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### Searching for life

The article on the search for life elsewhere in the solar system ("C'est la Vie," SN: 11/1/97, p. 284) cites three essentials for life's advent: organic compounds, liquid water, and a source of energy. It fails to mention other elements, such as phosphorus.

Phosphate, which is made up of oxygen and phosphorus, is needed for making adenosine triphosphate (ATP), a molecule that conveys the chemical energy whose flow keeps us (and all other organisms) alive.

No substitute for ATP is known to exist or thought to be possible. Thus, it seems surprising that the search for signs of extraterrestrial life apparently has not yet looked for telltale traces of phosphorus in planetary rocks or meteorites.

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*According to David J. Des Marais of NASA, the essentials for life are basically liquid water, energy, and nutrients. "Nutrients" means all of the elements, phosphorus included, needed to construct cellular life. That's a bit different from what one looks for in extraterrestrial samples as evidence of life. That search includes morphological evidence (individual fossil cells or features built by microbial communities), chemical evidence (certain classes of organic compounds being the most diagnostic), mineralogical evidence (including apatite, a phosphorus mineral), and stable isotopic evidence. The mere presence of phosphorus is not evidence of life. —R. Cowen*

### Ancient toupee?

Before applying a skin graft, surgeons often pass it through a device that scores the graft in a regular pattern, creating a mesh. When stretched, this lattice significantly improves both coverage area and "take" and bears a striking resemblance to the "crisscross design made of collagen" which decorates

the Nahal Hemar skull in the photograph accompanying "Ancient adhesive surfaces in Israeli cave" (SN: 11/1/97, p. 279).

As an animal pelt prepared in this fashion would make a fine head of hair for an ancestor's skull, perhaps the application of a post-mortem toupee accounts for the mysterious cross-hatching, whose position on the photographed skull is fairly consistent with that interpretation. The raised collagenous pattern may derive from an adhesive applied to the inner surface of the meshwork or, indeed, from the pelt itself, wetted, stretched, and bonded with heat pressure.

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**Cover:** These glass beads are just a portion of the 200 tons of frontier-bound cargo recovered from the steamboat *Arabia*, which sank in 1856. The ship and its treasure—the largest collection of pre-Civil War artifacts—were excavated from beneath a Kansas cornfield in 1988. Page 24  
(Photo: *Arabia* Steamboat Museum)

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