The net effect of these two terms turns out to be quite small.

These four equations, plus the retirement rates projected above, can be used to predict the number of new PhD's and the total number of physicists for the period 1960–1970 as a function of the four free parameters α, β, γ and r. According to time-honored phenomenological methods, we have used a minimization routine to find the values of these constants that produce the best agreement (in the least-squares sense) with the experimental data. The best values are $\alpha = 1.39$, $\beta = 690$, $\gamma = 0.0252$, and $r = 0.0355$. A comparison of the experimental values of N and δ_n with the results obtained using these parameters is shown in figure 2. Considering the simplicity of the model, we feel the fit is quite good.

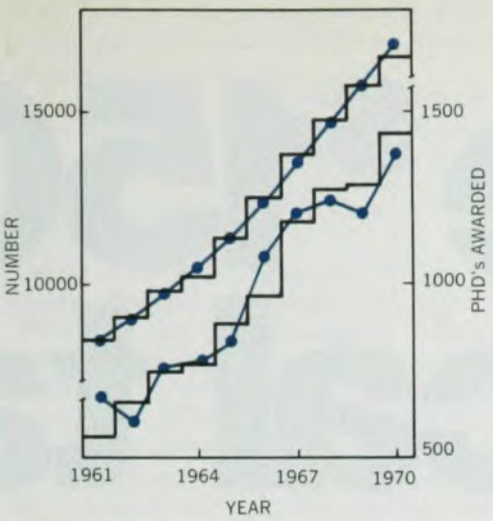
What does this model predict for our future? The answer depends, of course, on the budget. We have investigated a number of possible growth rates; in this letter we shall show the results of only two, zero growth and 3.55% ($=r$) growth, which (hopefully) are reasonable bounds on the true figure.

The number of new PhD's produced is determined primarily by the value of β; when supply and demand are in balance, we can expect to award about 690 degrees per year. This figure represents roughly the number of jobs that can be supported by the salaries freed through death and retirement. Our model predicts that the PhD output will fall to this figure by the late 1970's, as shown in figure 3, and not increase much above it thereafter.

The implication of this result for graduate education in physics is profound: *We must plan to exist on a graduate enrollment of about one-half that of the peak years of the last decade.* Such a cutback will necessitate considerable rethinking of policies on course offerings, teaching assistants, and many other related matters. Moreover, fewer students require fewer faculty, depressing demand still further.

A rapid decline in PhD production will, of course, lead to considerable improvement in the job market. The degree of this improvement is shown in figure 3 by the number of job openings predicted for each of the two growth rates. With reasonable budget growth (about 2% per year) those of today's seniors who go on to graduate school can expect a seller's market by the time their PhD's are awarded or soon thereafter.

If present trends continue as indicated by this analysis, then the job crisis will correct itself. Everything possible should, of course, be done to ease the difficulties it is now causing; but we should also devote more effort to planning what happens afterward. Unless some means of stimulating demand for PhD physicists, other than a rising budget, can be developed, we are facing a serious decline in graduate enrollment in physics.



Comparison of the predictions of our model with the experimental values for the total number N of physicists and the number δ_n of new PhD's awarded per year. Because of the six-year time lag built into the model, the data from 1955–1960 must be used as initial conditions. Figure 3

References

1. Allan M. Cartter, Proc. Am. Stat. Assoc., 1965 edition, page 70. See also Dael Wolfle, Charles M. Kidd, Science **173**, 784 (1971).
2. L. E. Moses, Science **177**, 494 (1972).
3. N. W. Dean, IS-2985.

NATHAN W. DEAN
Iowa State University

Racial statistics decried

I just received the APS–AIP Questionnaire and want to voice my objections to Question 32 of that questionnaire.

Question 32 reads: "Race or Ethnic Groups: Please check the race or ethnic groups which apply to you." It then proceeds to list nine categories of "race or ethnic groups": White, Black, Oriental, Other Asian, American Indian, Mexican-American, Puerto-Rican, Other Spanish Speaking, Other (specify).

