This note is a first attempt at suggesting a formal structure by which proposed experiments can be expeditiously and yet carefully evaluated with some built-in mechanisms to insure objective and fair treatment.

A reasonably efficient system has evolved over the years for assigning beam time at the major U.S. accelerators. The system works roughly as follows: Proposals for experiments are submitted in confidence to the laboratory director or his designated officer. The director consults a panel of advisors chosen by him who review the proposals, meet with the proposers, and offer their assessments to the director. The director then announces his program decisions in the form of approved beam hours and priorities. Until recently, nearly all reasonably sound experiments could expect to be approved and the principle competition was for beam hours and priorities. Rejected experiments were generally agreed by mutual consent of the advisory

panel and the proposers to contain flaws in technique or calculation which appeared in debate and which rendered them unfeasible. The advantage of this system was that the advisors relieved the director of being sole arbiter and judge of the physics. The confidential nature of the proceedings avoided unnecessary embarrassment to experimenters when correctable errors were uncovered in the review of fundamentally sound experiments. Very casual proposals were accepted on the reputations of the men responsible. The system was informal, adequate and effective.

Two things have combined in the last few years which threaten to invalidate this system: 1) More good experiments are being seriously proposed than can be accommodated with existing facilities 2) Lead times to fund, staff, and prepare experiments have increased so greatly that major policy decisions must be made prior to formal approval in many cases. The result has been that experiments which ultimately receive approval are often mistimed for the experimenter's staff schedule. Those which are completely rejected result in months and even years of wasted effort. It will soon get much worse. How then might we move to accommodate these changes and head off some of the worst problems?

Consider the diagram in Figure 1. It is a sort of flow chart to map the progress of an experimental proposal as it passes through the NAL decision-making process. Clearly, since all questions are posed in the yes-no format, it is somewhat simplified over real life.

The rectangular boxes are the heart of the system and are probably more important than the flow paths. It differs from the present system in three important ways: 1) Almost every part of the process is public 2) Criticism and discussion are invited between competitors in the presence of the advisory panel 3) A formal appeal procedure is suggested.

Proposals

This box is the logical beginning of the process. The policy of making proposals public has already been announced and is in accord with the present system.

Popular?

A question which can be answered without conflict by the secretary (Frank Cole). Here we attempt merely to divide the incoming proposals into groups of strongly similar experiments in which competition between groups for the same experiment is important. All experiments which are one of a kind pass immediately to the physics evaluation.

Free For All

This is a new departure and should prove at least controversial, if not downright unacceptable. What is envisioned is a session, perhaps 2-3 hours long, in which all the proposers of a given experiment are invited to present their best arguments to the director, his advisory panel, and his competitors. Each group might be alloted

15 minutes for an opening statement. Then the session would be opened to argument and criticism by all participants. In this way, panel members who are intelligent but not completely informed about the detailed technical aspects could modulate the discussions between groups and learn quickly the relative strengths of conflicting approaches. No one can criticize a proposal like his direct competitors! After the dust settles, the director and his advisors will have an insight and understanding which I believe is impossible to arrive at by any system lacking the free-for-all. This scheme is extremely democratic, hard on incompetents, and will likely be favored by "young (and old) Turks." It may be opposed by "gentleman physicists" if there are any left in high energy!

One Outstanding ?

This is a question that the director and his advisors must settle in private session after the free-for-all. If one group is clearly superior they should be passed on as a group to the next phase. If all groups have comparable strength, then all should be sent to the marriage bureau.

Marriage Bureau

This is the name for a process which should have no official laboratory existence, but operates in a *laissez faire* manner as it sees fit. Candidates for marriage should be told that their *experiment* is looked upon with favor, and the laboratory would welcome a

collaborative approach. Some physicists will balk at this, but I believe the burden is upon them to produce clearly superior ideas if they feel unwilling to enter collaborations. The laboratory itself should try not to mediate the negotiations lest it become the target of rancor and ill will.

Good Physics ?

Near the end of the program meeting period, the director and his advisors should meet in private session to consider the physics to be produced by the various proposals, both popular and unpopular. If any of the proposals are found to be unsatisfactory at this point, the proposer(s) should receive a letter from the secretary briefly outlining the reasons why such a decision was reached. Keeping magnetic tape recordings of the sessions for a short period following each meeting could help the secretary reconstruct the arguments. This step of physics judgment should be kept strictly separate from some of the following questions, and a special formal appeal structure should be set up for these decisions. All other decisions on this chart can be made in a fairly straightforward way, but it is the nature of basic research not to reveal ahead of time the most fruitful lines of attack, and I believe it important to have a process by which physics judged to be unsatisfactory can be defended. More on this in the appeal section.

