

Our Universities' Research-Associate Positions in Physics

By J. Howard McMillen

Research-associate positions in physics, according to the author, play such a significant role in our country's basic research activity and in the maturation of young PhD's that expansion of the program seems in order. However, caution may be required by universities with regard to the rate at which these positions are established in order to prevent a runaway situation from developing, both with respect to their number and remuneration. The author, who is program director for physics in the Mathematical, Physical, and Engineering Sciences Division of the National Science Foundation, states that the views expressed in this article are his own and do not necessarily represent those of the Foundation.

RESEARCH associates play an impressive role in our university physics research. Without them research in universities would lose much of its vitality and certainly move at a slower pace. The research-associate positions have been a boon to fresh young PhD's wishing to extend their experience and obtain post-PhD training. A year or two of apprenticeship as a research associate is considered the best entree to better jobs and an opportunity of doing research under burden-free conditions.

But in spite of the laudatory comments one hears about the research-associate business, it may be time to ask a few questions about where it is headed. The number of research-associate positions is growing and at a rate which is faster than the permanent staff positions. At present one would estimate that there are now about 200 of these positions* scattered throughout the physics departments in the nation. They form a group comparable in size with the full professorships in our leading universities. Then too, not all research positions fall into the category of opportunity for further maturing and learning. In some the learning feature is minor and the helper function predominates. Fortunately in physics cases where research associates have been "captured" for jobs that were not to their best advantage are rare. With these general comments as a background we would like to discuss the physics research-associate situation in this country, hoping this discussion will be useful to those who individually create these positions from time to time.

Reservoir of Talented Young PhD's

Keeping in mind the ever-present question of national manpower requirements, the research-associate group takes on the attributes of a reservoir of exceedingly valuable physicists. In it are stored the most talented, ener-

getic, and adventuresome of the current crop of young PhD's. A totalitarian state interested in a short-range advance in science would lose no time in commandeering this group to achieve its technological goal. If the United States finds itself in a war emergency, this research-associate reservoir will be fished out early in the mad scramble for task directors.

A different kind of emergency looming ahead is the impending shortage of college and university teachers. A major test for this research-associate reservoir will be its usefulness in supplying teaching personnel. Much will depend on how these positions are administered in the next few years and what salary pattern develops, as will be discussed later.

Unbridled Expansion of These Positions

The number of research-associate positions has grown rapidly in the present era of government-sponsored research and, what is more significant, at a faster rate than permanent staff positions. This growth has all the appearance of an expansion which possesses no built-in dampening coefficients or self-acting brakes. The absence of any built-in brake on the expansion of this class of physicists comes from the manner in which they are supported. For the most part universities share little in cost of research associates, most of the funds being derived from the federal agencies which finance university research projects. The positions are recognized as temporary by the university and since the responsibility shared by the university is negligibly small, no appreciable resistance to expansion comes from these quarters. The granting federal agencies are prone to support good people and not be too much concerned with individual university employment policies. These administrative conditions conspire to form a situation where the research-associate positions will continue to increase both in number and remuneration to a point where the university's dual education-research system will have to seek a new point of equilibrium. Those universities concerned with trying to keep a certain balance between research and teaching will need to reorient their programs.

We may be faced with the question of a number ceiling and a moratorium on competitive salary bidding. But who should set these limits? Government agencies could hardly impose a set of tenure-raising policies on research-associate positions without seeming to interfere with the university's business. University employment practices are frequently steeped in local tradition and cross-linked with nonscience disciplines. One likes to see those that

* While the term research associate is used to describe a variety of positions, only those occupied by physicists who have recently received their PhD's will be considered in this discussion.

make grants in support of research adopt the minimum of paternal regulations. Such regulations generated in some environments acquire a power of their own and go on dominating the scene long after their need or purpose is forgotten. Controls are much better invoked near the point of application, where exceptions have a chance of appeal and special treatment. It would be much more satisfactory if the individual universities invented their own controls.

