

CORRESPONDENCE

Six Years for a PhD

SIR,—The impression exists among many students of college age and earlier, and among their families, that three years is a “normal” length of post-baccalaureate time for a PhD. Many university faculty expect their graduate students to finish in four, or perhaps five, years. Those who

case of foreign students, it was not always a BA or BS. No adjustments were made for interrupted or part-time study. Obviously most of those taking over ten years were not in graduate full-time for the entire period. The curve for mid-year degrees, which at Harvard are dated “March”, is shifted left by six months to provide a better fit.

gradually extending out to approximately 30 years. The number who receive PhDs in the traditional three years or less is negligible: less than one per cent.

The curves for mid-year and June degrees agree also in absolute numbers for the wings; additional recipients of June degrees are clustered at 5 and 6 years. The sharp drop thereafter probably represents the effect of the existence of deadlines, not only departmental rules but also psychological pressure felt by the individuals, both students and advisers.

The California Institute of Technology is a more specialized institution, and the 117 PhDs awarded in June 1971 were all in scientific subjects. Yet the distribution (Fig. 2) is very similar to that for all Harvard degrees, peaking at 5 and 6 years with a long tail that extends out to 16 years.

The average length of time of post first-degree enrolment before receiving a Caltech PhD is 6.4 years, with a median of 6 years and a mode of 6 years.

Clearly, the fact that so many students take more than five years for a PhD reflects more than individual delays, and must result partly from the design of

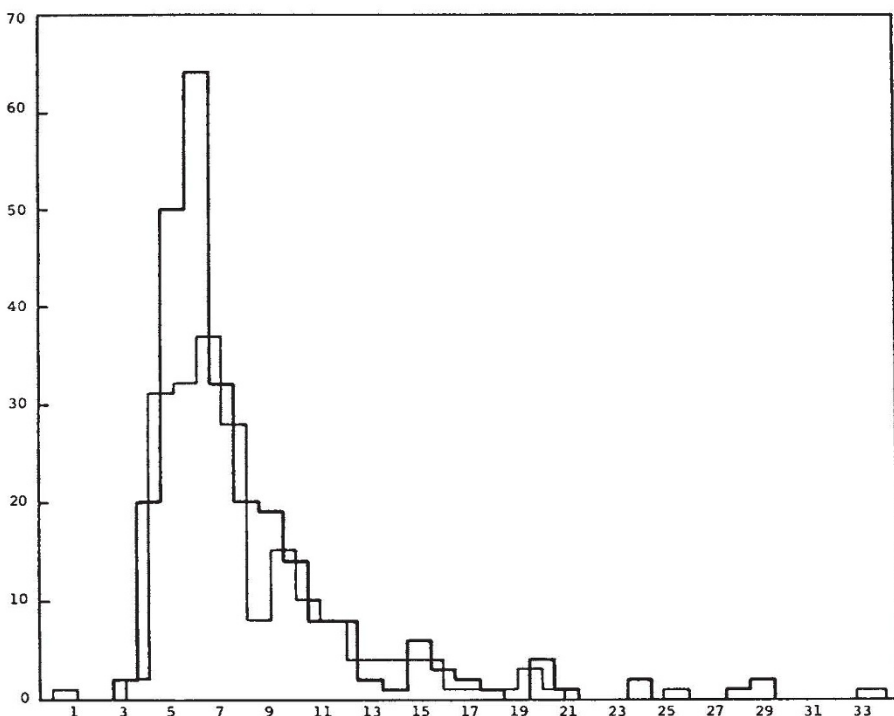


Fig. 1 Number of years between first degree and PhD for those receiving degrees at Harvard commencement in 1969. The dark line is June degrees; the light line is March (mid-year) degrees.

spend six years or more in graduate study are often asked why they took so long. As we shall see here, however, six years is about the median time for a PhD at both Harvard and Caltech.

Fig. 1 shows the distribution of time between first degree and doctorate for all students receiving PhDs at Harvard University in 1969. The first degree is always used although, especially in the

The curves, which are drawn to the same absolute scale, agree in the form of the distribution, which peaks at five through seven years. The average length of time spent before receiving the 262 June 1969 degrees at Harvard was 7.9 years, with a median of 6 years and a mode of 6 years. The average for the 459 total degrees was 8.9 years, with a median of 7 years. There is a long tail,

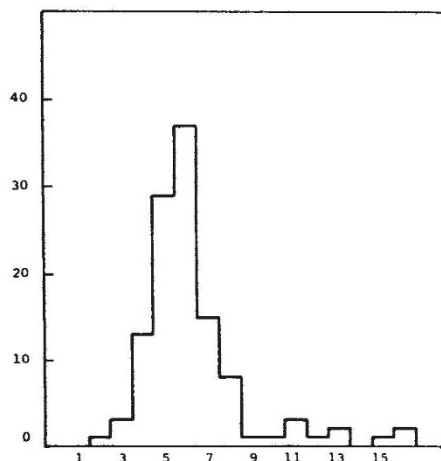


Fig. 2 Number of years between first degree and PhD for those receiving degree at California Institute of Technology commencement in 1971.

requirements laid down by the departments, including minor theses, qualifying examinations, and supplemental research projects.

