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Radiogenic isotope: not just about words

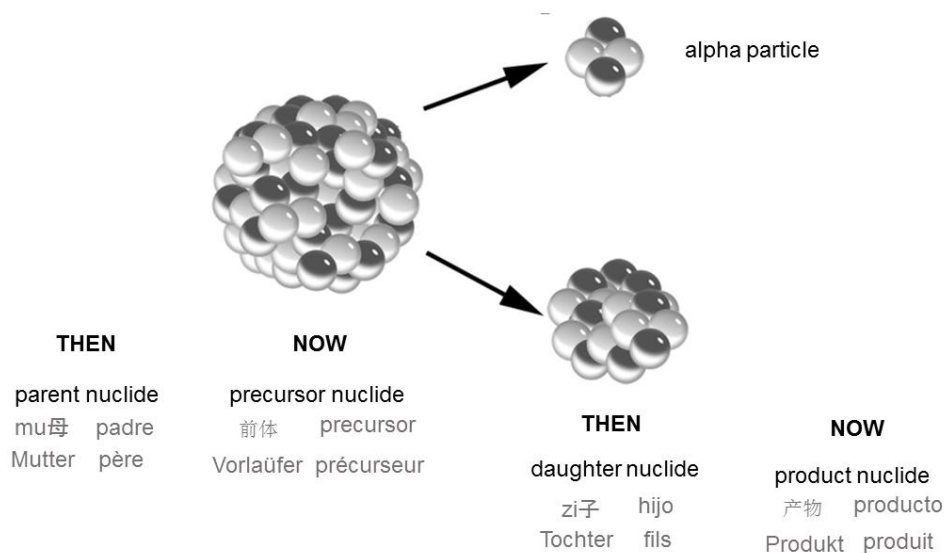
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Do you know an inclusive terminology for the product which remains after an original isotope has undergone radioactive decay? Historically, we used parent/daughter in English, père/fils (father/son) in French, mu母/zi子 (mother/son) in Chinese, padre/hijo (father/son) in Spanish, Mutter/Tochter (mother/daughter) in German... Some people also used parent/progeny.

Even if style guides from journals discourage the use of gender-specific language, we still see the use of these anthropomorphic words for radiogenic isotope description in many articles and textbooks and still use them in our class.

This problem was already raised by Martin M. Bursey in 1991 who says that:

“Mass spectrometry is not the only discipline that uses daughter to describe the product of a transformation, and indeed the term has been popular for a long time. With the invention of tandem mass spectrometry the related granddaughter ion has been popular, though the phrase is much older. The problem is not a lack of clarity. It is that some mass spectrometrists find it offensive. Whoever continues to use a term after learning that it is offensive is rude. Use product ion.”,

and further questioned by Jeanette Adams in 1992 who wrote:

“Thus, I am surprised that the archaic gender-specific terms “daughter,” “granddaughter,” and “great-granddaughter,” and the anthropomorphic “parent ion” and “progeny fragment ions,” are supported in this compilation. Ions are not members of either the plant or animal kingdoms, and thus they are incapable of either sexual or asexual reproduction. Therefore, they are incapable of being either mothers, fathers, daughters, or sons. They are simply ions, or fragments of ions, or products of ion reactions. They can, however, be related as “first, second, or third generation” because, according to my Webster dictionary, “generation” can describe either persons, animals, or thing.”

Ken-Ichi Yoshino (2007; 2009) further advocated for a change, but it was only in 2013 that the International Union of Pure and Applied Chemistry deprecated these terms in favor of the more descriptive "precursor ion" and "product ion" terms (Murray et al., 2013).

This terminology makes a lot of sense to us and we encourage all the Isotope Geology community to now use them. Applied to radiogenic isotope terminology, the "daughter nuclide" would be the "product nuclide" of a "precursor nuclide". A product ion could go on to be a "precursor ion" of a new "product ion."

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Viewpoints – *Applied Geochemistry*

Olivier Pourret is an associate professor of geochemistry in the Agroecology and Hydrogeochemistry (AGHYLE) group at Institut Polytechnique UniLaSalle, Beauvais (France) since 2007.

His research interests include trace metal fractionation and particularly Rare Earth Elements and cobalt in low-temperature aqueous systems, from rock to water, soil and vegetation.

He advocates for Open Science, just Science done right, and gets involved in various Diversity Equity and Inclusion initiatives, especially fighting against disability discrimination.

He is also an Editorial Board member of *Chemical Geology* since 2017, and *Results in Geochemistry and Geochemical Journal* since 2020. Olivier Pourret is a fellow of the Society of Economic Geologists.

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Karen Johannesson is a professor of geochemistry in the School for the Environment at the University of Massachusetts Boston as well as in the Intercampus Marine Sciences Graduate Program of the University of Massachusetts System. From 2007 to 2019 she was a professor of geochemistry and chemical hydrogeology at Tulane University in New Orleans where she was also the Cochran Family Professor of Earth and Environmental Sciences from 2015 until 2019.

Viewpoints – Applied Geochemistry

Her research focuses on the chemical speciation and biogeochemical cycling of trace elements in the environment. She has worked extensively in groundwater flow systems over the years, and more recently in estuarine and coastal marine systems.

Since 2016 Professor Johannesson has served as an Editor-in-Chief of the journal *Chemical Geology*. She has also served as an associate editor for the journal *Geochimica et Cosmochimica Acta* from 2005 until 2021 and was an associate editor for the *American Mineralogist* from 2014 until 2017. Professor Johannesson is a fellow of the Geochemical Society, the European Association of Geochemistry, the International Association of GeoChemistry, and the Geological Society of America. In 2015 she was awarded the Clair C. Patterson Medal of the Geochemical Society.

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