

Composition of Products Formed by Thermal Neutron Fission of ^{235}U

I. Compilation of Nuclear Data of the Fission Products

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An extensive compilation is made of the data up to July 1957 for the fission yields, decay schemes, half-lives and thermal neutron cross sections of the ^{235}U fission products.

For the calculation of the beta activity, mole fraction and isotopic composition of the fission elements (Part II²⁶ and III²⁷ of this series), an extensive compilation has been made of the fission yields, modes of transformation, half-lives and thermal neutron cross sections of the ^{235}U fission products. Similar compilations have previously been made, *e.g.* by Coryell and Suger-
man^{1, 2}, Steinberg and Glendenin²⁸, and Lock¹⁷. These compilations are either less comprehensive or less up to date than the present paper.

In this paper most of the data have been covered up to July 1957. The decay schemes and half-lives are taken mainly from Nuclear Science Abstracts. The thermal neutron capture cross sections are taken from Hughes and Harvey²⁹. In the compilation of fission yield values¹⁻²⁵, mass spectrometric data have generally been preferred; all values have been standardized towards a cumulative fission yield of 6.32 ± 0.24 % for ^{140}Ba ¹². The sum of the fission yields amounts to 202 %.

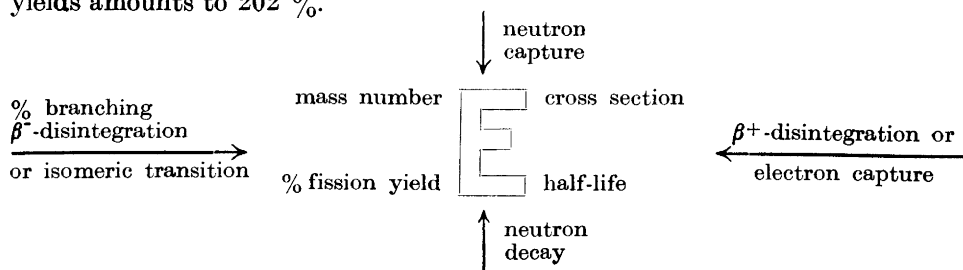
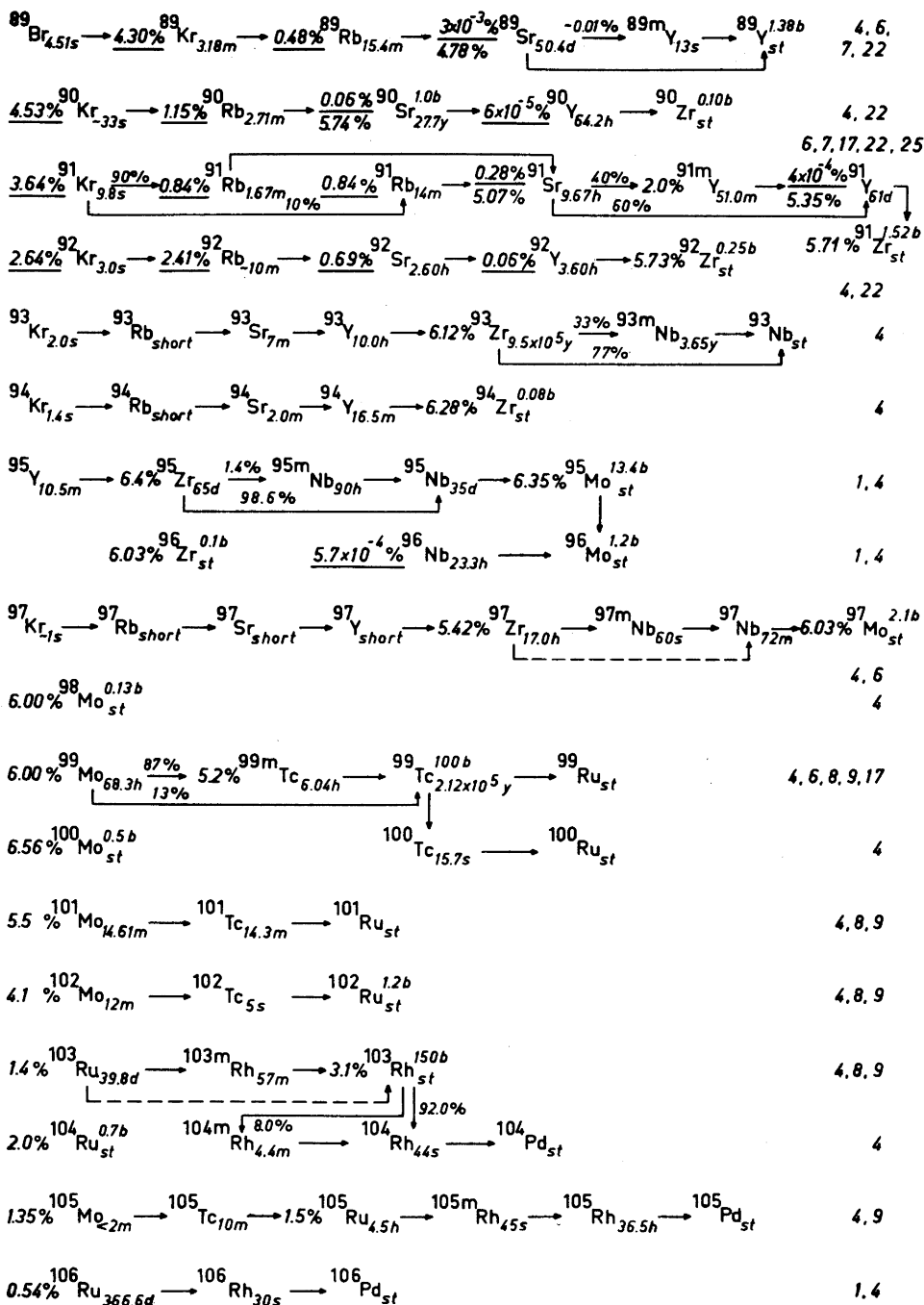


