

involvement in mild primary hyperparathyroidism. It is possible, although at present uncertain, that mild hyperparathyroidism may affect bone metabolism and perhaps osteoporosis.<sup>19</sup> This is relevant because most patients with mild asymptomatic hyperparathyroidism are elderly women, who are particularly prone to osteoporosis.

More patients need to be followed up for longer periods before confident guidelines can be laid down. At present, however, we are managing medically patients with primary hyperparathyroidism who have no symptoms referable to the condition and no evidence of bone disease or recurrent renal stones. We consider it wise to advise operation if the plasma calcium concentration is greater than 3 mmol/l and also in younger patients. We have not established age limits, but we are reasonably confident that medical management is satisfactory for patients over 60 though less so for patients under 50 years. With the passage of time we are now tending also to observe patients over 50.

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## References

- Haff RC, Black WC, Ballinger WF. Primary hyperparathyroidism: changing clinical, surgical and pathologic aspects. *Ann Surg* 1970; **171**:85-92.
- Boonstra CE, Jackson CE. Serum calcium survey for hyperparathyroidism (results in 50 000 clinic patients). *Am J Clin Pathol* 1971; **55**:523-6.
- Harrop JS, Bailey JE, Woodhead JS. Incidence of hypercalcaemia and primary hyperparathyroidism in relation to the biochemical profile. *J Clin Pathol* 1982; **35**:395-400.
- Heath H III, Hodgson SF, Kennedy MA. Primary hyperparathyroidism: incidence, morbidity, and potential economic impact in a community. *N Engl J Med* 1980; **302**:189-93.
- Mundy GR, Cove DH, Fiske R, Heath DA, Somers S. Primary hyperparathyroidism: changes in the pattern of clinical presentation. *Lancet* 1980; **i**:1317-20.
- Anonymous [Editorial]. Diagnosis and treatment of primary hyperparathyroidism. *Lancet* 1980; **i**:1339-40.
- Wang C-A. Surgery of the parathyroid glands. *Adv Surg* 1971; **5**:109-27.
- Russell CF, Edis AJ. Surgery for primary hyperparathyroidism: experience with 500 consecutive cases and evaluation of the role of surgery in the asymptomatic patient. *Br J Surg* 1982; **69**:244-7.
- George JM, Rabson AS, Ketcham A, Barter FC. Calcareous renal disease and hyperparathyroidism. *Q J Med* 1965; **34**:291-301.
- Hamilton M, Pickering GW, Roberts JAF, Sowry GSC. The aetiology of essential hypertension. 1. The arterial pressure in the general population. *Clin Sci* 1954; **13**:11-35.
- Bjornsson TD. Use of serum creatinine concentrations to determine renal function. *Clin Pharmacokinet* 1979; **4**:200-22.
- Thomis JA, Soep HH, Hallynk T, Boelaert J, Daneels R, Dettli L. Creatinine clearance, different methods of determination. *Br J Clin Pharmacol* 1982; **13**:260.
- Purnell DC, Smith LH, Scholz DA, Elveback LR, Arnaud CD. Primary hyperparathyroidism: a prospective clinical study. *Am J Med* 1971; **50**:670-8.
- Purnell DC, Scholz DA, Smith LH, et al. Treatment of primary hyperparathyroidism. *Am J Med* 1974; **56**:800-9.
- Scholz DA, Purnell DC. Asymptomatic primary hyperparathyroidism. *Mayo Clin Proc* 1981; **56**:473-8.
- Rohl PG, Wilkinson M, Clifton-Bligh P, Posen S. Hyperparathyroidism: experiences with treated and untreated patients. *Med J Aust* 1981; **1**:519-21.
- Adams PH. Conservative management of primary hyperparathyroidism. *J R Coll Physicians Lond* 1982; **16**:184-90.
- Christensson T. Parathyroid hypertension. *Br Med J* 1983; **286**:1899.
- Heath H III, Purnell DC. Asymptomatic hypercalcaemia and primary hyperparathyroidism. In: Heath DA, Marx SJ, eds. *Clinical endocrinology. 2 Calcium disorders*. London: Butterworth, 1982:189-216.

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## For Debate . . .

# Individual contributions to multi-author papers

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## Abstract

The curricula vitae of four candidates for a professorial appointment at Athens University were examined to estimate the actual contribution of each candidate to the papers of which he was a coauthor. A total of 879 research papers by the four candidates were analysed in terms of the number of authors, the sequence of names, and the year of publication. The four authors presented 364, 349, 96, and 70 papers. If an equal contribution of all

coauthors is assumed, the actual number of papers (all papers divided by the number of authors), is about 106, 83, 28, and 26, respectively, so that the rank of the four candidates did not change. On the assumption that the contribution was related to the candidate's position in the order of the coauthors' names, the numbers of papers were corrected to 84, 95, 26, 33 using one statistical method and to 88, 94, 28, 31 using another. These assumptions may not be valid, however, especially as the last author may be more important than the intermediate ones.

