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LEVEL SCHEMES FOR SOME FISSION PRODUCT NUCLIDES

—COMPARISON OF LEVEL SCHEMES USED BY JAERI AND PETTEN—

June 1978

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Level Schemes for some Fission Product Nuclides
-Comparison of Level Schemes used by JAERI and Petten-

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Level schemes of 24 fission product nuclides comparable between JAERI's and Petten's are presented. When the assignments of spin and parity are different between, the reasons for JAERI's are described. In typical cases are compared the cross section of inelastic scattering and (n,γ) reaction calculated using the JAERI's and Petten's level schemes. The distribution of the low-lying levels of which spins and parities are assigned, is also presented.

Keywords : Fission Product, Level Energy, Spin, Parity, Level Distribution, Neutron Inelastic Scattering Cross Section, Neutron Capture Cross Section, Comparative Evaluation

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核分裂生成核種の準位様式
－JAERIおよびPetten で使用した準位様式の比較－

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JAERI および Petten で決めた核分裂生成核種のうち，両者の比較ができる24核種のレベル・スキームを比較して示す。スピンやパリティの決定が両者の間でくいちがっている場合には，われわれの決定理由を述べた。これらのレベル・スキームを使って計算した非弾性散乱と（n，γ）反応の断面積とを，典型的な場合について比較した。またスピンとパリティとを決められているレベルの分布状況を図で示してある。

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1. Introduction

In order to evaluate the neutron cross sections, it is necessary to use the evaluated level schemes of relevant nuclides. However, the critical evaluation of level schemes, of course, is so difficult that the international collaboration is highly required. In making critical evaluation, the determination of level energies and the assignments of spin and parity should be worked out carefully based on many kinds of experimental data, not only decay data but also reaction data. In this case, the determined level energies, spins and parities can be ensured only when the all available experimental data are not inconsistent with each other. Critical evaluation, however, yields a little well-established assignments in many cases, while for cross section evaluation, the spin-parity assignments to levels are required as many as possible.

Working group on evaluation of fission product nuclear data has selected about 100 nuclides as important ones. However, the level schemes of the most of them appeared in Nuclear Data Sheets were not satisfactory to our purpose since some are out-of-date or some include only a little information. Therefore, we were obliged to make our own level schemes based on the all available experimental information, and using not only strong arguments but also weak arguments. In some cases, the spins and/or the parities have been unwillingly selected without any reasonable arguments only when the assignments were necessary in calculating the cross sections. One typical example for such assignments is the spin-parity selection based on only gamma

transitions from or to other known levels. The energies of levels (in MeV) have been taken from Nuclear Data Sheets or original paper.

In this report, our level Schemes, reported previously[1] and revised recently, are compared with those reported by Gruppelaar[2] for 24 nuclides. In section 2, the level energies and spin-parities of the low-lying levels are tabulated for three cases. In section 3, the step-wise diagrams for the distribution of low-lying levels of which spins and parities are assigned are presented. Although the diagram may be only a reference for the level density, it seems to be still useful in statistical calculation of cross section for high energy region. In section 4, the calculated inelastic scattering cross sections are compared by using the different level schemes.

2. Comparison of Level Schemes used by JAERI and Petten

Level schemes, reported previously[1] and revised recently by us and those reported by Gruppelaar[2] are tabulated in subsection 2.1 2.24. Comments are added if both of our revised ones and Gruppelaar's disagree with each other. However, the most of the comments are based on rather quite weak arguments unless new experimental evidence offers the convincing arguments.

