

# precision isotope ratio measurement

- BIG science (age of solar system, Jurassic era climate, diet of mammoths, global warming etc)
- provenance of food
- doping control
- conflict diamonds / conflict minerals (REE)
- security application (chemical and nuclear forensics)
- adulteration of pharmaceuticals

# fundamental constants and isotopes

- Avogadro constant                      silicon
  - Faraday constant                        silver
  - Boltzmann constant                     argon
  - Water triple point                      O and H
- Etc etc

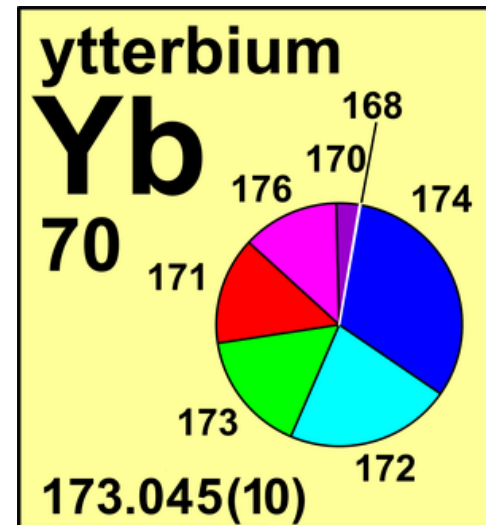
Can CCQM respond to these  
challenges????

# best isotope measurements ever

BAM	cadmium, magnesium
LGC	carbon
NIM China	selenium, ytterbium
NRC	mercury, germanium, indium
PTB	silicon

“...there have only been two calibrated measurements of ytterbium’s isotopic composition since the element was first purified 50 years ago, both of which returned different value

”



# challenges

- In the last decade NMIs invested heavily in stable isotope characterization but there is no coordination
- at CCQM isotope expertise is spread in 3-4 WGs. No critical mass or focus.
- the “light isotope world” is anchored to a constellation of artifacts (CRMs) with ZERO uncertainty not to the SI. (see issues with the kilogram)
- heavy “isotope world” is largely SI traceable however the relative ( $\delta$ ) measurements are over used
- uncertainties of isotopic characterization is often significantly underestimated
- although light and heavy isotope characterization are facing similar metrological challenges there is virtually no crosstalk between these fields.
- apart from measurement challenges the mathematics of handling isotopic measurement data is exceedingly complex. This impacts every discipline which uses mass spectral data.

# opportunities

- start addressing stable isotope characterization issues in a systematic manner:
  - build capacity in this field
  - coordinate and leverage NMI and other stakeholder efforts
  - serve as a resource to other CCs and WGs facing challenges with either isotope related measurements or with associated data handling
  - bring new scientific communities to the SI
  - firm up isotopic abundance/ atomic weight estimates for the most commonly measured elements
  - bring stable isotope characterization under the SI
- establish an ad-hoc WG tasked to develop the terms of reference / strategic plan of a stable isotope WG and present it to CCQM for consideration.