It is tempting to conjecture what self-imposed controls individual universities might adopt. At first glance, adopting a norm for the number of research-associate positions any university might want to have seems difficult to accomplish objectively. Fortunately there are many research projects where a rational approach to research-associate positions is possible and is being carried out, notably those involving large facilities or teams of scientists. Some accelerator-based research, for example, just can't be attempted if the personnel are restricted to the staff member and his graduate students only. The same can be said for some cosmic-ray projects. It is less true for some atomic research and for theoretical research. One must not, of course, be too quick to rule out the use of project justification for research associates in theoretical research mainly because some theoretical advances thrive on the stimulation of verbal exchanges at levels beyond the graduate student's ability and experience.

But our present population of research associates is not made up entirely of those working on large projects. Many positions have been set up to increase the speed at which the principal investigator's research is being carried out. In a sense, these latter can be described as "amplifiers" of the principal investigator's talents. It is these amplifier-type positions which have the potentiality of becoming almost limitless in number.

A Balance Index for These Positions

In casting around for some device to which these amplifier-type research-associate positions can be anchored, one is attracted by indices which represent the university's permanent staff. In a rough way, the number of "permanent" staff members is a measure of the university's contribution to a department's over-all research activity. A fairly helpful index is one which is defined as the ratio of the research-associate positions to "permanent" staff positions. This ratio is useful in attracting attention to departures from the norm in the use of amplifier-type research-associate positions. As to the large facility research-associate positions, they are reviewed for each facility on an individual basis by the supporting agency and the optimum number is determined fairly objectively.

As an example of the emphasis research-associate positions are receiving, we find that one of our older privately endowed universities has a balance ratio in physics ("temporary" to "permanent") of *one to four*. A similar type university, except for a facility-building burden, runs around *one to two and a half*. A third private university, with an operating accelerator, has built up a balance coefficient of *one in one and a half*. A large midwestern state school with a modest facility obligation runs *one to three*,

while a neighboring state university with about the same facility program has no research associates. Other mid-western universities have balance ratios of *one to four*, *one to three*, *one to two*, etc. Far from the middle of the road is a private university with a balance coefficient of *one to one*. Even though this university possesses a good sized facility, the ratio shows an unusually large affinity for research associates. (In calculating these coefficients, only young PhD research associates were counted and only those easily identified as part of the physics department activity were included. Permanent positions were taken to be assistant professor positions and above.)

It might be thought that the lack of available physicists to fill research-associate positions would serve to check their growth. But this is only true in a closed system which does not exist. Research-associate positions may be and are filled with scientists from many foreign countries, which gives evidence of an almost unlimited market. True, recruiting is slower and funding more difficult as more positions are established, but the source of manpower seems quite limitless, especially if quality standards are lowered.

Because of the commendable desire of foundations, industry, and government to support research and because of the great demand for physicists, an economic situation has developed in which there are few forces at work to keep the remuneration of research associates in line with other university and government positions. Competitive bidding tends to increase the stipends being paid. For those large projects where research-associate positions are an absolute necessity, competitive bidding is understandable. It is more difficult to justify competitive bidding for positions which simply amplify or speed up the research along the line of the senior investigator's interest. It would be interesting to know how widely practiced is the system of hiring permanent staff members from the research-associate reservoir at a comparable salary level. But the big question is whether research-associate salaries will still be within reach when recruiting for teaching positions is undertaken in the coming teacher shortage emergency.

In Conclusion

The purpose of this discussion was not to propose a set of procedures which would improve the administration of research-associate positions but, rather, to make a few general comments which might assist individual universities in their discussions about the future of these positions. In particular, attention is called to their potential runaway character with respect to both number and salary. This is especially true for the positions which are of the amplifier rather than project type. Falling as they do in a sort of no man's land between the university and the government, there is a danger that any problems which they create will be overlooked. Today a given university and supporting agencies may accept as good tradition a balance ratio of say *one to three*, but someone should ask under what conditions they are willing to move into a new balance ratio, even one which may be in the reverse order such as *three to one*.