2.1 $^{93}_{41}Nb$

Adopted		Revised		RCN	
0.0	$9/2^+$	0.0	$9/2^+$	0.0	$9/2^+$
0.0304	$1/2^-$	0.0304	$1/2^-$	0.0304	$1/2^-$
0.686	$3/2^-$	0.686	$3/2^-$	0.686	$3/2^-$
0.7440	$7/2^+$	0.7440	$7/2^+$	0.7440	$7/2^+$
0.8087	$5/2^+$	0.8087	$5/2^+$	0.8087	$7/2^+$
0.8101	$5/2^-$	0.8101	$5/2^-$	0.8101	$3/2^-$
0.9499	$13/2^+$	0.9499	$13/2^+$	0.9499	$13/2^+$
0.9791	$11/2^+$	0.9791	$11/2^+$	0.9791	$11/2^+$
1.0826	$9/2^+$	1.0826	$9/2^+$	1.083	$9/2^+$
				1.127	$5/2^+$
1.28	$3/2^-$	1.28	$3/2^-$		
1.2974	$9/2^+$	1.2974	$9/2^+$		
1.3156	$5/2^-$	1.3156	$5/2^-$		
1.3351	$17/2^+$	1.3351	$17/2^+$		
1.364	$7/2^-$	1.364	$7/2^-$		

<u>0.8087 level</u> Angular distribution in (p,α) and Hauser-Feshbach analysis for (n,n') show $5/2^+$.

<u>0.8101 level</u> Angular distribution in (p,α) suggests $5/2^-$ or possibly $3/2^-$. (n,n'γ) experiments suggest ($3/2^-$, $5/2^-$) or (5/2, 7/2).

<u>1.127 level</u> Uncertain level in (n,n'γ) and analysis shows $5/2^+$, 7/2. Only an uncertain γ to $5/2^+$.

<u>1.28 level</u> Angular distribution in (p,α), and ℓ=1 in (^{3}He,d).

<u>1.2974 level</u> Hauser-Feshbach analysis for (n,n').

<u>1.3156 level</u> Hauser-feshbach analysis for (n,n'). ℓ=3 in (d, ^{3}He) suggests $5/2^-$, $7/2^-$, but no γ to $9/2^+$ selects $5/2^-$.

<u>1.3351 level</u> Hauser-Feshbach analysis for (n,n').

<u>1.364 level</u> Angular distribution in (p,α).

2.2 $^{95}_{42}Mo$

Adopted ('74)		Revised		RCN	
0.0	$5/2^+$	0.0	$5/2^+$	0.0	$5/2^+$
0.20394	$3/2^+$	0.20394	$3/2^+$	0.2039	$3/2^+$
0.76583	$7/2^+$	0.76583	$7/2^+$	0.7658	$7/2^+$
0.7862	$1/2^+$	0.7862	$1/2^+$	0.7862	$1/2^+$
0.82065	$3/2^+$	0.82065	$3/2^+$	0.8207	$3/2^+$
0.9478	$9/2^+$	0.9478	$9/2^+$	0.9479	$9/2^+$
1.0391	$1/2^+$	1.0391	$1/2^+$	1.039	$1/2^+$
1.059	$5/2^+$	1.059	$5/2^+$	1.057	$5/2^+$
1.0741	$7/2^+$	1.0741	$7/2^+$	1.074	$7/2^+$
1.2225	$5/2^+$	1.2225	$5/2^+$	1.220	$3/2^+$
1.310	$1/2^+$	1.310	$1/2^+$	1.310	$1/2^+$
1.376	$3/2^+$	1.376	$3/2^+$	1.370	$3/2^+$
1.433	$5/2^+$	1.433	$5/2^+$	1.426	$3/2^+$
				1.440	$7/2^+$
				1.470	$1/2^+$
1.541	$11/2^+$	1.541	$11/2^+$	1.541	$11/2^+$
1.5528	$9/2^+$	1.5528	$9/2^+$	1.552	$9/2^+$
				1.570	$5/2^+$
				1.580	$3/2^+$
		1.6202	$3/2^+$	1.620	$3/2^+$
				1.650	$7/2^-$
		1.670	$5/2^+$	1.670	$5/2^+$
		1.683	$9/2^+$	1.683	$9/2^+$
		1.707	$1/2^+$		
		1.938	$11/2^-$		

<u>1.2225 level</u> Weakly populated in ^{95m}Tc ($1/2^-$) decay with log ft = 10.7, thus suggesting $5/2^+$.

