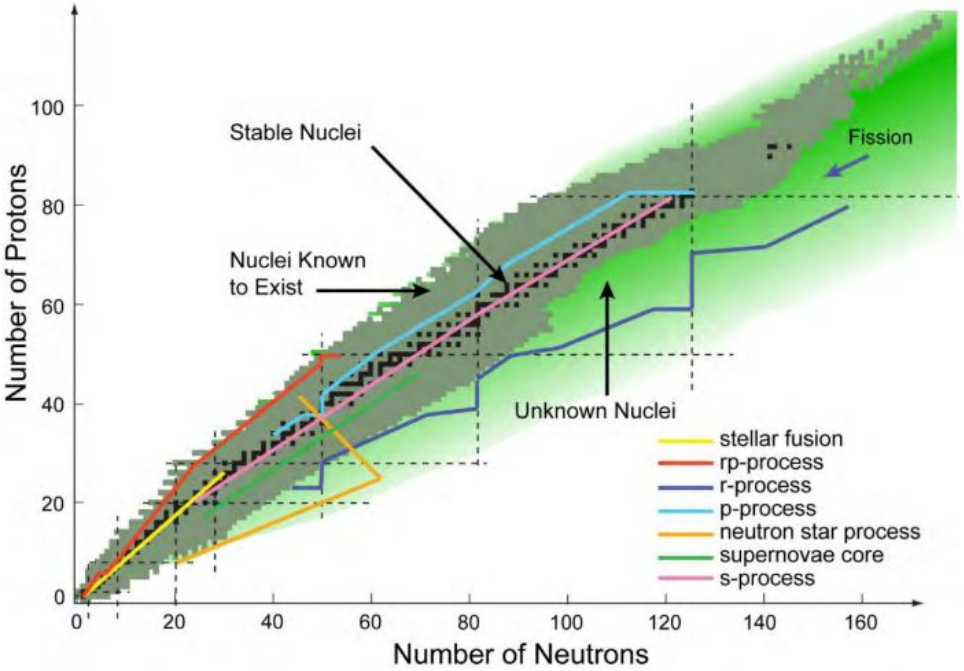
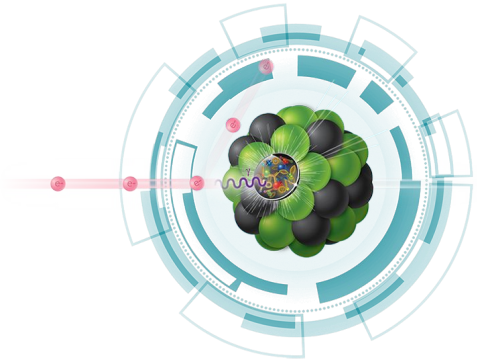
Finding New Isotopes with the EIC