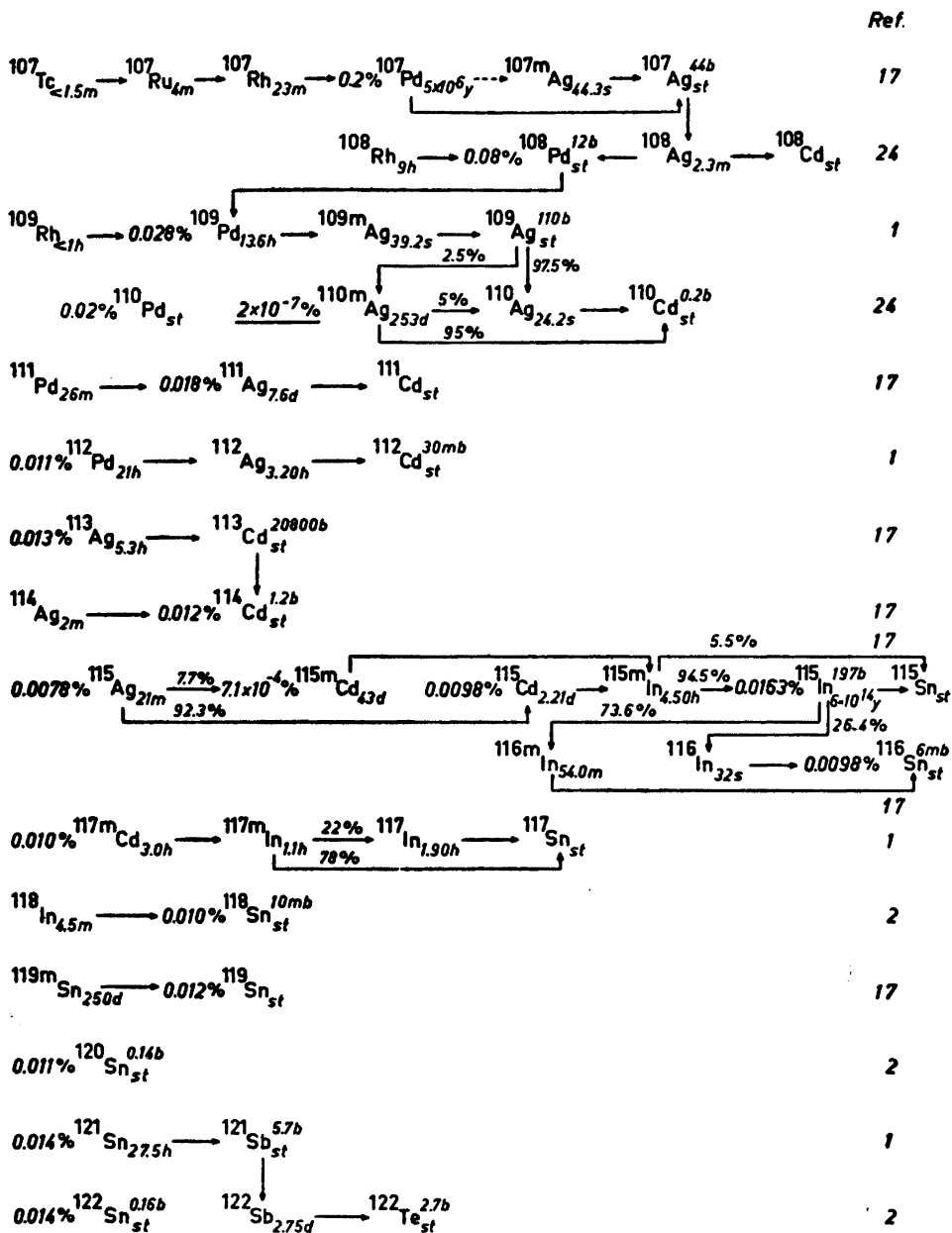
Fig. 1. Key to the presentation of the data; E stands for Element. The figure is more extensively explained in the text.