<u>1.426 level and 1.433 level</u> These are assumed to be identical. $\ell=2$ in (d,p) suggests $3/2^+$, $5/2^+$. $^{92}Zr(\alpha,n\gamma)$ and $^{94}Zr(\alpha,3n\gamma)$[3] suggests $5/2^+$.

<u>1.440 level</u> No experimental evidence could be found.

<u>1.470 level</u> No experimental evidence could be found.

$^{95}_{42}Mo$

1.570 level	No experimental evidence could be found.
1.580 level	No experimental evidence could be found.
1.650 level	No experimental evidence could be found.
1.707 level	$\ell=0$ in (d,p).
1.938 level	$^{92}Zr(\alpha,n\gamma)$ and $^{94}Zr(\alpha,3n\gamma)$[4].

2.3 $^{96}_{42}Mo$

Adopted		Revised		RCN	
0.0	0^+	0.0	0^+	0.0	0^+
0.7783	2^+	0.77826	2^+	0.7783	2^+
1.1479	0^+	1.1479	0^+	1.148	0^+
1.4978	2^+	1.49782	2^+	1.498	2^+
1.626	2^+	1.626	2^+	1.626	2^+
1.628	4^+	1.628	4^+	1.628	4^+
1.8695	4^+	1.8695	4^+	1.870	4^+
1.9783	3^+	1.9783	3^+	1.978	3^+
2.0956	2^+	2.0956	2^+	2.096	2^+
2.219	4^+	2.2193	4^+	2.219	4^+
2.2345	3^-	2.2345	3^-	2.235	3^-
2.4262	3^+	2.4262	3^+	2.426	2^+
2.438	5^+	2.43838	5^+	2.438	5^+
2.441	6^+	2.44064	6^+	2.441	6^+
2.481	4^+	2.4807	4^+	2.481	3^+
				2.541	2^+
				2.594	3^+
				2.625	3^+

<u>2.4262 level</u> Intensity of γ from capturing state in (n_{th},γ) suggests 2^+, 3^+ or possibly 4^+. No γ to 0^+ g.s., but to 2^+ levels select 3^+ or possibly 4^+. No ε-decay from ^{96m}Tc (4^+) is not consistent with above evidence. 3^+ is assigned tentatively considering the fact that it is hard to see the ε-decay even if exists, since ε-decay of ^{96m}Tc is only 2% (IT=98%).

<u>2.4807 level</u> Log ft = 7.0 from ^{96m}Tc (4^+) suggests 3^+, 4^+, 5^+. No β from ^{96}Nb (6^+) selects 3^+, 4^+. (p,p') and (α,α') show 4^+.

<u>2.541 level</u> Intensity of γ from capturing state in (n_{th},γ) suggests 2^+, 3^+ or possibly 4^+. No γ to 0^+ g.s., but to 2^+ levels. No ε-decay from ^{96m}Tc (4^+).

<u>2.594 level</u> Log ft = 5.7 from ^{96m}Tc (4^+) suggests 3^+, 4^+, 5^+.

$^{96}_{42}Mo$

No β from ^{96}Nb (6^+) selects 3^+, 4^+.

<u>2.625 level</u> Log ft = 7.6 from ^{96m}Tc (4^+) suggests $3^{\pm}$, $4^{\pm}$, $5^{\pm}$. No β from ^{96}Nb (6^+) selects $3^{\pm}$, 4^+. (p,p') and (α,α') show 4^+.