As a matter of very deeply felt principles, I respectfully refuse to answer Question 32. By the same principles, as a member of the American Physical Society, I urge you take measures toward permanently removing answers to Question 32 from each questionnaire returned.

The last time I had to answer questions regarding my race was in Nazi-occupied Poland. On the basis of my own and other people's experiences

the $1500* optical table

a complete high performance 4′x8′ vibration isolated table system

Newport Research Corporation can now deliver a complete 4′x8′ table system, the new K 48, anywhere in the continental USA for only $1500. The K 48 is the first and only quality high performance table produced by automated mass production techniques to give you the advantage of both price and performance.

K 48 System Performance Features

The top of the K 48 table is a flat (better than ±.004″ overall) ultra rigid, highly damped (>250 db/sec) 4′ x 8′ x 8″ steel honeycomb panel with ferromagnetic steel skins and a NRC steel honeycomb core. It has 4,185 ¼″-20 mounting holes, positioned on a precision one inch grid pattern, to provide the ultimate in convenience for mechanical mounting.

The K 48 table floats at bench height on a pneumatic isolation system, with automatic servo leveling control, consisting of four convenient free standing air mounts. The resonant frequency of the air mounts is less than two hertz and the load carrying capacity is well above normal working requirements.

NRC Offers The Very Best.

Newport Research Corporation is applying its automated production techniques to its other table systems too. Our Advanced Research Series tables, the ultimate in performance, now have 1″ center-to-center mounting holes as a standard feature—at no increase in cost. ARS tables are available from stock in sizes up to 5′x12′x18″ and 4′x16′x18″, with larger or thicker tops available on request.

Special Custom Systems

A unique production and engineering capability makes Newport Research Corporation the source of special systems for unusual laboratory, airborne and shipboard applications. All systems are produced to required mil specs.

12′x28′ split level modular table

*Surprise, price includes delivery

The company that puts innovation and production technology to work for you

NEWPORT RESEARCH CORPORATION

18235 Mt. Baldy Circle, Fountain Valley, California 92708 Phone (714) 962-7701

Circle No. 14 on Reader Service Card

stemming from that period, I shall not willingly belong to any organization that keeps files on the race of its members, no matter how well-intentioned such information-gathering activity might be.

One can only lament the naivité of Question 32. Is it needed to prove the obvious: That the American physics community is predominantly white? And isn't it evident that, once the debate on the racial-ethnic composition of the scientific community gets underway, it may very well turn out that, just as some races or ethnic groups are under-represented, some others—not necessarily named in the highly arbitrary list of Question 32—are over-represented. Is this where we are heading?

The American Institute of Physics can play a positive role in making first-rate education in science available, at all levels, to underprivileged groups of the population. I honestly believe that keeping racial files or engaging in racial statistics of its membership is not a step in the right direction.

RYSZARD GAJEWSKI
Newton, Massachusetts

•

I want to express my strong disagreement with the inclusion of Question 32 in the APS/AIP Questionnaire in regard to race or ethnic group of a physicist.

In these days of racial problems, I understand very well the reasons for being interested in the statistics of racial distribution within the physics community. However, I strongly oppose an assignment of race to a single individual. We know too many cases in the history of this country and other countries where such attributes have been grossly abused. Physics is a human activity, and the same scientific conclusions are reached by any human being regardless of his race, political affiliation or creed.

It would have been very easy to establish this statistical survey without attaching any race to an individual, by separating the paper on which the racial distinction is noted and have this information anonymously collected. Personally I would also be somewhat opposed to such a poll because of my individual aversion to any such political or racial distinctions. However, I see the desirability of observing a possible change in our ethnic distribution during the next few years.

Unfortunately the questionnaire is distributed and little can be done at this moment to rectify the situation. I would however strongly suggest, as other people have done, that the AIP erase that information on each questionnaire after having made anonymous use of the statistical information. This act should be publicly announced.

VICTOR F. WEISSKOPF
Massachusetts Institute of Technology
Cambridge, Mass.