Table 1. Fission products decay scheme. Legend to the presentation is given in Fig. 1;
 -----> stands for a presumptive transformation.

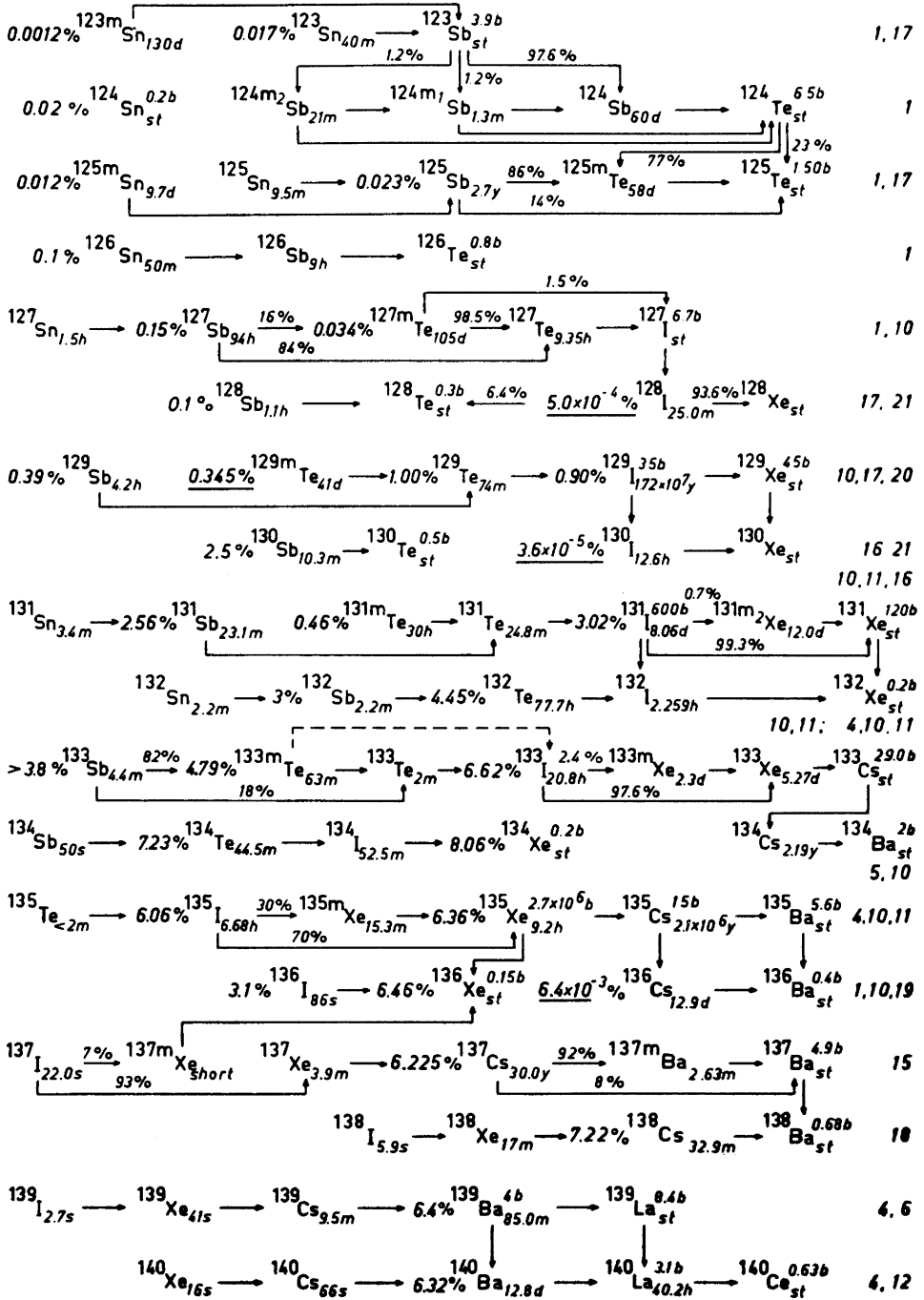
	Ref.
$0.25\% \text{}^4_2\text{He}_{st}^0$	23
$1.6 \times 10^{-5} \% \text{}^{72}_{30}\text{Zn}_{49.0h} \longrightarrow \text{}^{72}_{31}\text{Ga}_{14.25h} \longrightarrow \text{}^{72}_{32}\text{Ge}_{0.94b}$	1
$\text{}^{73}_{30}\text{Zn}_{2m} \longrightarrow 1.0 \times 10^{-4} \% \text{}^{73}_{31}\text{Ga}_{5h} \longrightarrow \text{}^{73}_{32}\text{Ge}_{13.7b}$	1
$\text{}^{74}_{31}\text{Ga}_{-8m} \longrightarrow 4 \times 10^{-4} \% \text{}^{74}_{32}\text{Ge}_{0.60b}$	2
$1.0 \times 10^{-3} \% \text{}^{75}_{32}\text{Ge}_{82m} \longrightarrow \text{}^{75}_{33}\text{As}_{4.1b}$	17
$2 \times 10^{-3} \% \text{}^{76}_{32}\text{Ge}_{0.35b} \longrightarrow \text{}^{76}_{33}\text{As}_{26.5h} \longrightarrow \text{}^{76}_{34}\text{Se}_{82b}$	2
$77m \text{}^{77}_{32}\text{Ge}_{59s} \longrightarrow 3.8 \times 10^{-3} \% \text{}^{77}_{32}\text{Ge}_{12h} \longrightarrow 5.6 \times 10^{-3} \% \text{}^{77}_{33}\text{As}_{39h} \xrightarrow{2\%} 77m \text{}^{77}_{34}\text{Se}_{17.5s} \xrightarrow{98\%} \text{}^{77}_{34}\text{Se}_{40b}$	1
$0.018 \% \text{}^{78}_{32}\text{Ge}_{86m} \longrightarrow 1.8 \times 10^{-3} \% \text{}^{78}_{33}\text{As}_{90m} \longrightarrow \text{}^{78}_{34}\text{Se}_{0.4b}$	1, 3, 17
$0.037 \% \text{}^{79}_{33}\text{As}_{9m} \longrightarrow 79m \text{}^{79}_{34}\text{Se}_{3.5m} \longrightarrow \text{}^{79}_{34}\text{Se}_{6.5 \times 10^4 y} \longrightarrow \text{}^{79}_{35}\text{Br}_{10.4b}$	17
$0.067 \% \text{}^{80}_{34}\text{Se}_{st} \xrightarrow{18.3\%} 80m \text{}^{80}_{35}\text{Br}_{4.5h} \xrightarrow{81.7\%} \text{}^{80}_{36}\text{Kr}_{18m} \longrightarrow \text{}^{80}_{36}\text{Kr}_{95b}$	2