2.4 $^{97}_{42}Mo$

Adopted		Revised		RCN	
0.0	$5/2^+$	0.0	$5/2^+$	0.0	$5/2^+$
0.4809	$3/2^+$	0.4809	$3/2^+$	0.4809	$3/2^+$
0.65792	$7/2^+$	0.65792	$7/2^+$	0.6583	$7/2^+$
0.6796	$1/2^+$	0.6796	$1/2^+$	0.6796	$1/2^+$
0.71947	$5/2^+$	0.71947	$5/2^+$	0.7193	$5/2^+$
0.7211	$3/2^+$	0.7211	$3/2^+$	0.7211	$3/2^+$
				0.7530	$5/2^+$
				0.7950	$1/2^+$
0.8882	$1/2^+$	0.8882	$1/2^+$	0.8810	$1/2^+$
				0.9930	$3/2^+$
1.02453	$7/2^+$	1.02453	$7/2^+$	1.0250	$7/2^+$
1.0926	$3/2^+$	1.0926	$3/2^+$	1.0920	$3/2^+$
1.1167	$9/2^+$	1.1167	$9/2^+$	1.1180	$9/2^+$
				1.1360	$3/2^+$
		1.1486	$7/2^-$	1.1490	$9/2^+$
				1.2650	$5/2^+$
1.26863	$7/2^+$	1.26863	$7/2^+$	1.2690	$7/2^+$
1.273	$3/2^+$	1.273	$3/2^+$		
		1.284	$13/2^+$	1.2840	$13/2^+$
		1.2846	$3/2^+$	1.2850	$3/2^+$
1.4095	$11/2^+$	1.4095	$11/2^+$	1.4100	$11/2^+$
1.4373	$11/2^-$	1.4373	$11/2^-$	1.4370	$11/2^-$
1.447	$3/2^+$	1.447	$3/2^+$	1.4470	$3/2^+$
1.51564	$9/2^+$	1.51564	$9/2^+$	1.5160	$9/2^+$
1.5452	$5/2^-$	1.5452	$5/2^-$		
1.5651	$3/2^+$	1.5651	$3/2^+$		

<u>0.7530 level</u> No experimental evidence could be found.

<u>0.7950 level</u> No experimental evidence could be found.

<u>0.9930 level</u> No experimental evidence could be found.

<u>1.1360 level</u> Reported in (d,t) but no information for J^π.

<u>1.1486 level</u> Probably fed by β^- from ^{97}Nb ($9/2^+$) with log ft > 7.9, thus suggesting $7/2^-$, $9/2^-$, $11/2^-$.

$^{97}_{42}Mo$

γ to $5/2^+$ g.s. selects $7/2^-$.

1.2650 level No experimental evidence could be fould.

1.273 level $\ell=2$ in (d,p) suggests $3/2^+$ or $5/2^+$, but $3/2^+$ is more probable.

1.5452 level and 1.5651 level $5/2^-$ and $3/2^+$ doublet reported in (d,p).

2.5 $^{98}_{42}Mo$

Adopted		Revised		RCN	
0.0	0^+	0.0	0^+	0.0	0^+
0.7349	0^+	0.7349	0^+	0.7348	0^+
0.78742	2^+	0.78742	2^+	0.7875	2^+
1.43232	2^+	1.43232	2^+	1.4320	2^+
1.51013	4^+	1.51013	4^+	1.5100	4^+
1.7585	2^+	1.7585	2^+	1.7590	2^+
				1.8120	6^+
		1.8809	3^+	1.8810	3^+
1.965	0^+	1.965	0^+	1.9640	0^+
		1.9855	1^+	1.9850	1^+
2.0176	3^-	2.0176	3^-	2.0180	3^-
				2.0390	4^+
2.1049	2^+	2.1049	2^+	2.1050	2^+
2.2069	2^+	2.2069	2^+	2.2070	2^+
2.2240	4^+	2.2240	2^+	2.2240	2^+
2.3334	2^+	2.3334	2^+	2.3330	2^+
2.3437	6^+	2.3437	6^+	2.3440	6^+
2.4198	3^-	2.4198	3^-	2.4200	3^-
		2.450	4^+	2.4500	4^+
2.4854	4^+	2.4854	3^+	2.4850	3^+
		2.5063	3^-	2.5060	3^-
				2.5260	0^+
				2.5620	3^+
				2.5730	4^+
				2.6090	3^-
				2.6170	0^+
				2.6210	2^+
				2.6460	5^-
				2.6790	6^+
				2.7080	2^+

<u>1.8120 level</u> Observed only in (n,n'). No evidence for J^π assignment.