By Zach Finger

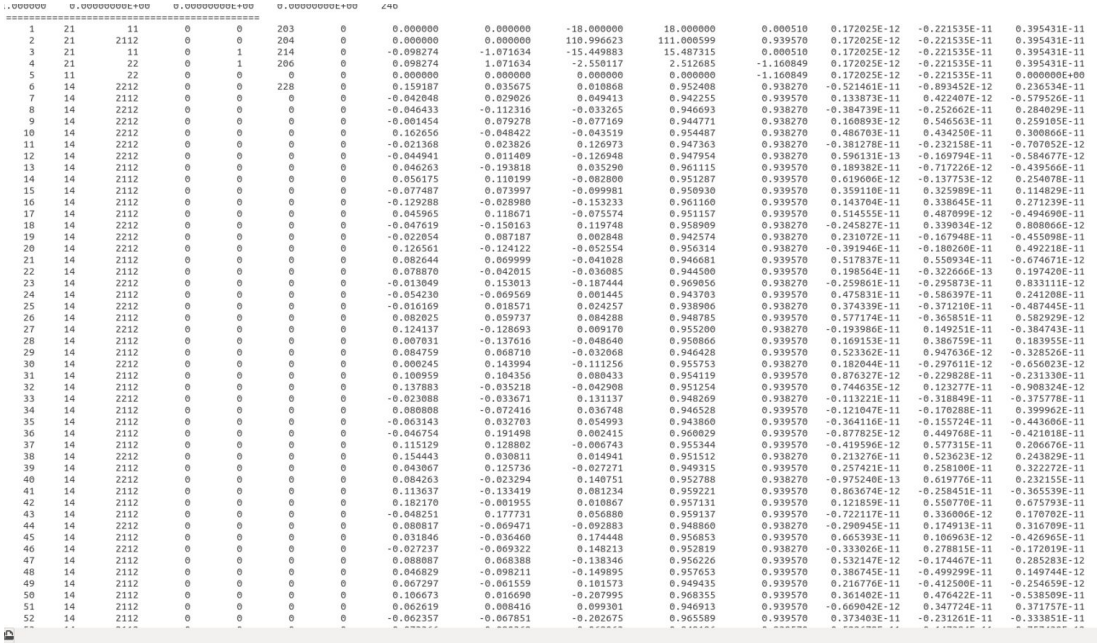
Searching for Nuclei





Setting Up Analysis

- Used BeAGLE data for Gold, Carbon, and Deuteron
- Modified analysis to plot stable, unstable, and all nuclei



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2	21	2112	0	0	204	0	0.000000	0.000000	110.996623	111.006599	0.939570	0.172025E-12	-0.221535E-11	0.395431E-11
3	21	11	0	1	214	0	-0.098274	-1.071634	-15.449883	15.487315	0.000510	0.172025E-12	-0.221535E-11	0.395431E-11
4	21	22	0	1	206	0	0.098274	1.071634	-2.550117	2.512685	-1.160849	0.172025E-12	-0.221535E-11	0.395431E-11
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6	14	2212	0	0	228	0	0.159187	0.035675	0.010868	0.952408	0.938270	-0.521461E-11	-0.893452E-12	0.236534E-11
7	14	2112	0	0	0	0	-0.042048	0.029026	0.049413	0.942255	0.939570	0.133873E-11	0.422407E-12	-0.579526E-11
8	14	2212	0	0	0	0	-0.046433	-0.112316	-0.033265	0.946693	0.938270	-0.384739E-11	-0.252662E-11	0.284029E-11
9	14	2212	0	0	0	0	-0.001454	0.079278	-0.077169	0.944771	0.938270	0.160893E-12	0.546563E-11	0.259185E-11
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11	14	2212	0	0	0	0	-0.021368	0.023826	0.126973	0.947363	0.938270	-0.381278E-11	-0.232158E-11	-0.707052E-12
