Retraction

IN OUR REPORT “X-ray fluorescence spectrometry of asteroid Itokawa by Hayabusa” (1), we analyzed the major elemental ratios of asteroid 25143 Itokawa with the x-ray spectrometer (XRS) onboard the Hayabusa spacecraft. We used an improper analytical procedure, which resulted in erroneous identification of x-ray fluorescence peaks and statistically insignificant conclusions. Therefore, we retract the paper.

Our XRS team confirmed that our original analysis was inaccurate in parallel with both the steering committee of the Institute of Space and Astronautical Science, Japan Aerospace Exploration Agency, and an investigation team appointed by the institute.

Figure 1 of our Report shows the x-ray spectrum, which is fitted with some x-ray fluorescence peaks and continuum components. The figure shows the smoothed data. The smoother x-ray spectrum was used in the model fitting (statistical analysis). We should have used the raw data and examined it in detail before proceeding to the modeling.

In our data analysis, x-ray photon energy calibration (relation of detector channel number to x-ray photon energy) was conducted using the observed data, because the instrument had no onboard calibration source, such as 56Fe radioactive nuclide. The observed raw data was smoothed to identify the expected x-ray fluorescence peaks effectively. In the smoothed profile, we detected two apparent intense peaks. We erroneously identified the peaks as the anticipated x-ray fluorescence of Mg and Si.

The energy calibration formula we obtained differed from the formula we had obtained in our pre-flight ground testing; we attributed the difference to a drift of the XRS instrument parameters due to temperature variation of the instrument. However, recent detailed investigation of the past data shows that it is more appropriate to adopt a different formula for the energy calibration. Furthermore, the peak we identified as the x-ray fluorescence of Mg is likely to be an artificial peak from the instrument. Thus, the x-ray photon energy axis of Figure 1 was incorrect.

Our reinvestigation revealed another error. In the model fitting to obtain the major elemental abundance ratio of the target asteroid Itokawa, we analyzed the smoothed data, not the raw data, which resulted in inflated statistical significance. In a properly done elemental analysis, the signal-noise ratio is too low to support our conclusion of chondritic elemental abundance.

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REFERENCE


Livestock crucial in hunger equation

THE EDITORIAL “Zero hunger” by M. S. Swaminathan (1 August, p. 491) rightfully points out the importance of family farms and the need to shift the focus of tackling global hunger from food security to nutrition security. However, his description of a family farm limited to crops to support nutritional security is incomplete.

Family farms or farms operated by small holders represent most of the agriculture in developing countries. In addition to crops, livestock play a substantial role in improved nutrition, food, and economic security and resilience on small farms (1). Globally, meat, milk, and eggs currently provide nearly 13% of the energy and 28% of the protein consumed (2). Furthermore, the “livestock revolution”—the massive recent increase in meat consumption in developing countries (3)—is being driven by higher demand, which is expected to more than double in developing countries by 2050 and to expand almost fourfold in sub-Saharan Africa (4). In addition to high levels of energy and protein, animal source foods provide essential amino acids and many micronutrients and vitamins, all of which contribute to the high-quality diet that is critical for maternal health and children’s growth and learning (5, 6).

Most food-insecure people live in South Asia and Africa, where livestock make huge net contributions to human nutrition by converting nonedible feed such as grass, crop residues, and waste products into valuable animal protein. Livestock’s contribution goes beyond food; animals provide draft power for cropping, which helps farmers increase the amount of land under cultivation, and manure to restore soil fertility (7). Moreover, for most of the rural poor, livestock represent resilience and are often the only form of currency available to trade for needed food, school fees, and medical costs.

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Ancient trade between India and Indonesia

IN HIS NEWS FEATURE “Sailing Sinbad’s seas” (27 June, p. 1440), A. Lawler describes the development of the Indian Ocean trade from the 5th century B.C.E. to the 8th century C.E. The map (p. 1441) indicates that Indonesia and Island Southeast Asia joined these networks in the 8th century C.E. Archaeological data from the islands of Bali, Java, and Sumatra show that sea trade in this region began 900 years earlier.

Excavations at the late prehistoric sites of Sembiran and Pacung on the northern coast of Bali (1, 2) have produced high counts of fine Indian pottery with specific parallels from the 2nd and 1st centuries B.C.E. in India, Sri Lanka, as far west as the Red Sea in Egypt (3, 4), and in Southeast Asia, including peninsular Thailand (5), the Indonesian island of Java (6), and Vietnam (7).

Simultaneous contacts with India and mainland Southeast Asia some 2000 years ago have been documented since the first excavations at Sembiran and Pacung, and 2nd century B.C.E. to 1st century C.E. dates were later obtained from Pacung burials (8, 9). (My team’s recent excavations seem consistent with these results.) These dates match the 2nd century B.C.E. to 3rd century C.E. dating of burial layers containing fine Indian pottery at the site of Batujaya in northwestern Java (6).

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