$0.129 \% \text{}^{81}_{33}\text{As}_{10m} \xrightarrow{8 \times 10^{-3} \%} 81m \text{}^{81}_{34}\text{Se}_{57m} \xrightarrow{0.137\%} \text{}^{81}_{34}\text{Se}_{13.6m} \longrightarrow \text{}^{81}_{35}\text{Br}_{2.6b} \longleftarrow 81 \text{}^{81}_{36}\text{Kr}_{2.1 \times 10^5 y}$	1.4, 17
$0.26 \% \text{}^{82}_{34}\text{Se}_{st} \xrightarrow{2.31 \times 10^{-5} \%} \text{}^{82}_{35}\text{Br}_{39.5h} \longrightarrow 2.3 \times 10^{-3} \% \text{}^{82}_{36}\text{Kr}_{45b}$	4, 17
$83m \text{}^{83}_{34}\text{Se}_{67s} \xrightarrow{10\%} 0.21 \% \text{}^{83}_{34}\text{Se}_{25m} \xrightarrow{0.48\%} \text{}^{83}_{35}\text{Br}_{2.3h} \longrightarrow \text{}^{83}_{36}\text{Kr}_{114m} \longrightarrow 0.557 \% \text{}^{83}_{36}\text{Kr}_{205b}$	1, 19
$84 \text{}^{84}_{34}\text{Se}_{-2m} \xrightarrow{0.65\%} \text{}^{84}_{35}\text{Br}_{31.80m} \longrightarrow 1.02 \% \text{}^{84}_{36}\text{Kr}_{st}$	1, 19
$85 \text{}^{85}_{35}\text{Br}_{3.00m} \longrightarrow 1.0 \% \text{}^{85}_{36}\text{Kr}_{4.4h} \xrightarrow{23\%} 0.300 \% \text{}^{85}_{36}\text{Kr}_{10.27y} \xrightarrow{77\%} 1.30 \% \text{}^{85}_{37}\text{Rb}_{0.72b}$	4, 17, 19
$2.07 \% \text{}^{86}_{36}\text{Kr}_{st} \xrightarrow{3.1 \times 10^{-5} \%} \text{}^{86}_{37}\text{Rb}_{18.66d} \longrightarrow \text{}^{86}_{38}\text{Sr}_{1.3b}$	1, 19
$87 \text{}^{87}_{35}\text{Br}_{55.6s} \xrightarrow{-2\%} 87m \text{}^{87}_{36}\text{Kr}_{short} \xrightarrow{-98\%} 1.7 \% \text{}^{87}_{36}\text{Kr}_{78m} \xrightarrow{2.49\%} \text{}^{87}_{37}\text{Rb}_{0.12b} \xrightarrow{6.2 \times 10^{10} y} 87m \text{}^{87}_{38}\text{Sr}_{2.90h} \longrightarrow \text{}^{87}_{38}\text{Sr}_{st}$	1, 4
$88 \text{}^{88}_{35}\text{Br}_{15.5s} \longrightarrow \text{}^{88}_{36}\text{Kr}_{2.77h} \longrightarrow \text{}^{88}_{37}\text{Rb}_{17.8m} \longrightarrow 3.53 \% \text{}^{88}_{38}\text{Sr}_{5mb}$	4