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16	14	2112	0	0	0	0	-0.129288	-0.028980	-0.153233	0.961160	0.939570	0.143704E-11	0.338645E-11	0.271239E-11
17	14	2112	0	0	0	0	0.045965	0.118671	-0.075574	0.951157	0.939570	0.514555E-11	0.487099E-12	-0.494690E-11
18	14	2212	0	0	0	0	-0.047619	-0.150163	0.119748	0.958909	0.938270	-0.245827E-11	0.339034E-12	0.808066E-12
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20	14	2212	0	0	0	0	0.126561	-0.124122	-0.052554	0.956314	0.938270	-0.391946E-11	-0.180260E-11	0.492218E-11
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29	14	2112	0	0	0	0	0.084759	0.068710	-0.032068	0.946428	0.939570	0.523362E-11	0.947636E-12	-0.328526E-11
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46	14	2212	0	0	0	0	-0.027237	-0.069322	0.148213	0.952819	0.938270	-0.333026E-11	0.278815E-11	-0.172019E-11
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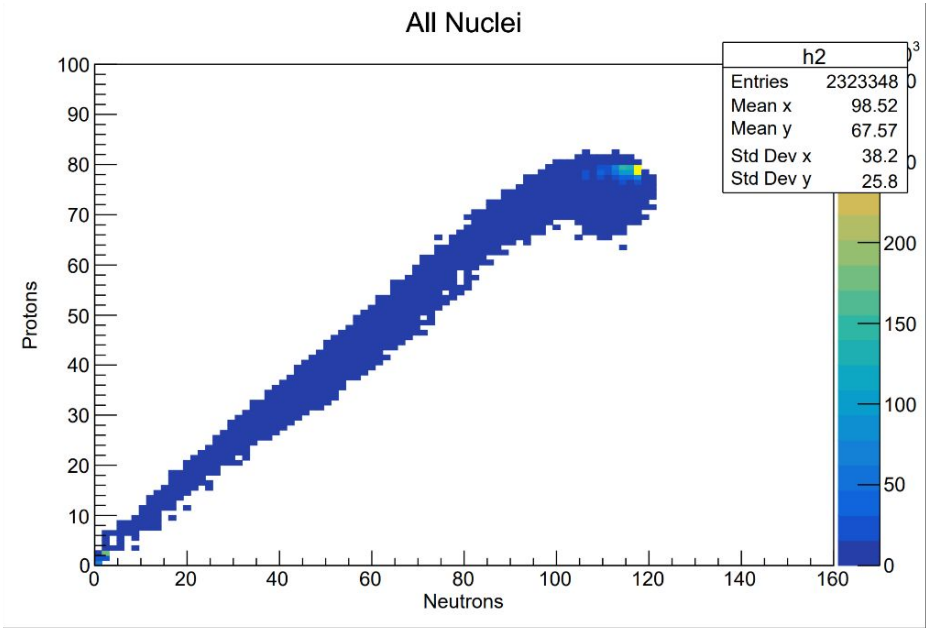
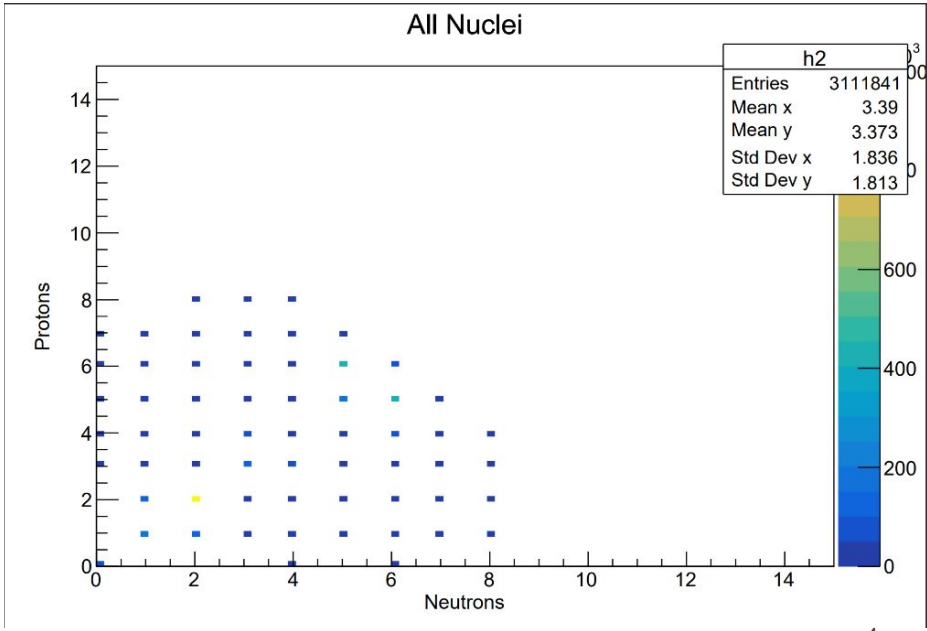
51	14	2112	0	0	0	0	0.062619	0.008416	0.099301	0.946913	0.939570	-0.669042E-12	0.347724E-11	0.371757E-11
52	14	2112	0	0	0	0	-0.062357	-0.067851	-0.202675	0.965589	0.939570	0.373403E-11	-0.231261E-11	-0.333851E-11

