120 to 192 the number of frequency channels on the spectrometer for radioastronomy using digital auto-correlation techniques; PROF. J. N. HUNT, professor of physiology, Guy's Hospital Medical School, £980 for the construction of a recording *in vivo* colorimeter; DR. W. J. JONES, University Chemical Laboratory, Cambridge, £500 for the purchase of equipment to enable him to increase the efficiency of the laser apparatus for the excitation of Raman spectra; DR. D. W. TURNER, reader in organic chemistry at the Imperial College of Science and Technology, London, £3,000 for the construction of a K-shell photoelectron spectrometer.

A NEW journal entitled *Chemical Physics Letters* is being published by North-Holland Publishing Company as from January this year. It will appear initially as a monthly journal and deal primarily with results of theoretical and experimental research in the field of chemical physics.

DR. B. C. J. LIEVEGOED, professor of social pedagogy at the Netherlands School of Economics and dean of the Faculty of Social Sciences in the new Twente Technological University Enschede, will give the first of the newly established Andrew Betts-Brown Memorial Lectures at Heriot–Watt University on January 16. The title of his lecture, which is open to the public, is "Consequences of Technological and Social Change".

THE eighth International Embryological Conference will be held in Interlaken during September 3–9. Further information can be obtained from Dr. A. Curtis, Zoology Department, University College, London, Gower Street, W.C.1.

AN international symposium on "Tropical Root Crops" is to be held in the University of the West Indies during April 2–8. Further information can be obtained from the Secretary, International Symposium on Tropical Root Crops, Department of Agriculture, Crop Production, University of the West Indies, St. Augustine, Trinidad.

A SYMPOSIUM on "Atomic Absorption Spectroscopy" is to be held in the Welsh College of Advanced Technology during April 6–7. Further information can be obtained from the Organizer of Short Courses, Welsh College of Advanced Technology, Cathays Park, Cardiff.

A ONE-DAY symposium on "Telemetry in Medical and Biological Research", organized by the Scottish Sections of the Institution of Electronic and Radio Engineers and the Institution of Electrical Engineers, will be held at the Royal Infirmary, Edinburgh, on March 9. Further information can be obtained from P. M. Elliott, Honorary Secretary, Scottish Section, I.E.R.E., 21 Craigmount Loan, Corstorphine, Edinburgh 12.

ERRATUM. In the communication by Dr. E. T. Gláz, E. Csányi and J. Gyimesi entitled "Supplementary Data on Crotocin—an Antifungal Antibiotic" (*Nature*, **212**, 617; 1966) the second sentence of the fourth paragraph should read " . . . the cytotoxic concentrations (in μg/ml.) which resulted in 50 per cent inhibition of transplantability were as follows: crotocin 400·0, crotocol 250·0, trichothecin 20·0 and trichothecolon (the alcohol part of trichothecin) 400·0".

CORRIGENDUM. In the communication "Renin and Euryhalinity in the Japanese Eel, *Anguilla japonica*" by Dr. H. Sokabe, Dr. S. Mizogami, Dr. T. Murase and Prof. F. Sakai (*Nature*, **212**, 952; 1966), on line 4 "three to" should be inserted between "for" and "eleven", and on line 38 "of *p*H 7·4" should be inserted following "buffer".

CORRIGENDUM. In Table 1 of the article "Maternal Origin of the Group Specific (Gc) Proteins in Amniotic Fluid", by M. Usategui-Gomez and D. F. Morgan, in *Nature*, **212**, 1600 (1966), in the column headed "Foetal sera" the sixth figure should be 2–1 and not 2–2.

CORRESPONDENCE

Origin of the Genetic Code

SIR,—I should like to make two points about the account of my talk to the British Biophysical Society which you published recently[1]. I do not in fact believe that the idea of a stereochemical relationship between all amino-acids and their anticodons, as suggested by Dunnill[2], is likely. There is, in my opinion, suggestive evidence against it, but at the moment it is not enough to disprove the idea.

My second point concerns the main substance of my talk, which was an attempt to show that a plausible theory could be constructed without necessarily assuming any stereochemical interaction of amino-acids with either codons or anti-codons. I imagined the code to go through three phases:

1. The Primitive Code, in which a small number of amino-acids were coded by a small number of triplets.

2. The Intermediate Code, in which these primitive amino-acids took over most of the triplets of the code in order to reduce nonsense triplets to a minimum[3]. The codons produced by this process for any one amino-acid were likely to have been related.

Woese[4] has pointed out that this state of affairs could also have been produced by reading only a single base of a triplet, or by considerable inaccuracy in the reading of a few triplets.

3. The Final Code, as we have it today.

The crucial idea, already mentioned by Jukes[5], concerns the transition from 2 to 3, which I certainly do not think was "unlikely to have taken place"[1]. Evolutionary theory suggests that a new amino-acid was incorporated into the developing code only if its introduction at that time gave a selective advantage to the primitive organism. This implies that its introduction did not disturb too much the proteins then being produced, and in addition made a significant improvement to at least one of them. This would have happened most easily if

(*a*) the new amino-acid was "related" to the one previously coded by the triplet(s) in question[6];

(*b*) the organism coded rather few proteins;

(*c*) these proteins were rather primitive in their construction.

Eventually as the number of proteins coded became larger, and their design more sophisticated, no possible new amino-acid could, on balance, be an advantage and the code would be frozen.

Such a theory could thus explain in a general way the non-random nature of the present code, since "related" amino-acids might well have acquired related codons. It is quite distinct from theories[3,7] which postulate that the code evolved as it did in order to minimize the damaging effects of present-day mutations on individual proteins.

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[1] *Nature*, **212**, 1397 (1966).
[2] Dunnill, P., *Nature*, **210**, 1267 (1966).
[3] Sonneborn, T. M., in *Evolving Genes and Proteins* (edit. by Bryson, Vernon, and Vogel, Henry J.) (Academic Press, New York and London, 1965).
[4] Woese, C. R., *Proc. U.S. Nat. Acad. Sci.*, **54**, 1546 (1965).
[5] Jukes, T. H., *Molecules and Evolution*, 70 (Columbia University Press, 1966).
[6] Epstein, C. J., *Nature*, **210**, 25 (1966).
[7] Goldberg, A. L., and Wittes, R. E., *Science*, **153**, 420 (1966).