to infer a surface geothermal gradient. Their 'geothermal gradient' could only be produced by a sub-crustal heat flow of ~2 HFU (compared with modern values of 0.8 HFU) and no crustal heat production. A model geotherm for uniform distribution of heat production in the Archaean crust, fitting temperatures ~800 °C at 35 km depth, gives a near-surface geothermal gradient of ~40 °C km^{-1} (ref. 4). For a more geochemically reasonable, exponential decrease in heat production with depth in the Archaean crust[5], an even larger near-surface geothermal gradient is obtained. The small amount of data available for Archaean *P–T* relationships suggests a surface heat flow at ~3,000 Myr, between two and three times modern values. This lack of data indicates the most urgent need for geothermal studies in Archaean terrains. Continental heat flow as high as that indicated by *P–T* studies has important implications for both lithospheric thickness and the dynamics of lithospheric motion that may not coincide with uniformitarian hypotheses about island arcs, Benioff Zones and so on, during the early history of the Earth[6].

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1. Burke, K. & Kidd, W. S. F. *Nature* **272**, 240 (1978).
2. Tarney, J. & Windley, B. F. *J. geol. Soc. Lond.* **134**, 255 (1977).
3. Richardson, S. W. *Fortschr. Miner.* **47**, 65 (1970).
4 Drury, S. A. in *Progress in Archaean Geochemistry* (ed. Windley, B. F.) (Elsevier, Amsterdam, in the press)
5 Glikson, A. Y. & Lambert, I. B. *Tectonophysics* **30**, 55 (1976).
6. Drury, S. A. *J. Geol.* **85**, 345 (1977).

BURKE AND KIDD REPLY—We did not intend to suggest that our gradients bore any relationship to near-surface geothermal gradients. It may have been clearer to have termed them average geothermal gradients. Our purpose in quoting these gradients was simply to emphasise that the temperature at the base of the crust (and therefore the contribution to conductive heat flow coming from below the crust) cannot have changed greatly since the stabilisation of the Archaean Superior Province greenstone–granodiorite terrains 2,500 Myr ago, and that this can be inferred from the lack of geological evidence for extensive melting of the lower crust in this and similar regions. Near-surface geothermal gradients are irrelevant to our arguments. We disagree completely that 'Archaean *P–T* relationships', presumably inferred from regional metamorphic mineral assemblages and their distribution, yield any information about the near-surface thermal gradients that existed in areas of Archaean continental crust in stable areas remote from orogenic zones. Such assemblages yield information only on the peak thermal gradients during discrete events of metamorphism and orogeny. Very high, near-surface thermal gradients can be inferred from mineral assemblages in many regionally metamorphosed terrains of post-Archaean age; such thermal gradients are also only valid for the time and place of the orogeny, and contain no information about the near-surface heat flow through stable continental crust elsewhere at that time. Such orogenic and metamorphic events have been restricted to zones of plate convergence or arc/continental collision during the latter half of Earth history, and we see no reason to suppose differently for the Archaean.

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Deutsch's octave illusion

THE controversy over Deutsch's octave illusion can now be resolved. The disagreement was due to a difference in paradigm. Deutsch[1] used a dichotic sequence of 250-ms tones with no gaps between them. The tones were of equal amplitude and alternated in frequency between 400 and 800 Hz. The identical sequence was presented to both ears simultaneously; however, when the right ear received 400 Hz the left ear received 800 Hz, and vice versa. This repetitive sequence was presented continuously for 20 s. In these conditions the majority of listeners heard a single high tone in one ear alternating with a single low tone in the other ear. Further investigation showed that this effect was based on two factors: the following of the sequence of frequencies presented to one ear rather than to the other, and the localisation of each tone towards the ear receiving the higher frequency signal, regardless of which frequency was perceived[2]. Further, right-handed subjects tended significantly to hear the high tone in the right ear and the low tone in the left (indicating a following of the sequence of frequencies presented to the right ear); however, left-handed subjects did not show this tendency.

Christensen and Gregory[3] used a different paradigm. Subjects made pitch and localisation judgments concerning single, isolated dichotic chords. In these conditions neither the localisation effect nor the handedness correlate were obtained. However, Deutsch has shown that the localisation to the higher frequency signal occurs with long, repetitive sequences, and that with short sequences consisting of two dichotic chords localisation patterns closely follow patterns of relative loudness (see ref. 4). Similarly, with long, repetitive sequences the handedness correlate described by Deutsch[1] is a clear and easily demonstrable phenomenon. However, Christensen and Gregory[3] have shown that this does not obtain when judgments are made of single chords in isolation.

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1. Deutsch, D. *Nature* **251**, 307–309 (1974).
2. Deutsch, D. & Roll, P. L. *J. exp. Psychol.* (*Hum. Perception Performance*) **2**, 23–29 (1976).
3. Christensen, I. P. & Gregory, A. H. *Nature* **268**, 630–631 (1977).
4. Deutsch, D. *J. acoust. Soc. Am.* **63**, 184–186 (1978).

Coenzyme A or adenosine inhibiting acetylcholine release?

COOK *et al.*[1] have reported that coenzyme A (CoA) inhibits the release of acetylcholine from autonomic nerves of the guinea pig ileum, and draw a comparison with other adenine derivatives such as adenosine, ATP and AMP which have been previously shown to reduce transmitter release in several tissues[2–4] and are again shown to do so in their report.

However, in building their hypothesis on the role of CoA, the authors fail to discuss the possibility that the CoA added in their experiments may be metabolised to simple purine derivatives such as adenosine, which are the active materials. Such a metabolism to adenosine from extracellularly applied ATP, AMP and cyclic AMP seems to occur in other situations in which it has been examined[5,6].

This conclusion is further supported by the author's own observation that theophylline, a known antagonist at the adenosine receptor, would block the effects of all the purine derivatives tested, including CoA.

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1. Cook, M. A., Hamilton, J. T. & Okwuasaba, F. K. *Nature* **271**, 768–770 (1978).
2. Ginsborg, B. L. & Hirst, G. D. S. *J. Physiol., Lond.* **224**, 629–645 (1972).
3. Vizi, E. S. & Knoll, J. *Neuroscience* **1**, 391–398 (1976).
4. Clanachan, A. S., Johns, A. & Paton, D. M. *Neuroscience* **2**, 597–602 (1977).
5. McIlwain, H. *Biochem. Soc. Symp.* **36**, 69–85 (1972).
6. Mah, H. D. & Daly, J. W. *Pharmac. Res. Commun.* **8**, 65–79 (1976).

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