It is suggested that the journals require authors to state their specific contribution to a paper, such as original idea, planning, collecting data, writing up, etc.

## Introduction

Multi-authorship leads to problems of indexing and an increase in the number of published papers,<sup>1</sup> and has been attributed to overpopulation, desire for promotion, multi-institutional or multidisciplinary trials, and the ease of including authors

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gratuitously or for a very minor contribution. Furthermore, the problem becomes more important when the number of publications is taken as an indication of the research activity of the individual researcher or when the quality of a paper has to be attributed to one of the coauthors. While we were evaluating the curricula vitae of four candidates for a professorial appointment at Athens University we tried to estimate the actual contribution of each candidate in the published papers of which he was coauthor.

**Materials and methods**

A total of 879 research papers by the four candidates were analysed in terms of number of authors, sequence of names, and year of publication. Reviews, editorials, and other publications usually written by one person were excluded.

The total number of papers with which each candidate should be credited was calculated on the assumption that his contribution was equal to that of his coauthors and that his contribution depended on the position of his name in the sequence of authors. On the assumption that the contributions were equal, the total number of credited papers was calculated as  $\sum 1/n$ , where  $n$  is the number of authors in each paper.

The contribution of each candidate according to his position in the sequence of names was calculated in two ways.

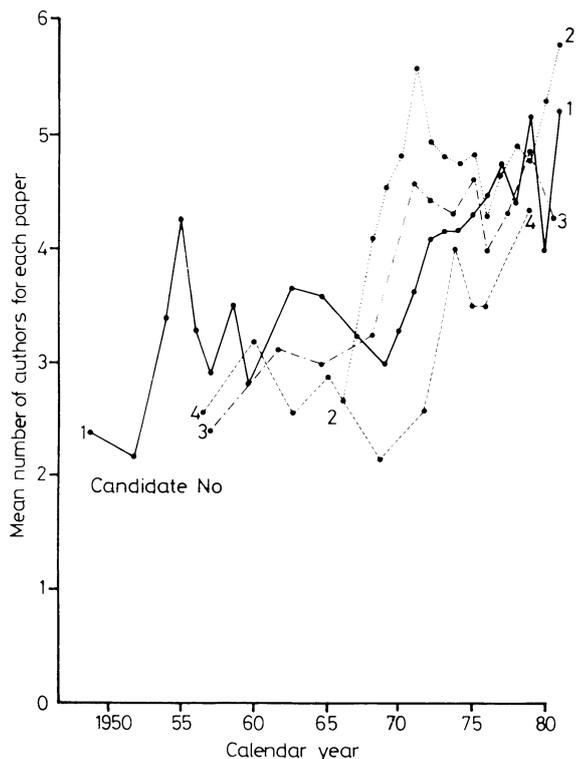


FIG 1—Average number of authors of each article as a function of time separately for each candidate. When number in a year was less than five, two or more years were combined.

TABLE 1—No of papers of each candidate as calculated by several methods

Candidate No	Total No of papers published	No of authors of each paper		Individual contribution*	Corrected individual contribution	
		Mean	SD		First method†	Second method†
1	364	4.02	1.41	106.39	84.53	88.00
2	349	4.81	1.54	83.49	96.53	93.58
3	96	4.02	1.23	27.59	26.53	28.07
4	70	3.17	1.19	26.18	32.66	31.15

\* Assessed as total number of papers ÷ number of authors in each paper.  
 † See text for details of methods.

Firstly, the probability of an author having a certain random position  $x$  in the sequence of names with  $n$  authors is  $1/n$ , his probability of having the same position in  $m$  papers with  $n$  authors is  $m/n$  papers, and his probability of having the same position with a number of authors  $n > x$  is the sum of all his probabilities of having this position. From the distribution of the probabilities of each position the mean expected random position was calculated. From the distribution of the actual positions of the candidate's name in his papers, his actual mean position was calculated. The total number of credited papers ( $\sum 1/n$ ) was then corrected by multiplying by the mean expected random position and dividing by the mean actual position.

