Homage to Becquerel

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Radioactivity: discovered by Herni Becquerel in 1896

Radioactivity materials were used before then:

Uranium glass from the 1830's – popular 1880 – 1920.

Welsbach gas mantle invented in 1891:
99% thorium dioxide, 1% cerium dioxide

Crustal abundances in ppm:

Al: 82,000
Fe: 63,000
K: 20,000 (K^{40}: 2.4)
Th: 8
U: 2
Ag: 0.08
Au: 0.004

Primordial (stellar):

$_{19}K^{40}$ half-life: 1.25 X 10^9 years

0.012% of naturally occurring potassium.
89% of time decay via β– emission to $_{20}Ca^{40}$
11% of time decay via EC to $_{18}Ar^{40}$

$_{90}Th^{232}$ half-life: 1.40 X 10^10 years.

$_{92}U^{235}$ 0.7%, half-life: 7.04 X 10^8 years
$_{92}U^{238}$ 99.3%, half-life: 4.47 X 10^9 years

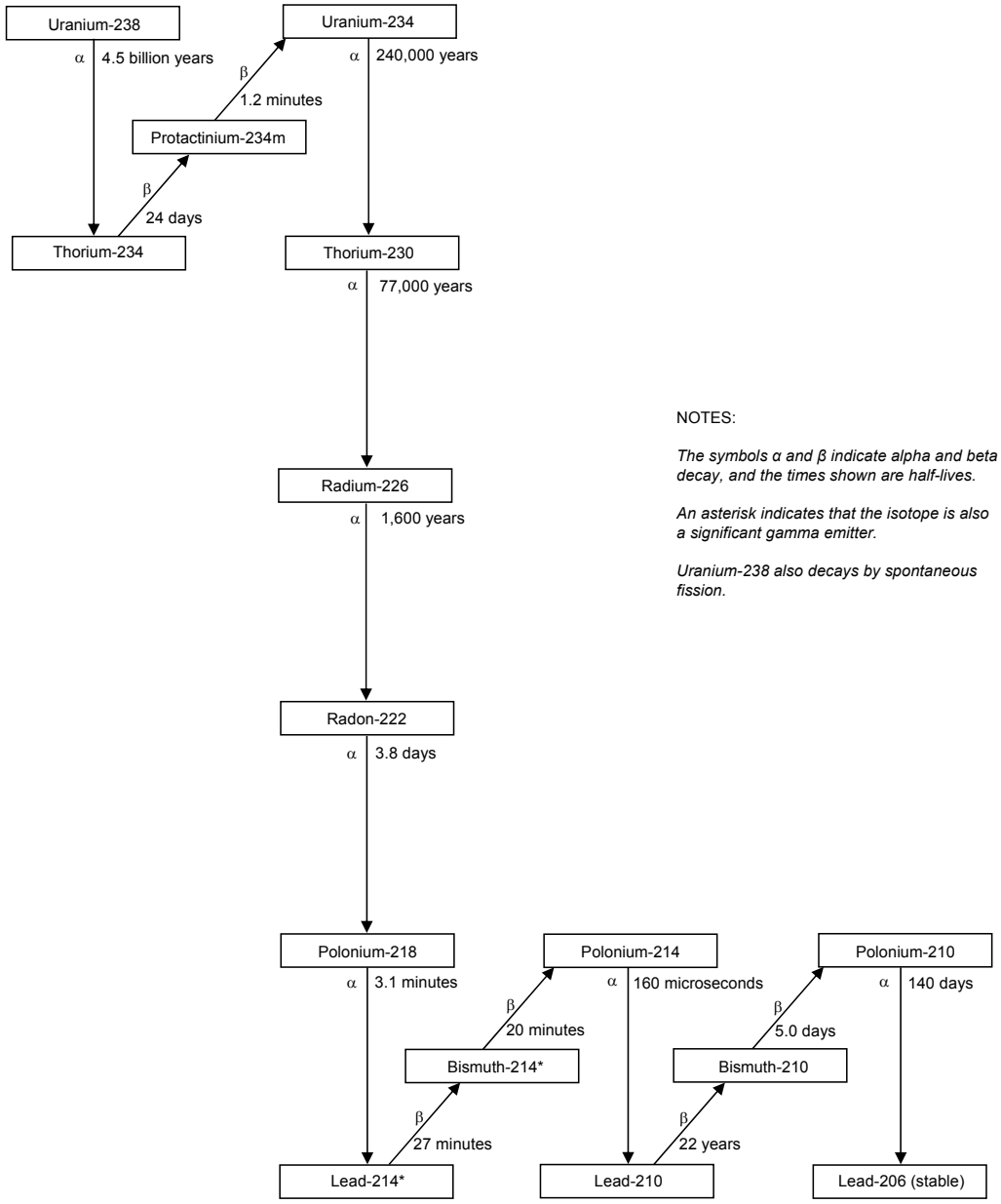
Non-primordial – cosmogenic or decay chains:

$_{6}C^{14}$ 5700 y half life. From cosmic ray interactions.

