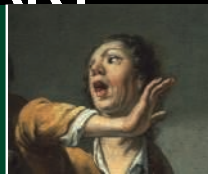

LETTERS

edited by Etta Kavanagh

The Israeli-Palestinian Science Organization

ON THE OCCASION OF THE NOVEMBER 2006 ANNUAL MEETING OF THE ISRAELI-PALESTINIAN Science Organization (IPSO), we, the members of IPSO's International Scientific Council, noted with considerable satisfaction the receipt of 71 proposals for joint scientific research between Palestinian and Israeli scientists, engineers, health professionals, and scholars who wish to work together.

In addition to its goal of promoting and funding joint research, IPSO encourages and supports quality education of Palestinian students and researchers—an essential element in securing a stable and economically viable society. Because of its desire to create a science-based bridge of good will, cooperation, and dialogue, IPSO joins Israeli university rectors and professors in opposing the ban that prohibits residents from the Palestinian Authority (PA) areas from entering Israel to study or to reach educational institutions in PA areas. We also call on the Israeli security authorities to allow, on an individual basis, academically qualified students to study in Israel.

"We must actively promote favorable conditions for all to meet and work together in a safe, equitable, and productive environment."

—Wiesel *et al.*

IPSO endorses the 31 October 2006 statement by the Council of the Israel Academy of Sciences and Humanities that calls on the Israeli government to "refrain from instituting any policy that hinders any group of scientists or academics, whether Palestinian or otherwise, from properly discharging their academic responsibilities."

Lastly, we urge the international scientific and scholarly community to support IPSO's goals of promoting high-quality research, advancing training in all areas of science and learning, and forthrightly opposing obstructions to academic freedom worldwide, including boycotts, moratoria, and arbitrary or sweeping access restrictions on students and academics to universities and research institutions. We must actively promote favorable conditions for all to meet and work together in a safe, equitable, and productive environment.

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Another Nail in Which Coffin?

A RECENT REPORT "VOLCANISM IN RESPONSE to plate flexure" by N. Hirano *et al.* (8 Sept., p. 1426) on small-volume volcanoes located far from plate boundaries and the related Perspective by M. McNutt "Another nail in the plume coffin?" (8 Sept., p. 1394), which casts this contribution in the context of the ongoing plume controversy, have inspired us to comment. Hirano *et al.* begin with the claim that "[v]olcanism on Earth is known to occur in three tectonic settings: divergent plate boundaries…, convergent plate boundaries…, and hot spots," followed by "Without the presence of a hot spot, new volcanism is not anticipated." They go on to show that plate flexure can induce fracturing and small-volume volcanism, which is unlikely to be related to any "mantle plume." The tenor of McNutt's Perspective is that this constitutes a victory in the ongoing battle against the hypothesis that volcanoes at hot spots are caused by jets of hot material (plumes) rising from the deep mantle ("It is thus with much kicking, dragging, and screaming that geoscientists are being brought to the realization that all might not be well with the concept of mantle plumes"). Actually, small-volume, within-plate volcanism isn't exactly news. There is a wealth of well-established knowledge about three types of within-plate, often alkalic volcanism that cannot directly be caused by deep mantle plumes: (i) tens of thousands of small volcanic seamounts (*1*, *2*); (ii) the 1600-km-long chain of oceanic and continental volcanoes known as the Cameroon Line, which shows no detectable time progression of eruptions and has long been discussed as a "hot line," not a plume (*3*); and (iii) volcanism associated with continental (and oceanic) rifts not related to plate boundaries. The discovery of another line of small alkalic seamounts not caused by a hot spot or a plume is neither new nor surprising. And the suggestion that this constitutes a "nail in the plume coffin" merely obfuscates the plume debate.

The basic rules of geochemistry tell us that high enrichments of incompatible trace elements found in alkali basalts require low degrees of melting; such melts are hardly a surprise in regions of thick oceanic lithosphere. Whether the volcanism itself is triggered by a mantle plume or a fracture in the lithosphere is a separate question. The observation that fractures can and do trigger volcanism is not an argument against deep-mantle plumes, any more than confirmation of mantle plumes, for example, through seismic tomography (*4*), could be an argument against fracture-related volcanism.

The question of whether deep-mantle plumes exist is too important to our understanding of mantle dynamics to be addressed in this fashion. Instead, let's look at those volcanic features where a plume mechanism actually makes some geological sense and investigate those. We suspect that geochemistry will not deliver the silver bullet for proving or disproving plumes. Rather, we suspect that when the dust has settled over the mapping of plumes with seismic tomography, we will come to a consensus over the question of whether the Hawaiian hot spot, for example, is caused by a plume. Evidence from small seamounts seems completely irrelevant to this debate.

So before we nail any more coffins, let's first be sure that there is a body to be buried.

ALBRECHT W. HOFMANN[1] AND STANLEY R. HART[2]

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Response

WE FOUND YOUNG ALKALIC VOLCANOES, NOT older than 1 million years, on the edge of 135-million-year-old oceanic crust in the Northwest Pacific, where it is subducting into the Kuril and Japan trenches. These volcanoes are closely associated with the occurrence of extensional cracks in the flexed parts of the subducting Pacific Plate, allowing small amounts of partial melts to find their way to Earth's surface from the shallow asthenosphere. Because of their small volume, we named these volcanoes petit spots, which should not be confused with hot spot volcanism.

