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### Featured in Physics

## Record of Cycling Operation of the Natural Nuclear Reactor in the Oklo/Okelobondo Area in Gabon

A. P. Meshik, C. M. Hohenberg, and O. V. Pravdivtseva  
 Phys. Rev. Lett. **93**, 182302 – Published 27 October 2004


<http://physics.aps.org> See Focus story: [The Pulse of a Nuclear Reactor \(http://link.aps.org/doi/10.1103/PhysRevFocus.14.18\)](http://link.aps.org/doi/10.1103/PhysRevFocus.14.18)



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**ABSTRACT**

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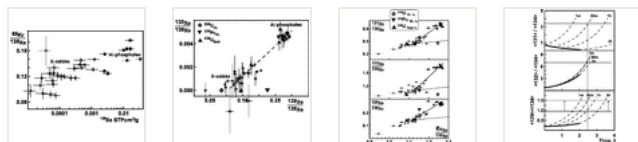
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### ABSTRACT

Using selective laser extraction technique combined with sensitive ion-counting mass spectrometry, we have analyzed the isotopic structure of fission noble gases in U-free La-Ce-Sr-Ca aluminous hydroxy phosphate associated with the 2 billion yr old Oklo natural nuclear reactor. In addition to elevated abundances of fission-produced Zr, Ce, and Sr, we discovered high (up to  $0.03 \text{ cm}^3 \text{ STP/g}$ ) concentrations of fission Xe and Kr, the largest ever observed in any natural material. The specific isotopic structure of xenon in this mineral defines a cycling operation for the reactor with 30-min active pulses separated by 2.5 h dormant periods. Thus, nature not only created conditions for self-sustained nuclear chain reactions, but also provided clues on how to retain nuclear wastes, including fission Xe and Kr, and prevent uncontrolled runaway chain reaction.



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## Physics FOCUS



[The Pulse of a Nuclear Reactor \(http://link.aps.org/doi/10.1103/PhysRevFocus.14.18\)](http://link.aps.org/doi/10.1103/PhysRevFocus.14.18)

Published 3 November 2004

Two billion years ago, a naturally occurring nuclear reactor cycled on and off every 3 hours, according to clues from xenon isotopes.

See more in *Physics* (<http://physics.aps.org/>)

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## Editorial

[A Decade of Editors' Suggestions \(/prl/edannounce/10.1103/PhysRevLett.118.030001\)](/prl/edannounce/10.1103/PhysRevLett.118.030001)

January 17, 2017

Lead Editor Hugues Chaté discusses why PRL highlights papers as Editors' Suggestions and how Suggestions are picked.

## Collection

[Heating up of Superconductors \(/prl/heating-up-of-superconductors\)](/prl/heating-up-of-superconductors)

January 27, 2017

This collection marks the 30th anniversary of the discovery of high-temperature superconductors. The papers selected highlight some of the advances that have been made to date, both in understanding why these compounds behave in the way they do, and in utilizing them in applications. The papers included in the collection have been made free to read.

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