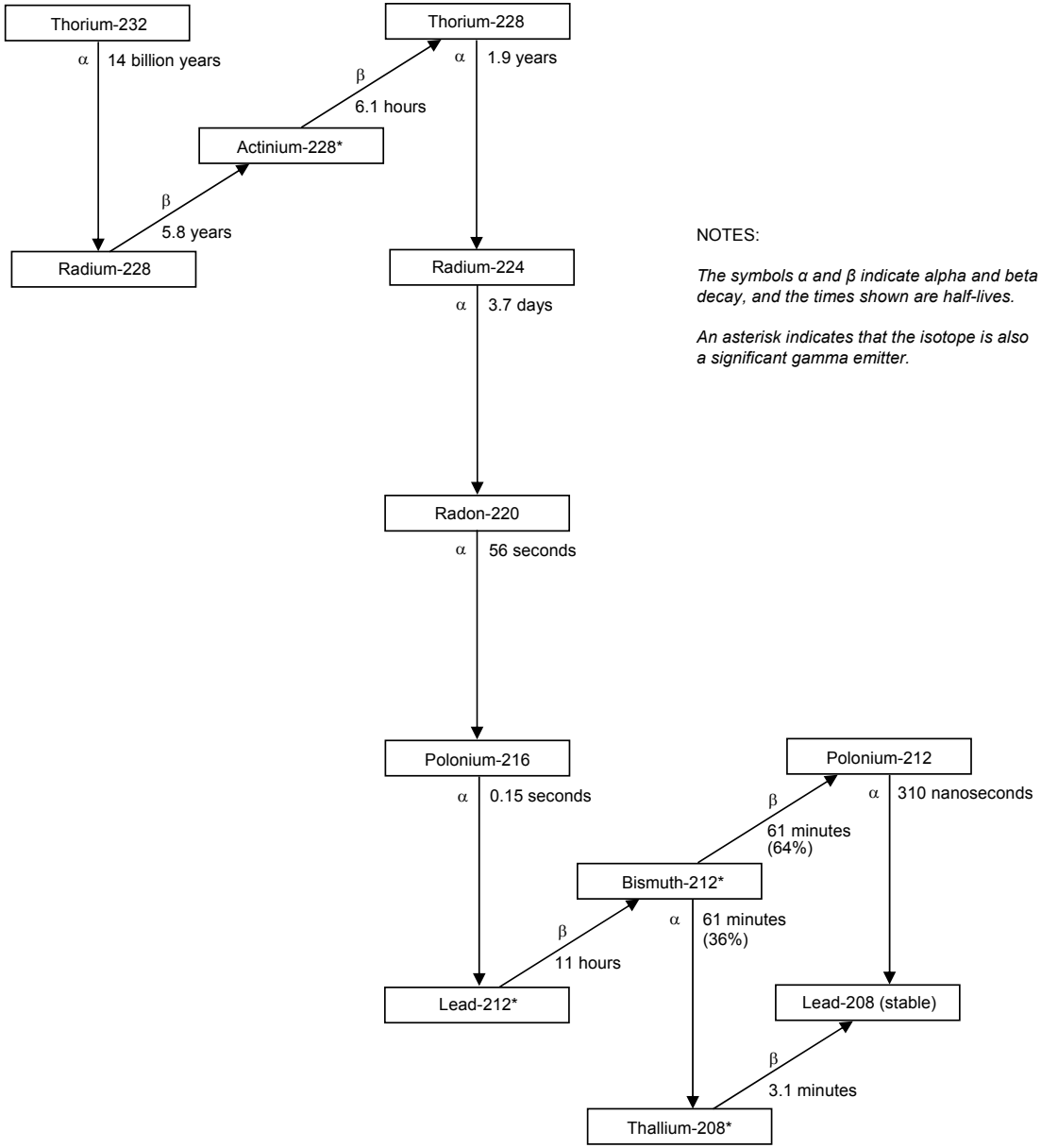
$_{88}Ra^{266}$ 1600 y half-life from decay of $_{92}U^{238}$

$_{88}Ra^{228}$ 5.1 y half-life from decay of $_{90}Th^{232}$

Radium: dangerous: frequently flaking paint. ingestion hazard. Produces radon gas. Radon decays to solids that are radioactive.



