

# Letters

## Egypt to Canterbury

In the Canterbury Cathedral comments by Borst and Barmore (1), neither has mentioned Lockyer's elegant work of 1894 concerning the same problem found in many Egyptian temples (2). Lockyer directed his attention to Egyptian temples after he discovered the foundations of the "old and the new Parthenon" in Athens were not parallel and were apparently directed to rising points of the Pleiades.

Egyptian engineering was capable of building the Great Pyramids with "errors" of only a small fraction of a degree. (The Great Pyramid of Khufu faces vary  $0^{\circ}1'57''$  to  $0^{\circ}5'30''$  from the cardinal directions; the longest and shortest sides differ by 7.9 inches in more than 9000 inches) (3). Hence in Lockyer's time, skew in temple plans was not considered engineering error, but was attributed to a "symmetrophobia" of the ancient Egyptians.

Lockyer believed the long rows of temple pillars served to collimate light from sun or star. When a stellar temple ceased to function after 200 to 300 years due to precession, a new one was built next to it, if space permitted, or else the collimating aisle was repaired along a new alignment so that starlight again would enter the innermost sanctuary. Astropolitics were such that a rival faction sometimes deliberately built a new temple across the line of sight of an existing one, literally blocking its use.

St. Peter's Cathedral in Rome is truly oriented to the vernal equinoctial sunrise, and many churches are aligned so that the sun enters them on the birth or name day of their patron saint. Occidentation later replaced orientation and eventually conscious celestial alignment was somewhat neglected, but the early temples, cathedrals, and henges were all observatories for celestial events and carefully engineered to function properly.

It would be helpful if it were clear what the exact direction of Canterbury Cathedral is with respect to true north,

and how this was determined, especially since magnetic variations change in time. While the original underlying henge probably faced east, the present door and fairway look west. Perhaps the nave and choir followed a setting star. Would Spica fit? And what about the alignments of the small chapels along the sides?

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### References

1. L. B. Borst, *Science* **163**, 567 (1969); F. E. Barmore and L. B. Borst, *ibid.* **166**, 772 (1969).
2. J. N. Lockyer, *The Dawn of Astronomy* (1894; reissued by M.I.T. Press, Cambridge, Mass., 1964).
3. I. E. S. Edwards, *The Pyramids of Egypt* (Penguin, Baltimore, Md., 1961), p. 256.

We are all indebted to Lockyer for his pioneering work on temple orientation. Egyptian chronology until recently has been uncertain because inscription dates were given within the Sothis cycle, but which cycle was never identified. The "wandering year" was caused by their assuming exactly 365 days and a Sothis began when the heliacal rising of Sirius coincided with the flooding of the Nile. The error in the length of the year caused the beginning of the year to migrate through the months until it again came to the flooding of the Nile. Some of Lockyer's dates are based upon the wrong Sothis—even in a recent edition of the *Encyclopaedia Britannica* the age of the pyramids is given as 4000 B.C. (in error by one Sothis).

In the case of Akhenaton's temple at El Amarna, known to have been built in 1360 B.C., the alignment is clearly upon the setting point of Spica, but his precessional date was 1900 B.C. The sun temple at Heliopolis in inscriptions was described as similar. It has the same orientation, but he identified the setting star as Capella and derived the date 5200 B.C. The similarity of the temples was probably complete and the original temples contemporary, probably early Hyksos. His data are excellent, his method, correct, but he suffered from the uncertainty of his contemporaries and

his conclusions were not always vindicated.

Returning to Canterbury: the new data, gathered in a second visit, are accurate (1). It is my present belief that Bellatrix was the celestial object so that the derived dates are contemporary with Stonehenge. Other English and Scandinavian cathedrals have similar plans (2). It is clear that these also are pre-Christian. St. Peter's in Rome has a historical relation to the Circus of Nero. The columns of the circus were used for the north aisle of the basilica. It is my opinion that a megalithic plan here also was involved, but insufficient data are available to make a convincing case.

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### References

1. L. B. Borst, *Science* **166**, 774 (1969).
2. ———, *Nature* **224**, 335 (1969).

## Population Crisis:

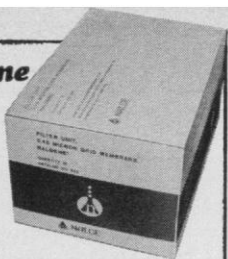
### Go Back to the Country!

It is doubtful that the drastic remedies mentioned in Luther Carter's article on the population crisis (7 Nov., p. 722) could be effective in solving the real population problem faced by this country, which is less a problem of absolute numbers than of the maldistribution of the population.

For instance, between 1950 and 1960, the population increase of 820,000 in Pennsylvania was accounted for entirely by the two major metropolitan areas of Philadelphia and Pittsburgh, with the remainder of the state actually decreasing by 40,000. On the other hand, there are 12 states (excluding Alaska) with a density of under 20 persons per square mile—hardly indicative of crowding! These states cover 39 percent of the area of the country; yet between them they accounted for only 6.3 percent of the total population in 1960. Granted that vast areas of these states cannot, or should not, become highly populated and that the notion of spreading the population evenly over the landscape is preposterous. There nevertheless can be a more sensible redistribution.

What is needed is a concentrated effort to check the rate of influx of migration into presently overpopulated areas, by adopting measures designed to discourage, and perhaps restrict outright, the movement of new businesses

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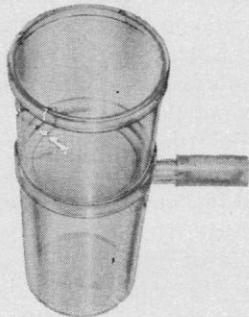
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and industries into those metropolitan centers which had officially been determined to be at the saturation point. Similarly, out-migration from such areas should be stimulated, through bonuses or tax credits to individuals, and through incentives and subsidies to spur the movement of industry and commerce into presently underpopulated areas. In this connection, we may note President Nixon's reference, in his message on population, to the need for new cities to be built in places removed from present centers of population.