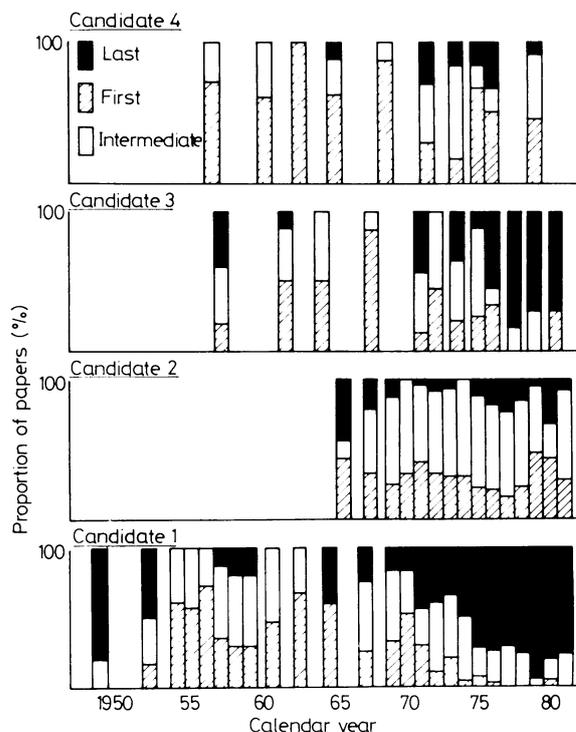


FIG 2—Proportion of papers with each candidate in first, last, and intermediate position. When number of articles in a year was less than five, two or more years were combined.

Secondly, the contribution of each author was estimated as being in inverse proportion to his position in the sequence of names ( $a/x$ ), while the contributions of all authors totalled one. Thus,  $a + a/2 + a/3 . . . + a/n = 1$ , where  $a$  is a constant depending on the number of authors in the paper.

Using a similar procedure to the first outlined above, the number of papers in which each candidate is randomly expected to be first or last author was calculated and compared with the actual number. In addition, his probabilities of being first or last were assessed over time. Finally, the number of papers published each year was calculated.

**Results**

Table I shows the number of papers to which each candidate contributed and the mean number of authors of each paper. It also shows the number of papers credited to each author assuming that his contribution to each article was equal to that of his coauthors. The rank of the candidates does not change. The table also shows the individual contribution as corrected by the methods previously described taking into account the position of each candidate in the sequence of names; this changes the rank of the candidates in terms of number of papers.

The number of authors of each article increases with time in all four candidates, as shown in fig 1.

Table II shows the actual and the expected number of papers in which each candidate was the last author. One candidate (1) appears last significantly more often than expected ( $p < 0.001$ ), while two others (2, 4) significantly more rarely ( $p < 0.001$ ). With the exception of the youngest candidate (2), as time passes the proportion of papers

where the candidate is the last author seems to increase and the proportion of those in which he is first author to decrease (fig 2).

The total number of papers published each year for the four candidates was: 1, 10.40; 2, 20.53; 3, 3.55; and 4 2.59 and this was clearly increased by time (fig 3).

TABLE II—No of papers in which each candidate appears last

Candidate No	Expected*	Actual	p Value
1	97.39	179	0.001
2	77.49	51	0.001
3	24.59	32	NS
4	22.18	8	0.001

\* Based on random allocation.

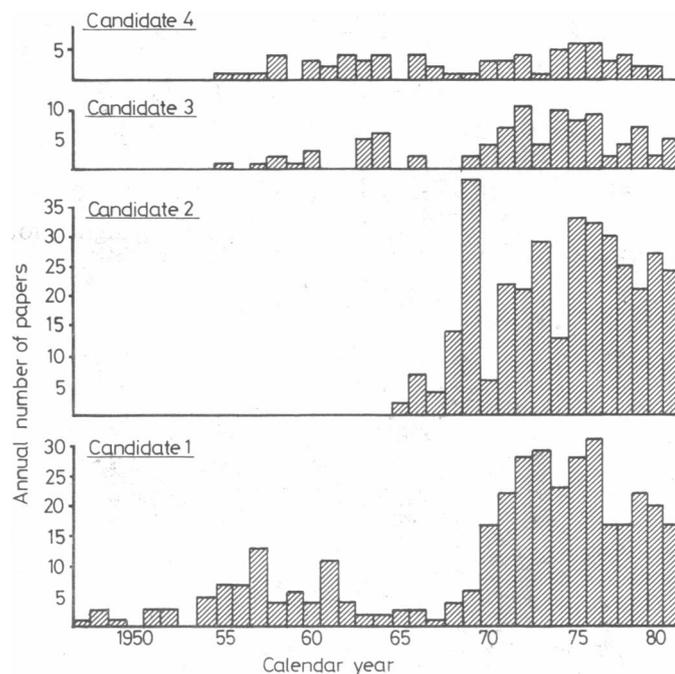


FIG 3—Annual number of each candidate's papers by year. The number of papers is represented by the area of the columns. When the number of articles in a year was less than five, two or more years were combined.

