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Medical Imaging of Hyperpolarized Noble Gases: Perspectives and prospects at the quarter- century mark

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The first biological magnetic resonance images of laser-polarized xenon-129 were published in 1994, in a seminal paper in Nature. In addition to the first proof-of-concept images in a mouse lung, this paper presented a variety of advanced human imaging possibilities ranging from simple ventilation imaging in the lung to dissolved-phase imaging of xenon-129 in the brain. Almost 25 years later, nearly all the originally predicted capabilities of xenon-129 and helium-3 MRI have been fully realized, at least on the technical side. However, adoption of these techniques by medical practitioners has been painfully slow. Hyperpolarized-gas MRI is still not FDA-approved in the United States, not due to any deficiency in the quality of the obtainable information but rather in its usefulness for informing decisions about medical care. This talk will discuss the past history and future prospects for medical imaging of inhaled hyperpolarized gases, from the perspective of a trained nuclear physicist now working in medicine.

Primary author: Prof. MILLER, Wilson (University of Virginia)

Presenter: Prof. MILLER, Wilson (University of Virginia)

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