Hofmann and Hart fittingly note that McNutt's Perspective stretches her interpretation of this new type of within-plate volcanism too thin, by linking it to the heated debate on the existence of mantle plumes and the formation of the major hot spot trails, like Hawaii (*1*, *2*). We agree with Hofmann and Hart that the discussion of the petit spot model should be divorced from the ongoing mantle plume debate. Instead, we emphasize the unique tectonic settings in which the petit spot volcanoes are formed.

Other types of non–plume-related volcanism have been recognized to exist close to the midocean spreading centers, in continental rifts, and maybe in some seamount trails, like the Cameroon Line. However, none of these volcanoes were formed at locations far away from spreading centers, hot spots, or, more generally, areas of thermal upwelling. Whereas small off-axis seamounts (*3*–*5*) are easily explained by the faulting and thermal contraction of juvenile oceanic crust during seafloor spreading, the formation of young volcanoes on oceanic crust older than 100 million years is rather uncommon and remained undiscovered until we recognized the petit spots on the oldest part of the Pacific Plate. These volcanoes have geochemical signatures that are characterized by highly alkaline major element compositions, highly enriched incompatible elements, and degassed noble gas isotope ratios. These characteristics suggest a low degree of partial melting in combination with an origin in the shallow upper mantle, about 95 km deep.

The petit spots thus should be accepted as a new type of within-plate volcanoes that are not fed by large-scale thermal upwellings or mantle plumes. However, it also is a rather uncommon type of volcanism, which only represents a minute fraction of the total volcanic output in the ocean basins. As Hofmann and Hart argue, this type of volcanism is entirely unrelated to the processes that may form the voluminous Hawaiian seamount trail. In fact, the petit spots can be entirely explained by the bending and cracking of the subducting Pacific Plate, which is a rather unique situation and may only be reserved for oceanic crust that is located close to a convergent plate boundary.

NAOTO HIRANO AND ANTHONY A. P. KOPPERS

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Response

I AGREE COMPLETELY WITH HOFMANN AND Hart that a nonplume origin for young volcanoes seaward of the Japan trench cannot be used to argue that plumes do not exist anywhere. As they point out, Earth is rife with examples of nonplume volcanoes that form along suspected fractures away from plate boundaries. What is unusual in this particular case is that, in addition to the fracturing mechanism being well constrained rather than just "surmised," small volumes of melt penetrated a very thick plate above a region of large-scale downwelling, all features that are the antithesis of what is expected from plume theory. The existence or nonexistence of plume-type transport of heat and mass bears on the rheology of Earth's mantle, thermal and chemical layering in the interior, mixing rates of geochemical heterogeneities, the energy budget of the geodynamo, and other properties that are difficult to assess deep within this dynamic planet. Indeed, high-resolution seismic imaging holds the best hope for settling this debate. However, further gains in resolution at the scale needed to resolve plumes require filling in the very large gaps in network coverage in the ocean basins with seismic receivers, one of the goals of the Ocean Observatories Initiatives of the U.S. National Science Foundation. Recently, concerns over the cost of installing and maintaining deep-water open-ocean seismic observatories have led to a reduction in the plans for filling in these gaps. Sadly, unless some new source of funding or more affordable technology can be found, 10 years from now, our "patient" might still be lying on life support.

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Chemistry Nobel Rich in Structure

THE 2006 NOBEL PRIZE IN CHEMISTRY, awarded to Roger Kornberg for the structure and understanding of RNA polymerase ("Solo winner detailed path from DNA to RNA,"

R. F. Service, News of the Week, 13 Oct., p. 236) (*1*), marks the latest in a long line of Nobel Prizes awarded in the area of macromolecular structure analysis.

It is interesting to consider how the selection of Nobel Prizes over the past few decades reflects our fascination with the structure of biomolecules.

In particular, there were 12 Nobel Prizes in chemistry and physiology or medicine awarded for work in this field from 1956 to 2006 (table S1) (*2*). Almost one in four chemistry prizes since 1956 have been for structure work, and in the last decade, fully half have dealt with work related to macromolecular structure.

Because many of these prizes were awarded for fairly recent work, we can compare their subjects to those in the scientific literature as represented in publication databases.

We examined the relative abundance of papers dealing with "protein conformation" and its subset, "crystallography," by measuring the number of records matching these Medical Subject Heading (MeSH) terms in PubMed for each year from 1970 to the present (table S2) (*2*). (We assumed that the sum total of PubMed publications bearing the chemistry MeSH term represent the corpus of work eligible for a Chemistry Nobel.) From 1970 to 2006, 4% of all chemistry publications dealt with crystallography, yet this subfield captured 19% of the available Nobel Prizes (table S3) (*2*). During the past decade, crystallography papers represented 7% of all chemistry publications, but commanded 4 of 10 available prizes. Even the much broader category of protein conformation displays two-fold "Nobel enrichment" in both year ranges. Overall, the Nobel Prizes in chemistry are noticeably enriched for work in macromolecular structure determination.

Macromolecular structure determination is a potent tool to understand biological systems and periodically yields landmark results that impact the scientific community at large. It would also seem that the surest road to Stockholm is through a crystal tray.

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2. See Supporting Online Material available at www.sciencemag.org/cgi/content/full/315/5808/40/DC1.

CORRECTIONS AND CLARIFICATIONS

Random Samples: "Demise of a blimp" (3 Nov. 2006, p. 735). The subject of this item, the USS *Macon*, was misidentified as a blimp. It is a dirigible.