The cost of stemming the tide of population being swallowed up by our megalopolitan areas will be considerable, in economic terms, as well as in terms of the limitations which may have to be set on our prized freedom of movement. Yet it will be small compared to that which we are paying today in trying to cope with the increasingly insoluble problems of housing, traffic, urban decay and sprawl, and of the degeneration of human values which beset urban America.

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At the International Botanical Congress Donald S. Farner, president of the International Biological Union, stated "Population increase must be reduced to zero," but proposed no effective means of accomplishing this objective. Joseph J. Spengler ("Population problem: In search of a solution," 5 Dec., p. 1234) implies that the so-called right to parenthood should be transformed into a privilege. His proposals for population control involve government action, but beyond that are so utterly Utopian as to border on the fantastic.

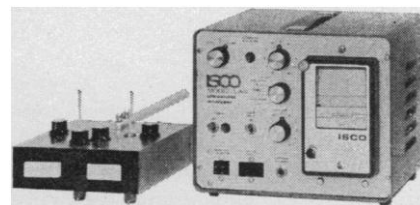
Population increase can be reduced to zero only by laws which make sterilization compulsory. Such laws will be passed only when a significant majority in a given nation are ready to accept them. Biologists may propose such action now without committing professional suicide; politicians cannot.

I propose that:

- 1) Voluntary sterilization be encouraged and all costs involved therein be paid by the government.
- 2) Sterilization of any female who has produced three offspring be made mandatory by law.

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nied; fatherhood may be not only denied, but may well be unknown. Setting the number of children a woman may bear at three will come as close as possible to balancing, on the one hand, women who have none or but one (through choice or otherwise) and, on the other hand, those whose final permissible pregnancy results in multiple births.

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### Brighter Future for Latin American Science Education

In response to Schwartz's letter (14 Nov.) concerning Latin American science education, I am pleased to report that in spite of "current budget cut-backs in Washington," financial support for the science and technology programs of the Organization of American States (OAS) has been increased during the past year about 20 times above the previous level. This increase has been approved by all of the member countries in spite of the well-known economic difficulties of the majority of these countries and of a less enthusiastic atmosphere for U.S. support of foreign assistance.

Beginning with meetings of chiefs of state at Punta del Este, Uruguay, in 1967, the OAS has given concrete evidence of increasing appreciation of the basic role of science and technology in the cultural and economic development of the Latin American countries. Among the programs which have been initiated with better financial support are those for the improvement of primary and secondary science education. The major thrust, however, is toward the training of larger numbers of high-level specialists who are receiving their graduate education at Latin American institutions.

Another very encouraging aspect of the Latin American science picture is the creation, or strengthening, of national research councils or their equivalents by several Latin American countries during the past few years. Some of these councils are now being asked to contribute to the formulation of national development plans.

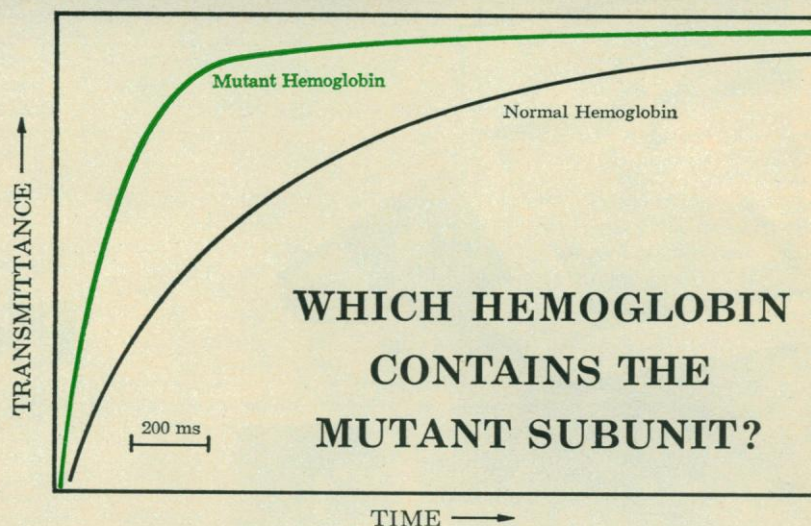
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23 JANUARY 1970

## CHEMICAL PROFILES

... drawn by Durrum

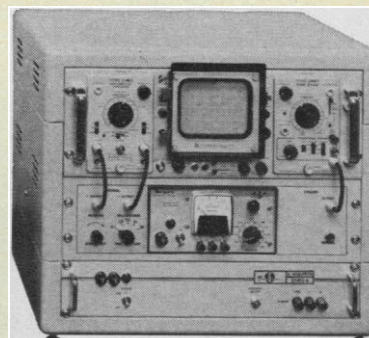
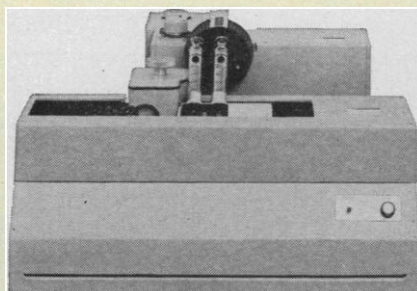


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\*AS REPORTED BY HENRY F. EPSTEIN AND LUBERT STRYER IN VOLUME 32 (1968) OF THE JOURNAL OF MOLECULAR BIOLOGY.



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