Ref.

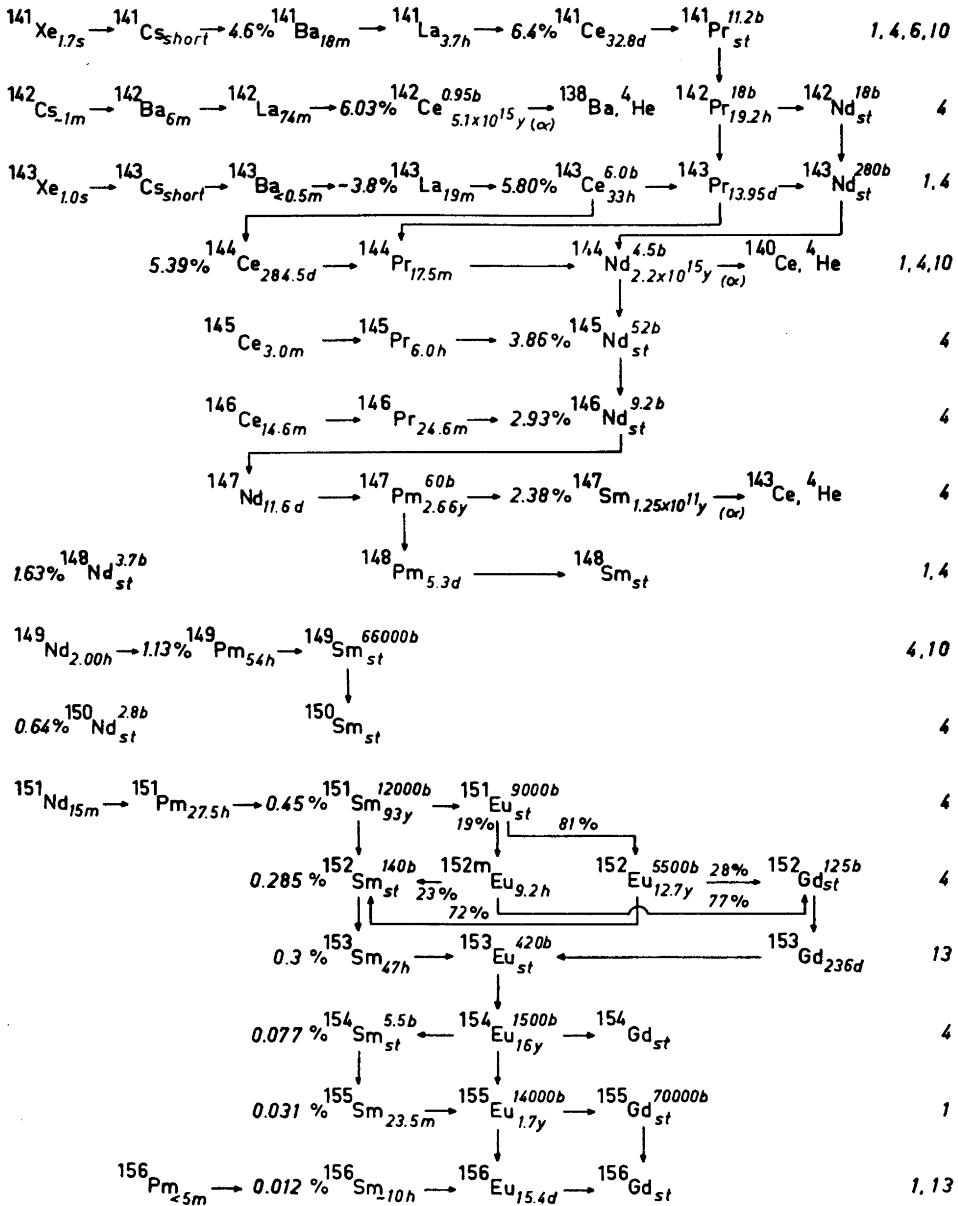




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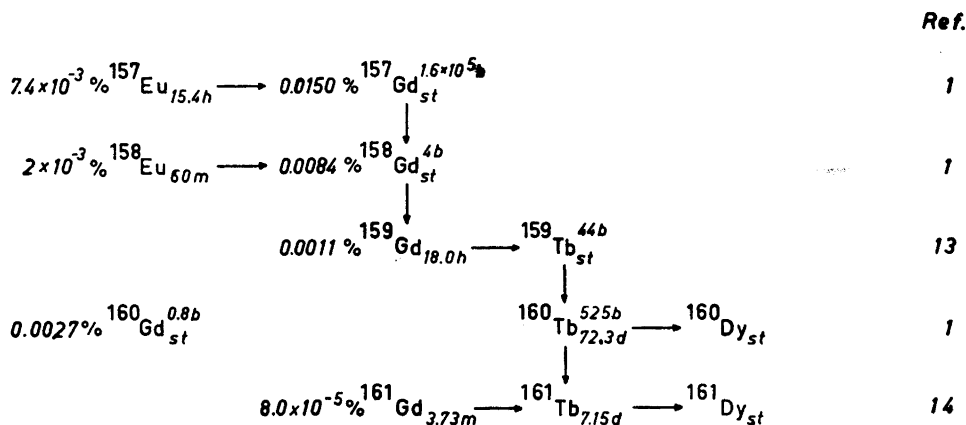


Fig. 1 shows the method of presenting the data, which are given in extenso in Table 1. The arrows indicate the formation process; percentage figures are given when branching ratios are known. The cross sections are given in barns and millibarns (indicated by *b* and *mb*) and half-lives in years (*y*), days (*d*), hours (*h*), minutes (*m*) or seconds (*s*). The percentage value given in front of the element is the cumulative fission yield value, except for underlined values, which refer to primary yields.

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