## Discussion

The number of authors of each published article was found to increase with time in the four candidates examined. A similar increase was observed when we examined the papers in a journal.<sup>2 3</sup>

Several attempts were made to quantify the contribution of each candidate to his papers. Dividing by the number of co-authors assumes an equal contribution of all the authors, which is not the case. The first author is usually considered to be the prime mover.<sup>3</sup> An assessment based on the order of names seems to be closer to the commonly held opinion.<sup>4</sup> Of the two statistical methods used to deal with this problem, however, the first may yield a sum of contributions for one paper that does not total one, while the second method is arbitrary in assigning the contributions exactly in inverse proportion to their order relative to the contribution of the first author. Furthermore, neither method takes into account the peculiar value of the last author. If we assume that the candidates' own assessment of the importance of the last author is proportional to the frequency with which they placed their own names last, the subjective value of this position increased with time for three candidates (fig 2) and differed widely among the four candidates (table II). Bibliographical evidence suggests that the last author is considered to

be the most supportive individual.<sup>3</sup> It is obvious that different results would be obtained if the two statistical methods described were applied, while the last author was given a different weight from that appropriate for his position.

Although some information can be derived from this analysis of data, no accurate conclusion can be drawn as to the relative research activity of an author compared with that of his coauthors or as to the individual mainly responsible for the quality of the paper.

We would suggest that journals ought to require from authors a statement of their specific contribution to the paper, such as original idea, planning, participation in the experiment or in laboratory or clinical work, collecting data, technical advice, technical help, writing up the paper, and so on. If more than one author contributed in a similar way, their contribution would be considered equal unless stated otherwise.

## References

- 1 Broad WJ. The publishing game: getting more for less. *Science* 1981;**211**: 1137-9.
- 2 Strub RL, Black FW. Multiple authorship. *Lancet* 1976;ii:1090-1.
- 3 Dardic H. Multiple authorship. *Surg Gynecol Obstet* 1977;**145**:418.
- 4 Stokes J III. Polyauthorship. *N Engl J Med* 1971;**285**:183.

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*Is it correct to say that in the (primary or secondary) prevention of ischaemic heart disease soft margarines made of coconut oil should be avoided in preference to margarines made of polyunsaturated vegetable oils?*

Coconut oil has a low melting point (and therefore yields a "soft" product when incorporated into a margarine) because its triacylglycerols contain a particularly high concentration of fatty acids of medium chain length compared with other oils. About 90% of these fatty acids, however, are saturated.<sup>1</sup> Hegsted *et al* showed that, in combination, lauric (dodecanoic acid, 12:0), myristic (tetra-decanoic, 14:0), and palmitic (hexadecanoic, 16:0) acids are the most effective of all fatty acids in raising plasma cholesterol concentration.<sup>2</sup> Together these contribute 73% of all coconut oil fatty acids.<sup>1</sup> Saturated fatty acids with greater chain lengths have less effect on plasma cholesterol because of their poorer absorption, while those with chain lengths lower than 12 carbon atoms have no effect because they are absorbed into the portal blood and oxidised in the liver.<sup>2</sup> Dietary polyunsaturated fatty acids have a negative influence on plasma cholesterol.<sup>2</sup> If it is accepted that there is a link between plasma cholesterol concentration and the risk of developing cardiovascular disease the most appropriate dietary strategy for those most at risk would be to use soft margarines based on unhydrogenated polyunsaturated oils rather than any based on coconut oil. A factor that may well be of equal or greater importance is the influence of dietary fat on platelet aggregation. If this is the case then there is also evidence that polyunsaturated vegetable oils would have a more beneficial effect on this aspect.<sup>3</sup>—  
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<sup>1</sup> Paul AA, Southgate DAT. *McCance and Widdowson's the composition of foods*. 4th edn. London: HMSO, 1978.

<sup>2</sup> Hegsted DM, McGandy RB, Myers ML, Stare FJ. Quantitative effects of dietary fat on serum cholesterol in man. *Am J Clin Nutr* 1965;**17**:281-95.

<sup>3</sup> Anonymous. Dietary essential fatty acids, prostaglandin formation and platelet aggregation. *Nutrition Reviews* 1976;**34**:243-5.

## Correction

### Any Questions

In the reply to the question on naloxone by Dr J C Stoddart (22 October, p 1200) the sixth sentence on the 11th line should read: "Its use in shock resulting from septicaemia was suggested by the hypothesis that some of the features of this condition were caused by the release of beta endorphin, an endogenous opioid." We apologise for this error.