

## REFERENCES AND NOTES

1. J. L. Marshall and V. R. Marshall, "Ernest Rutherford, the 'True Discoverer' of Radon," *Bull. Hist. Chem.*, **2003**, 28, 76-83.
2. M. F. Rayner-Canham and G. W. Rayner-Canham, *Harriet Brooks—Pioneer Nuclear Scientist*, McGill-Queen's University Press, Montreal, 1992.
3. E. Rutherford, "A Radio-active Substance Emitted from Thorium Compounds," *Philos. Mag.*, **1900**, 49, 1.
4. E. Rutherford and H. T. Brooks, "The New Gas from Radium," *Trans. R. Soc. Canada*, **1901**, Section III, 21.
5. E. Rutherford, "Emanations from Radio-active Substances," *Nature*, **1901**, 64, 157.

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## RESPONSE TO RAYNER-CANHAM LETTER

Marlene Rayner-Canham includes an added dimension to the discovery process of radon in Rutherford's laboratory. The question is raised whether the actual discovery date should be earlier. We have found that identifying "the" discovery date of an element can be difficult, owing to uncertain criteria for the elements previous to modern times; this was briefly discussed in the beginning of our article. V. Karpenko (*Ambix*, **1980**, 27, 77-102) discusses this matter more fully and cites E. Rancke-Madsen (*Centarus*, **1976**, 19, 299), who suggests two criteria to be an "effective discoverer of an element," the first being the observation of a new substance recognized as being elemental (but may be in combination or may be impure), and the second being the announcement (publication or even professional lecture) of this discovery so that it has been noticed by persons outside the immediate circle. On this basis we

would tend to adhere to the "official" dates given in our article. (As we have noted in our article, we had contacted IUPAC, which has no official standing regarding the "true discovery of elements" except for the recent artificial elements.) However, we completely agree that the first recognition of a new element may precede the "official" date. Notable examples include einsteinium (whose first detection in a nuclear detonation was kept secret for a period of time) and oxygen (which was discovered by Scheele probably even before his work in Uppsala, actually during his previous stay in Stockholm). The Rayner-Canhams' excellent comments remind us that the "discover" phenomenon is a dynamic and unfolding process, and they breathe additional insight into the discovery process of radon in the laboratory of Rutherford. December 6, 2003.

*James L. Marshall and Virginia R. Marshall*

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