Correspondence

Geophysical Theory

SIR,—May I, while thanking Professor Runcorn for the greater part of his review of the new edition of *The Earth* (*Nature*, **227**, 525; 1970), reply to his critical remarks concerning certain parts of it?

He refers to my "robust prejudices" and states that I indulge in "selection (selective?) quotation". I admit to a prejudice, namely that in an alleged explanation the conclusions should follow from the hypotheses, and that if the hypotheses lead to conclusions different from the facts there is something wrong with them. This prejudice is shared by most scientists.

As for selection, I admit that I have not read everything published in support of continental drift. I think that I have given reasons why the alleged explanation does not explain things that have happened and explains too many things that have not happened. On the other hand, I have not seen any work by a supporter of drift that even mentions that there are difficulties.

From Runcorn's review it would be inferred that I have not treated imperfection of elasticity apart from fracture. Following on the work described in the book (p. 331 *et seq*.) Crampin and I[1,2] have recently published further work, and the form that we find forbids convection and continental drift. It gives quantitative explanations of facts far beyond the original data. Most seismologists concerned with damping use a law that departs even more than ours from one type that permits convection.

Since the final proofs were passed, there have been extensive and severe criticisms of continental drift from the geological point of view by Meyerhoff[3] and Biswas[4].

Yours faithfully,

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[1] Jeffreys, H., and Crampin, S., *Mon. Not. Roy. Astron. Soc.*, **147**, 295 (1970).
[2] Jeffreys, H., *Nature*, **225**, 1007 (1970).
[3] Meyerhoff, A. A., *J. Geol.*, **78**, 1 (1970).
[4] Biswas, B., *Rising Continents, Deepening Oceanic Basins, and their Changing Configuration* (B. Biswas: Calcutta, 1970).

Wayward Bacterium

SIR,—Permit me to call to your attention evidence of a misconception on the part of your writer responsible for the article "Lunar Bacteriology—Bacillus by Rocket" (*Nature*, **226**, 1000, 1970). The question is asked, "But how did the bacterium escape through the tight sterility net applied to all extraterrestrial space missions?"

Early in the decade of the 1960s there was concern for terrestrial contamination of the Moon; but as the matter was studied, it became apparent that, though terrestrial life might survive on the Moon, it could not multiply in that adverse environment, and it could therefore be no threat to lunar life if it existed. Subsequently the only biological constraint on lunar missions has been the expressed opinion of the International Committee on Space Research (COSPAR) that careful sterilization is desirable for drills designed for deep lunar subsurface boring. NASA has gone one step further, however, and on the basis of a recommendation by the Space Science Board of the National Academy of Sciences has kept its lunar landing hardware as biologically clean as was practical. This action resulted in approximately 5×10^6 viable spores being aboard Surveyor 3 at the time of launch, as compared with 1×10^8 to 1×10^9 spores for a spacecraft assembled without cleanliness controls.

In contrast is the constraint placed on planetary missions. COSPAR has recommended that launching states assure that there shall be only one chance in one thousand of contaminating a planet deemed important for the investigation of extraterrestrial life during the period of biological exploration. NASA has closely adhered to this requirement by biasing the trajectory of non sterile flyby missions away from the planets sufficiently so that the probability of direct impact is very small and no ejecta can reach the atmosphere. When missions are launched to land capsules on Mars, those parts of the missions intended to land on the planet's surface will be sterilized to the extent that they will have a probability of less than 1×10^{-3} of contaminating the planet.

The United States is very aware of and is actively engaged in meeting its responsibility to protect the planets from biological contamination carried on its spacecraft. Its responsibilities with regard to the Moon have been more than met.

Yours faithfully,

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French Nuclear Tests

SIR,—The welfare of South Pacific communities is increasingly at risk in the face of relentless testing of nuclear weapons in French Polynesia. Public outcry in Europe prevented France from continuing her test programme in Algeria. However, the protesting voices of small South Pacific governments have been ignored.

We are faced with increasing evidence of the hazards of uncontrolled radioactivity. While the extrapolations of Sternglass[1] may overstate the threat, we cannot be complacent. Similar, more moderate, warnings by Gofman and Tamplin[2] and others on the dangers of the infamous "permissible" level of radiation are generally accepted in the scientific community.

While the lasting danger to the people of the South Pacific lies in a general atmospheric contamination which will be shared, to an extent, with the rest of the world, a more immediate threat exists from contaminated fish. Certain of the large migratory fish such as tuna might feed on smaller fish dependent on heavily contaminated plankton drifting from the test area. Such deadly migratory fish could turn up in catches all over the Pacific.

Coral reef organisms have a great capacity for concentrating radionuclides. Data of Odum and Odum[3] show a thousand fold concentration in coral. Molluscs also are notoriously efficient concentrators of radionuclides and these organisms constitute a major part of the diet of South Pacific Islanders.

The French Defence Minister, M. Debré, while in Tahiti recently, had the audacity to say that atomic scientists had "proved that the nuclear tests left no radioactive contamination in the area". British, New Zealand and