More numbers coincide

SIR — In the correspondence from Marcus Gossler[1] we are informed that, in the event of the statistical evidence being sufficient, "the numerological result has to be taken seriously and cannot be dismissed by any non-mathematical reasoning". However, I think it also reasonable to point out (and I am sure all concerned would agree) that, although any such statistical evidence would undoubtedly give cause for the results to be taken seriously, any proof of *physical* significance can only rely on the verification of predictions arising from the said[2,3] results.

I also think it reasonable to retract the statement, made in my article[2], that "I would state categorically that coincidence is ruled out", as it is purely personal opinion and not based on any statistical analysis of the results. At the same time I would state my view that the commentary by John Maddox[3] is also largely a matter of personal opinion, though its critical viewpoint was only to be expected in view of my "categorical" conclusions.

In the absence of any analysis of a verifiable statistical nature, my best defence lies in various new results I have produced. These undoubtedly increase the statistical evidence in favour of there being something to take seriously, although just exactly what that something is remains no less a mystery than in my original results. Perhaps it is best just to present the results and let readers decide for themselves.

My results are primarily based on a system in which the proton mass is represented as π^6 and the electron mass as $\pi/6$. One point worth bearing in mind (something I failed to raise in my article) is that $\pi/6$ is the volume of a sphere of unit diameter.

In these units I note that

$M\mu$ = cube of harmonic mean of π and π^2 (1)

Result (1) is quite accurate, the values being 108.262 and 108.264 respectively.

It is obvious, of course, that the most hopeful candidates for significance are those results that are independent of any choice of mass units. One such result now follows and, paradoxically, it will be seen (from the next few results) that it does have a direct bearing on my choice of units.

Where R is the radius of a sphere whose volume is equal to the mass (in any units) of a particle (for example Rp is that radius for the proton, and $R\pi^0$ is that radius for the particle pi-zero).

$$\tfrac{4}{3}\pi(Rp - R\pi^0)^3 = \pi(R\pi^0)^3 = \tfrac{3}{4}M\pi^0 \qquad (2)$$

The accuracy of result (2) is such that the left-hand expression (volume of a sphere of radius $Rp - R\pi^0$) is just 1.0000059 times the two right-hand expressions.

Whatever one makes of results (1) and (2), I feel that there can be few critics who would not agree that the following result, in view of results (1) and (2), should provide (in the event of a statistical analysis) sufficient grounds for my "theory" to be taken seriously.

For a value of π^6 for the proton mass,

$$Rp - R\pi^0 = 2.9146418 \qquad (3)$$

harmonic mean of π and e = 2.9146474

There may be a connection between results (2) and (3) and

$$e^6 = \pi^5 + \pi^4 \qquad (4)$$

The accuracy of this result is such that

$$e^6 - (\pi^5 + \pi^4) = 0.000017$$

Result (4) means that result (1) can be expressed as

$$M\mu = (2\pi^6/e^6)^3 \qquad (5)$$

These are a few of the more interesting new results I have produced. Result (4) means that the array of powers of π in my article[2] can be expressed, fairly accurately, in terms of the value e as well as π. The above is not a full list of all those new results that I consider to provide the basis of the evidence in favour of my hypothesis being taken seriously, and I suggest that anyone wishing to know of the other results should contact me at the address given.

Even if one considers the evidence (which at this stage can only be of a statistical nature) to be sufficient, there remains the problem of the lack of any predictions arising from the results. I therefore have to be objective, and agree with John Maddox[3] that it is one thing for the results to be "successful" (statistically) but quite another matter to prove that this success would make us "any wiser about the way matter is constituted".

PETER STANBURY

Flat 2, 3 Ferndale,
Tunbridge Wells,
Kent TN2 3RL, UK

1. Gossler, M. *Nature* **306**, 530 (1983).
2. Stanbury, P. *Nature* **304**, 11 (1983).
3. Maddox, J. *Nature* **304**, 11 (1983).

Inverted logic

SIR — In his comment on perception of relief in micrographs (*Nature* **306**, p.428; 1983), D.J. Cook has fallen victim to the very pitfall he sought to warn against. The replica image he describes as "correctly oriented" is upside down, and it is in fact his "inverted" picture which gives proper perception of relief. Topographical detail in micrographs of this type is "illuminated" not by light but by deposition of an electron-dense metal, usually platinum. In a standard positive photographic print, the custom is to orientate the picture with the direction of metal deposition from the bottom so that black deposits of metal lie below the protruding objects they pile up against, and white shadows are cast above them. The brain will then correctly perceive such objects as projections because it assumes the black deposits to be shadows cast by light from above. If a photographic reversal technique is used to produce a negative print, the white shadows cast by the metal can be turned into black ones. This then enables the picture to be viewed as if illuminated by light, that is, with the direction of metal deposition from the top. In either type of photomicrograph, the key to correct orientation lies in knowing from which direction the metal was originally deposited. This is simply done by reference to in-built markers of known topography, for example, the particles that cover freeze-fractured membranes.

The "series of channels" described by Cook are, in reality, a network of ridges. They come from a tight junction viewed on the half-membrane sheet left attached to the cell's protoplasm after splitting the membrane by freeze-fracture.

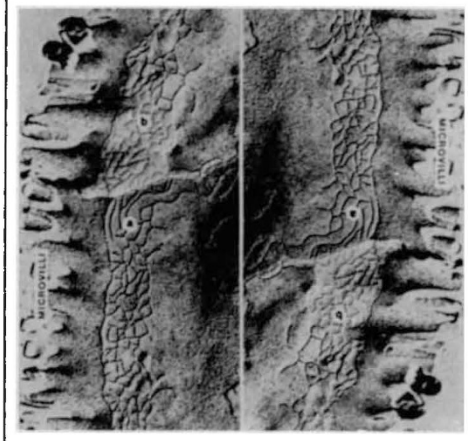
N.J. SEVERS

Cardiothoracic Institute,
2 Beaumont Street,
London W1N 2DX, UK

● D.J. Cooke replies — I accept Dr Severs' comments, which endorse my original point. Several times recently I have been misled or irritated because electron micrographs have been presented in such a way that the immediate percept of relief was incorrect. I therefore sent the letter in the hope that I could influence contributors to *Nature* to orient their electron micrographs in a "top lit" configuration which would elicit the correct perception of surface relief. I feel this would help those who read articles in *Nature* which include electron micrographs but who do not use electron microscopy themselves and I include myself in this category.

The illustration I used was not an original electron micrograph but from a book and was chosen as a good specimen of this particular relief reversal (channel to ridge and vice versa).

It now appears that I inadvertently chose a better example than I previously thought since the original publication was just such



an inverted image. My comments in the letter referred to the orientation as originally published, the left-hand photograph being the same as in the book, as can be seen from the lettering, while the right hand photograph corresponds to the book being inverted.

D.J. COOK

School of Pharmacy,
Portsmouth Polytechnic,
Portsmouth PO1 2DZ, UK

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