Yours faithfully,
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Bird Navigation

SIR,—Two points appear to be misleadingly used to indicate that domesticated *Columba livia* does not require sun-azimuth for route-finding when your correspondent on the homing sense in pigeons (*Nature*, 232, 86; 1971) stated: "Recent evidence that this ("map" mind of the homing bird) can operate effectively even after many days' imprisonment away from the home loft . . ." I published elsewhere¹ examples of very long memory in pigeons including the following: a Hollywood (USA) pigeon which raced up to 500 miles, 1931–4, sold to Huntington (California) which returned on escape after kept "prisoner" 8 years; one lost racing Rennes (France) to Manchester, 1926, which returned home 1931, after presumably being stolen and kept prisoner; an Australian pigeon lost racing 550 miles Benallo–Melbourne, 1944, which returned in 1948, and another which returned 400 miles to France 2 years after sale to Newcastle, where it was kept prisoner a year. I have known pigeons lost up to a year return to their old nest-boxes, among many inside a breeding loft, and fight the new owner for occupation. As the breeding season approaches, more lost birds home than otherwise.

In all such cases which could be investigated, the birds were kept as "inside" prisoners without sky-views. Where transported birds are kept prisoner a week or more in outside, mesh-wire "aviaries", they "resettle" to the new territory. Young birds (6 months old) have thus been resettled in 1 week, exceptionally in 4 days; but older birds usually require 8 to 10 days. My operational birds in the British Army Pigeon Service in the 1939–45 war were sent forward in baskets (to be flown back to their lofts) with the instruction "it is important that birds should be so placed that it is impossible for them to see their immediate external surroundings", and that unused birds should not be kept in delivery or stock baskets for more than 4 days (in trench-baskets, 3 days), but returned for replacements. This was to avoid birds "seeing" and "remembering" the new temporary release-point.

Visual recognition of their external surroundings (e.g. sky and landscape

was used to resettle birds to "home" to new loft-sites in place of old ones, using outside aviaries or baskets on top of the loft for at least an hour daily. I allowed my loftmen a minimum of a fortnight to settle pigeons to a new loft-site, but preferred 5 weeks (longer still for distances over 30–50 miles). We once settled thirty-four birds to "home" to a new loft site in 10 days. I have no evidence of birds settled to fly to a new loft-site by "inside" imprisonment, without external views, excepting the "nomad" type of training where a pigeon homed to a marked mobile loft, or basket, by recognition of the mark used also when feeding it.

While ability to home is known to be inherited (an untrained 2-months-old pigeon still squeaking homed 40 miles to one of my lofts, where it was bred) the homing territory is acquired after birth—pigeon eggs taken 100 miles to be hatched and reared "home" to the loft where they were reared, not where the eggs were laid. Pigeons returning to Scotland continued through the longer light of Scottish summer nights to arrive earlier than birds roosting in the darker English night before reaching English lofts. Pigeons liberated in fog distinct from merely ground-mist, are delayed, presumably by waiting for visibility to clear.

The more remarkable test of astral and sun navigation is not this long delayed homing of pigeons, but the annual return to the same breeding and wintering territories by trans-equatorial migrants, particularly the purely marine southern petrels and shearwaters, whose journeys cover seas with no landmarks.

Yours faithfully,
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¹ Hardy, E., *Pigeon Guide: A Complete Handbook of Pigeon Keeping* (Seeley, London, 1951).

Black Hole to the North?

SIR,—I read with extreme interest the editorial observation that, over the past ten years, "the population in the extreme North of Britain decreased, with Lancashire, Cumberland and Northumberland all returning figures lower than in 1961 . . ." thus confirming the fears of those of us who dwell beyond the pale in the thirty-one counties of mainland Britain on the wrong side of Hadrian's Wall, that in fact we really do have no existence and that contracting population acting like some contracting stellar body has pulled the land mass with it leaving a "black hole" to the north of Carlisle.

Or perhaps the statement showed a trace of Anglo-Chauvinism in confusing the land of the English with the island of

Great Britain?—an inauspicious error in a journal dedicated to the objective accuracy of science.

Yours faithfully,
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¹ *Nature*, 232, 512 (1971).

Unfair to Scientists

SIR,—During the period when the pay of civil service scientists has been the subject of public debate most of us concerned with the matter have felt the reports in *Nature* to be well balanced and to fairly state the case of both sides. Your conclusions have represented a fair assessment of the merits of the case. But, then, we could expect you as a serious commentator on scientific affairs to recognize what enormous damage would be done to the scientific community at large by the Civil Service Department's ludicrous pay offer to its scientific staffs. I should like, however, to emphasize the following points.

Regrettably, the arbitration tribunal has done nothing to resolve the basic problem. Anyone trying to reconcile the irreconcilable is likely to produce a nonsensical result. That was bound to be the outcome of trying to bring together "fair comparisons" and internal relativities. The Civil Service Department at least recognized the problem. They acknowledged that there were special circumstances affecting the pay of scientists but argued that they were irrelevant and, in any case, could not be measured. Thus, for them, there was no conflict. We were not prepared, and are not now, to have scientists treated as poor relations of their civil service colleagues in the technological field, nor yet of those in administration.

We will not take part in another pay research exercise and we are determined to get a joint review to establish a proper basis for future pay reviews for scientific staffs. We will press for early action on all of the structure aspects of Fulton, including the point which you rightly make about the need for scientists (and other specialists) to move across to more general administration. In part, of course, the point can be met by proper systems of accountable management but there will remain a need to move away from science for those who are going to get right to the top.

Neither this alone, nor in combination with your other point of allowing greater freedom to leave the civil service (a subject on which we are currently in discussion with CSD) will resolve the main problem. This remains the need to provide the great majority of scientific