Appeal

Again this process takes place largely outside the laboratory,

but it should have an official existence. One possible format might be the submission to the director of some number (like three) letters of support from established physicists with their views as to why the experiment should not be rejected as "poor physics." The director might then decide whether to rediscuss the matter with his advisory panel, overrule his advisors on his own authority, or reject the appeal. There will be relatively few cases in which an appeal will be carried out since questions of relative importance are made at the priority level and are not subject to the formal appeal sturcture.

The purpose of the appeal structure coupled to the good-physics question is to insure that the experiments which receive further consideration are basically sensible, doable, and contribute to our knowledge of particle physics. It does not have as its purpose to decide whether topic A or topic B has greater current interest and support. To open this question to appeal would produce far more politics than physics, since reaching the priority box would already have implied basic worth.

Enough People ?

This is an obvious question, but it is not obvious when to ask it. One might argue for deciding the question before the good-physics one. It's a subtle problem, in that the decision of the physics question may affect the personnel structure. I feel it might be best to decide what physics will be supported and then count noses. If

insufficient manpower is at hand (rare cases!) then the group can be sent back to the marriage bureau. In such a case, a second trip through the good-physics question should only require nominal approval by the director that the basic aim of the experiment is still intact. Most experiments will pass through both questions easily.

Feasible ?

At this level, three questions are separately considered which sometimes tend to be confused. The first one is the easiest. It determines whether an experiment is feasible to run (roughly) independent of the shape of the rest of the program. It is actually surprising how many proposals fall into this category and can be done in a straightforward way with minimal conflict. These experiments should be approved in due course.

Conflict ?

This is usually an easy question to answer although it may be difficult to resolve. It is designed to differentiate between experiments which conflict with one another over existing apparatus and those which require new facilities.

No Facility ?

This question is the logical complement of the previous question and requires no discussion.

New Facilities

This box is a classic part of the process of evolving laboratory policy. It is shown separately here to emphasize that questions which involve the construction of new facilities must inevitably demand a wider spectrum of opinion and information gathering than are required in mediating conflicting requests for existing facilities. More specifically, technical and fiscal studies usually must be made before any decision can be reached. Most likely, study decisions will be made at one meeting of the director with his advisory panel, and construction decisions at a following meeting when the studies have been completed. Experimenters who desire new facilities will likely have to be content to have their proposals held in abeyance for this period.

Priority

Again this function is not new. It has never been easy to establish priorities among different areas of physics and among various approaches to a given topic. What should have happened in the system proposed in this note is that all experiments which reach the priority box have already been judged to be good physics and the best approach possible in the case of competitive proposals. If new facilities are required, all pertinent information should be in hand at this point. This is the point at which hard decisions must be made. After the priorities are set, the approvals are announced.

Approval

Successful proposals together with approved beam hours and any special conditions or restrictions are announced here with a statement of expected scheduling to accompany the approval. It is probably not necessary to state explicit priorities; the initial schedule will indicate the priorities implicitly. It is not likely that all proposals which reach the approval box can be approved. The business of the priority box is to fix the order of approval. The business of the schedule box is to establish the number and sequence of experiments. The approval box must mediate between these two to produce the most effective program possible and communicate the results to the successful and to the unsuccessful proposers.

The two reporting functions are of comparable importance. For successful proposals, initial conditions and liaison arrangements should be fixed. A proposed run schedule and number of beam hours should be stated. Special arrangements over facilities and personnel should be noted in writing for definiteness, and a fairly detailed experimenter schedule should be requested. These things sound terribly legal, but pay dividends in the form of suppressing misunderstanding and conflict later on.

Dealing with unsuccessful experimenters is more painful but can be constructive. It is important to attempt to avoid writing platitudinous statements with little operational content. The letter should contain a brief statement indicating why the experiment was

given a lower priority. Sometimes the reason will be relative physics interest, and sometimes technical considerations. Little elaboration is need, but the reasons should be stated as candidly as possible. This then indicates to the proposer a direction to pursue to better his position next time around. All decisions of approval should be made public as soon as possible.

Schedule

After the tentative schedule is outlined by the approval process, it should pass into the hands of the proper laboratory people who will continue evolving the schedule as events dictate. Not much needs to be said here.

A few general comments are necessary in addition to the diagram just discussed. We note, for instance, that one might expect the director to involve his advisory panel in most of the key decisions, asking their opinion but, of course, making all decisions on his own authority in the end. Also, it might be very useful to have the advisory panel meet in two sessions separated by a month or so to give the marriage bureau a chance to work its wonders after the free-for-all. The entire process might occur once or twice per year depending upon the natural rhythm of the laboratory.

The system outlined in figure 1 and described above is not a radical departure from present practices. The trend toward more public proceedings in the program forming process is already well

advanced. The idea of having proposals public is welcomed by nearly everyone. The only new ideas really are the free-for-all and the formal appeal structure. The former will likely meet the most opposition, but is the most needed change. Before science became "big science," it was possible to let anyone who could get some minimum support pursue his own ideas. No critical review was made until the results were presented to the scientific community. The papers which survived subsequent scholarly criticism became the accepted standards until better results could be achieved.