All Nuclei

Gold

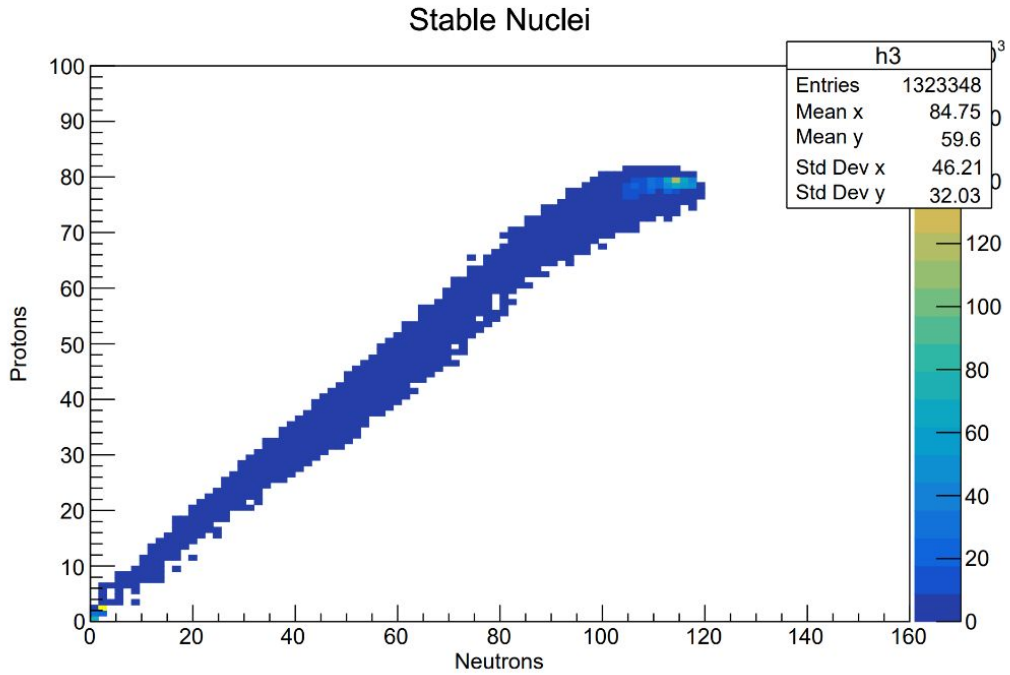


Carbon



Stable Nuclei

Gold



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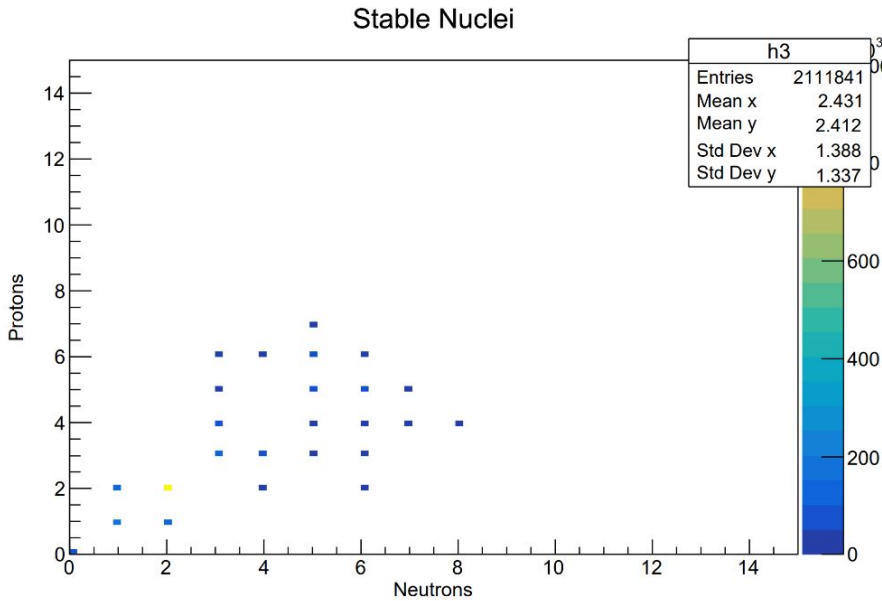
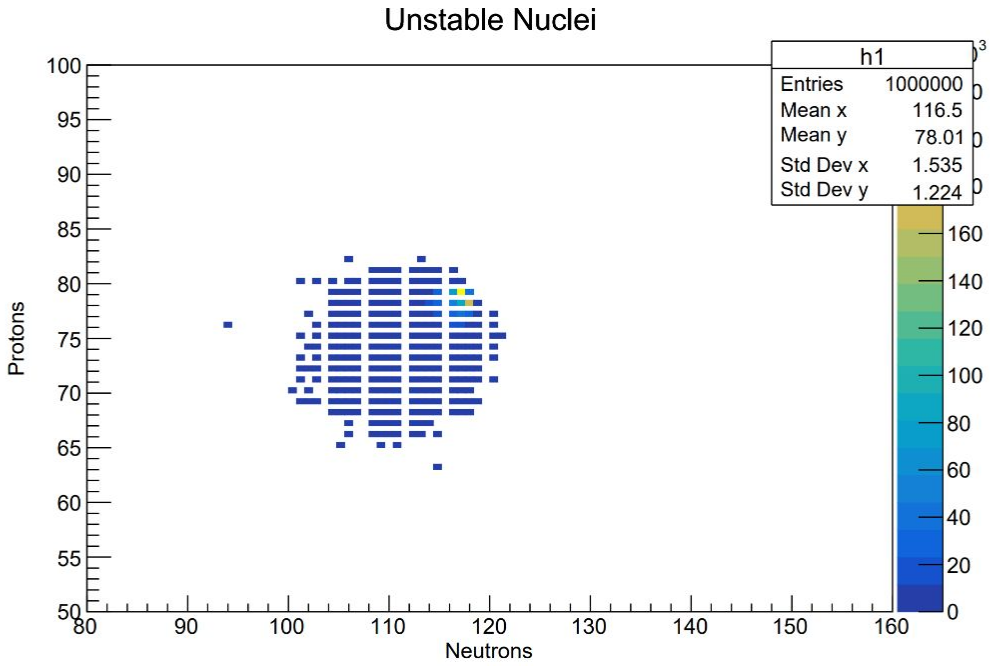