DIRECTOR OF AIP COMMENTS: I want to thank Ryszard Gajewski and Victor Weisskopf for their thoughtful letters and for the opportunity to share our concerns on these issues with the readers of PHYSICS TODAY. I hope everyone will be able, on the one hand, to understand our rationale for including the question on race and ethnic groups and, on the other, to agree that we are taking adequate safeguards to protect the confidentiality of individual responses.

To be sure, information about people, like physics itself, can be used for ill or for good. We must make certain that the information we collect concerning individuals or groups of individuals is not used by us, nor made available by us, for use by others for any discriminatory or other improper purposes.

A number of influences lie behind the decision to include Question 32. Our purpose at AIP is to advance the knowledge of physics and its applications. This is accomplished through a wide variety of programs designed to provide services to the eight member societies and to their individual members by anticipating and responding to their needs and requests. We believe that the data being collected on minorities will contribute to an understanding of the present situation of minority-group members who have entered or will enter physics, and hence to supporting efforts aimed at providing equal opportunity to all. We further believe that in pursuing such efforts to give equal access to physics—as distinct from equal representation in physics—we also contribute strongly to the good of physics itself.

A second thrust has come from two committees of The American Physical Society, the Committee on Women in Physics (see PHYSICS TODAY, August 1971, page 72) and the Committee on Minorities in Physics (see PHYSICS TODAY, August 1972, page 72). Both have recognized a need to amass data on the participation of minorities in physics, and themselves initiated efforts to identify members of such groups. These latter efforts do of course go beyond collection of statistical data.

The third thrust arises from the need of institutions seeking to establish affirmative action programs. They have great need for data on minorities in order to be able to establish realistic goals in setting up such plans.

continued on page 49

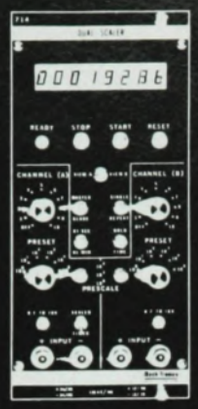
As for the confidentiality of the information, we did consider putting the race or ethnic group question on a separate sheet of paper. However, we quickly realized that such action would have meant that the data could not then be related to other statistical items, and hence that the raw numbers would have only limited meaning. Collecting all data anonymously would have presented even greater problems, for neither would we have been able to follow-up on non-respondents, a major activity in any well administered survey, nor would we have been able to manage control of the data or develop longitudinal files, which are so central to any analysis of change.

We therefore decided to seek out different precautionary measures to protect the individual respondent while at the same time allowing us to utilize the data fully, in a statistical manner, so as to provide information to the physics community on its composition and dynamics.

As stated on the questionnaire, all information below the double line on the first page of the questionnaire, i.e., items 4–32 (which includes the race or ethnic-group question), will be treated only in a statistical manner. Such data will be maintained on a statistical tape completely separate from the Name and Address file. Individuals thus will not be identified by race, sex or any other characteristic. The statistical tape does contain code numbers for data control and the development of longitudinal statistics. AIP will maintain full control of the tape and of the coded material as we have done in the past. Although full control resides entirely with the Manpower Division and myself, it is our intent that any use made of the coding would be made only with the advice of the appropriate committee.

Information above the double line, items 1 through 3, including names, addresses, telephone numbers and specialities will be maintained on a second separate tape for use in directories and in updating subscription address files.

The original questionnaire documents are to be stored in locked cabinets. Under no circumstances are outside groups or anyone inside the Institute not directly involved with the survey allowed access to these files. We believe that by following these precautions we can fully protect the confidentiality of individuals and their responses to our survey, in the future as we have in the past. For instance, when we cooperated with the survey done by Vera Kistiakowsky and the



714

The Model 714 incorporates two eight decade 50 MHz preset scalers, an eight digit, seven segment display, and 100 KHz time base. The discriminator inputs provide for both positive 0.2-10 volt adjustable and NIM fast negative inputs. Both channels incorporate unit's digit and decade multiplier preset switches. Each channel may be operated as a 6, 7 or 8 decade scaler by means of prescale selector switches. Serial printing capability is standard. Parallel printing capability is available (714-01) as a no-cost option. Price: $1,450.00.