Source: Argonne National Laboratory



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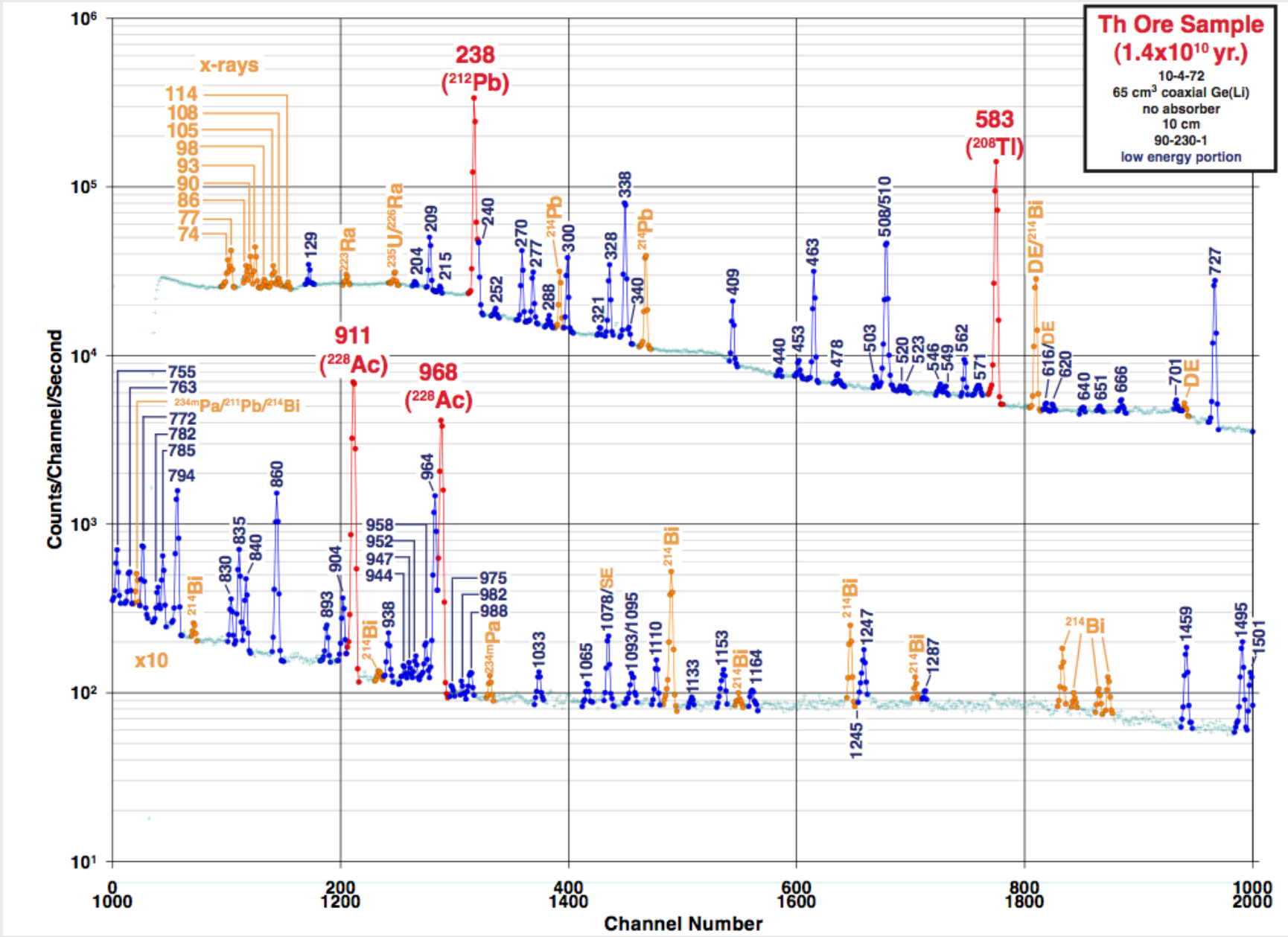
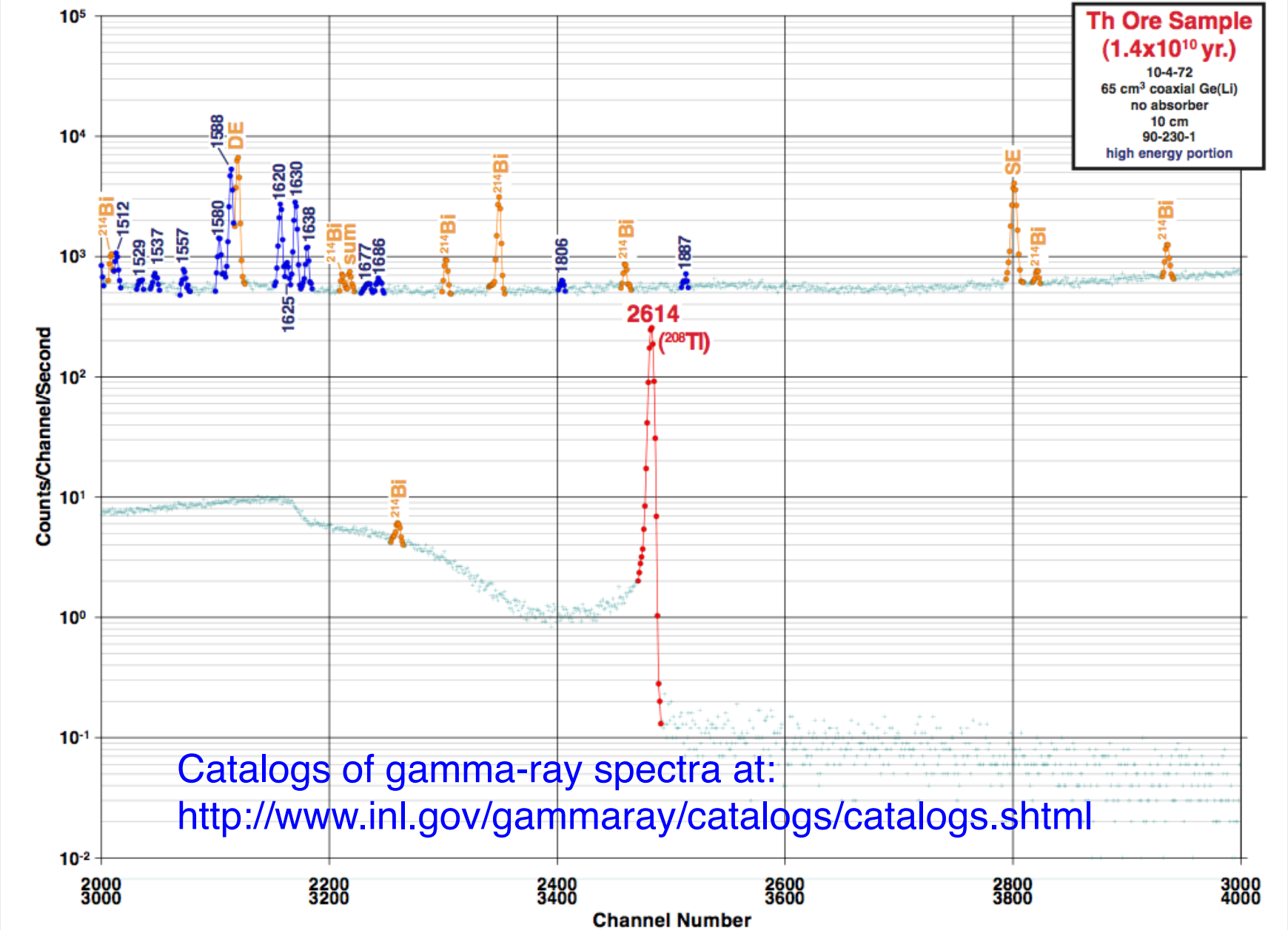

Th Ore Sample
(1.4x10^10 yr.)
10-4-72
65 cm^3 coaxial Ge(Li)
no absorber
10 cm
90-230-1
low energy portion
x-rays
114
108
105
98
93
90
86
77
74
238
(212Pb)
583
(208Tl)
911
(228Ac)
968
(228Ac)
x10
Counts/Channel/Second
Channel Number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Counts/Channel/Second
Channel Number
2614
(208Tl)
214Bi
1512
1529
1537
1557
1580
1588
DE
1620
1630
1638
1625
sum
1677
1686
1806
1887
SE
Catalogs of gamma-ray spectra at:
http://www.inl.gov/gammaray/catalogs/catalogs.shtml