What is suggested by the free-for-all process is essentially to transfer a fraction of the normal scholarly criticism to the period before the experiment is attempted in order to insure fewer overlooked trouble areas and to enable superior talent and preparation to reveal itself. Without such a mechanism, the director and his advisors face a truly monumental critical task. At last look, the stack of proposals was about a foot high. With no aid from "interested" competitors, it is not obvious that all this material can ever be evaluated with the care and attention to detail that the proposers deserve.

The formal appeal procedure will probably generate no significant opposition since it is explicitly separated from the question of priority. It is used exclusively for eliminating unsound proposals from either the theoretical or technical point of view. Few proposals which die on these grounds will be appealed. Those which are appealed

may be the crucial offbeat ones which upset the physics world in a revolutionary way -- it has happened so many times before!

# PROPOSAL FLOW CHART
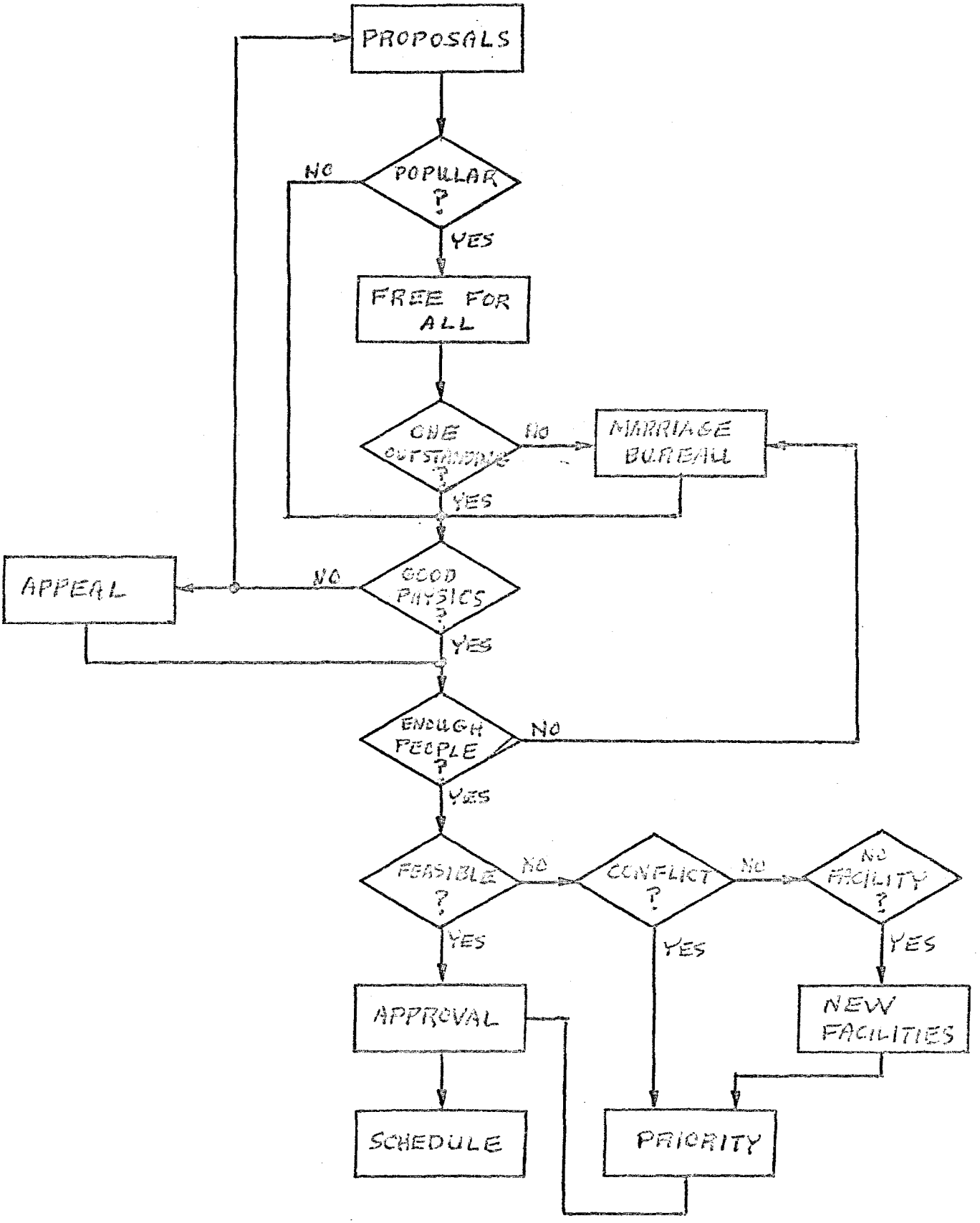
FIG. 1