Unstable Nuclei

Gold



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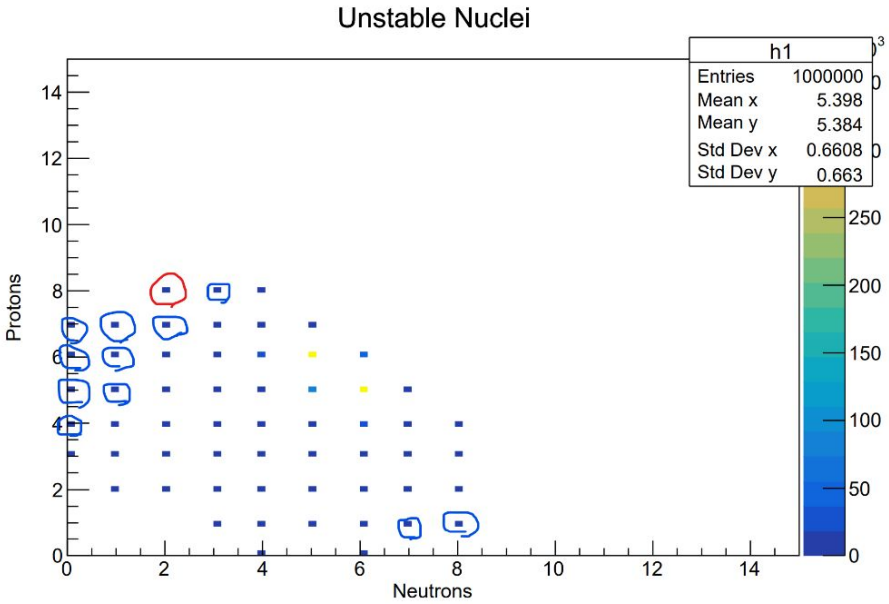
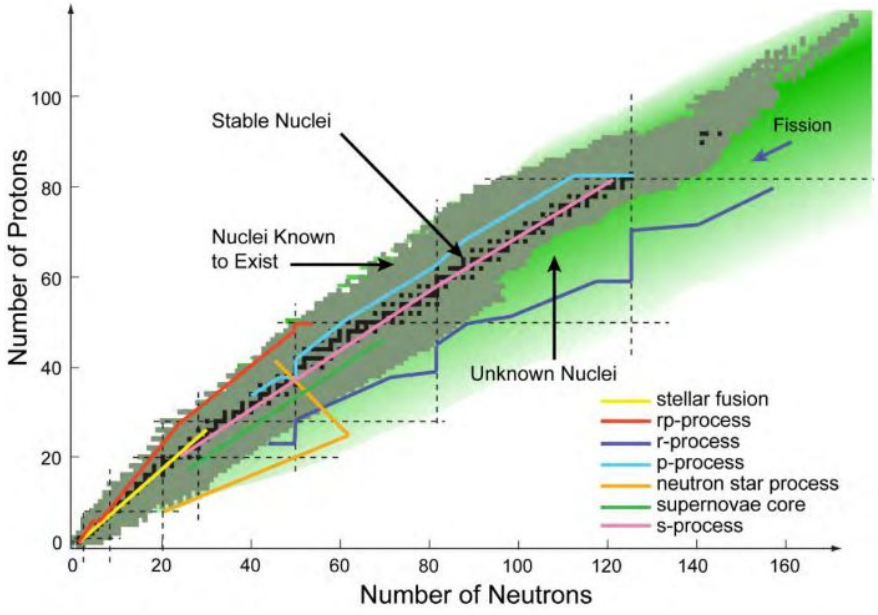


Next Steps

- Write a search script to identify new nuclei
- Find differential cross section for each new nucleus
- Figure out how frequently each new nucleus will be produced
- Run with untested nuclei



Rapid Neutron Capture Process

- Responsible for creating half the nuclei heavier than iron
- Produces the most neutron rich stable isotopes
- Most probably site is core-collapse supernova
- Provide insight into actinide synthesis (89-103) and determine r-process sites