715

The Model 715 incorporates two six decade 20 MHz scaling channels, sharing a common display. A synchronized time base and preset capability in one channel, provide both dual scaler and scaler and timer operating modes. Each channel incorporates a 0.2-10 volt discriminator and both positive and negative inputs. Serial printing capability is provided. Price: $1,025.00.

716

The Model 716 incorporates two "basic" six decade 20 MHz scaling channels, sharing a common display. Each channel incorporates a 0.2-10 volt discriminator and both positive and negative inputs. Serial printing capability is provided. Price: $925.00.

Introducing the bright ones

717

The Model 717 is a single preset six decade 20 MHz scaler with seven segment display. A synchronized time base allows the unit to function as a Scaler or Timer. 0.2-10 volt discriminator entry functions on both positive and negative inputs. Serial printing capability is provided. Price: $650.00.

718

The Model 718 is a "basic" six decade 20 MHz scaler with seven segment display. 0.2-10 volt discriminator entry functions on both positive and negative inputs. Serial printing capability is provided. Price: $575.00.

719

The Model 719 is a six decade 20 MHz counter with synchronized time base and preset time control. Single or Repeat count modes are provided as is 0.2-10 volt discriminator entry on both positive and negative inputs. The Model 719 is a non-printing instrument. Price: $585.00.

FROM MECH-TRONICS NUCLEAR

Among the eight new products introduced at the January "73" Physics Show are five data acquisition modules . . . "The Bright Ones" . . . Single and Dual Scalers and Scaler/Timers and a Counter. These instruments feature the highly readable sperry seven segment display first used in nuclear instrument modules by Mech-Tronics Nuclear in the Model 714 Dual 50 MHz Scaler.

Mech-Tronics
NUCLEAR

430A Kay Avenue / Addison, Illinois 60101 / For more information • write or call collect (312) 543-9304

Circle No. 26 on Reader Service Card

letters

Committee on Women when they were collecting data for their Roster of Women in Physics (see PHYSICS TODAY, July 1972, page 61) we did not give the Committee access to data about individual women, nor their names and addresses; rather we sent the questionnaires ourselves with a covering letter so that those women who wished to be listed in the roster or to give data could do so by returning the questionnaires themselves to the Committee. Perhaps because of this kind of extreme care, the AIP in its many years of dealing with surveys has never had any problems with reference to misuse of information on the questionnaires.

Let me add that the APS–AIP Register of Physicists and Associated Scientists is under the direct supervision of Beverly F. Porter, a trained sociologist and Deputy Director of the Manpower Division. Porter developed the questionnaire in association with R. W. Sears, APS Manpower Consultant. The questionnaire was pretested in several universities, industrial and government laboratories and revised appropriately to handle uncertainties and other critical aspects. The race and ethnic question was reviewed by Warren Henry, Chairman of the APS Committee on Minorities in Physics. The question was also reviewed by AIP's legal counsel. Porter and Sears have the responsibility for maintaining confidentiality of this information.

I realize that no matter how well intentioned, well conceived and well executed have been our actions, there is always the possibility of mistakes or of breach of the safeguards. Accordingly, some may not be inclined to accept the validity of our decision to include the racial and ethnic question. I believe, however, that AIP has acted responsibly and in the best interest of its member societies as well as of the larger national interests. I urge the members of our various societies who agree, to complete and return the questionnaire after completing Question 32, and I urge those who do not agree to return it without completing the question.

H. WILLIAM KOCH
Director
American Institute of Physics

Help for the blind

Science for the Blind is a nonprofit organization that provides scientific material on magnetic tape. We are in urgent need of volunteer readers. All that is necessary is a reel-to-reel tape recorder, a good voice and a willing spirit. To audition send your name and address for audition tape to:

SCIENCE FOR THE BLIND
221 Rock Hill Road
Bala-Cynwyd, Pa., 19004 □