$^{98}_{42}Mo$

2.0390 level Observed in (n,n') and (d,d'), but no information for J^{π} assignment. No β from 2.8 s ^{98}Nb (1^+) and 51.5 m ^{98}Nb (4 or 5) suggest J>6.

2.5260 level Observed in (d,p) and (p,t), but no information for J^{π} assignment.

2.5620 level Observed in (n,γ) and γ's to 2^+ and 3^- levels. Not observed in Nb decay.

2.5730 level (p,t) suggests 4^+.

2.6090 level Log ft = 5.9 from 2.8 s ^{98}Nb (1^+) suggests 0^+, 1^+, 2^+. No γ to 0^+ but 2^+ prefers 0^+.

2.6170 level (p,t) suggests 0^+.

2.6210 level (n,γ) suggests 2^+, but (α,2nγ) suggests 5^-.

2.6460 level Observed in (p,t) but no information for J^{π} assignment.

2.6790 level (α,2nγ) suggests 5^+ or 6^+. Log ft = 6.4 from 51.5 m ^{98}Nb (4^+ or 5^+).

2.7080 level (p,t) suggests 2^+.

2.6 $^{100}_{42}Mo$

Adopted		Revised		RCN	
0.0	0^+	0.0	0^+	0.0	0^+
0.5356	2^+	0.5356	2^+	0.5360	2^+
0.6944	0^+	0.6944	0^+	0.6944	0^+
1.0637	2^+	1.0637	2^+	1.0640	2^+
1.1361	4^+	1.1361	4^+	1.1360	4^+
1.4633	2^+	1.4633	2^+	1.4630	2^+
1.7657	1^+	1.7657	1^+		
1.7704	3^+	1.7704	3^+		
1.9081	3^-	1.9081	3^-		
2.033	0^+	2.033	0^+		
2.040	2^+	2.040	2^+		
2.1014	4^+	2.1014	4^+		
2.340	2^+	2.340	2^+		
2.4156	3^-	2.4156	3^-		
2.470	4^+	2.470	4^+		
2.5632	3^+	2.5632	3^+		
2.590	4^+	2.590	4^+		

1.7657 level γ's to 0^+, 2^+, but not to 4^+ suggest $1^{\pm}$. No strong reason exists to choose 1^+.

1.7704 level γ's to 2^+, 4^+, not to 0^+. No strong reason exists to choose 3^+.

1.9081 level Coulomb excitation suggests 3^-.

2.033 level (γ,γ') suggests 0^+.

2.040 level (γ,γ') suggests 2^+.

2.1014 level γ's to 2^+, 4^+, not to 0^+. No strong reason exists to choose 4^+.

2.340 level (p,p') suggests 2^+.

2.4156 level (p,p') suggests 3^-.

2.470 level (p,p') suggests 4^+.

2.5632 level γ's to 2^+, 3^+, 4^+, not to 0^+. No strong reason exists to choose 3^+.

2.590 level (p,p') suggests 4^+.

2.7 $^{99}_{43}Tc$

Adopted ('74)		Revised		RCN	
0.0	$9/2^+$	0.0	$9/2^+$	0.0	$9/2^+$
0.14051	$7/2^+$	0.140508	$7/2^+$	0.1405	$7/2^+$
0.14263	$1/2^-$	0.14263	$1/2^-$	0.1426	$1/2^-$
0.18107	$5/2^+$	0.18107	$5/2^+$	0.1811	$5/2^+$
0.5091	$3/2^-$	0.5091	$3/2^-$	0.5091	$1/2^-$
0.5343	$5/2^-$	0.5343	$5/2^-$	0.5343	$3/2^-$
		0.6254	$7/2^+$		
0.6715	$5/2^-$	0.6715	$5/2^-$	0.6715	$5/2^-$
0.7263	$7/2^+$	0.7263	$11/2^+$	0.7263	$9/2^+$
0.7616	$5/2^+$	0.7616	$5/2^+$	0.7616	$7/2^+$
		0.7620	$13/2^+$		
0.9205	$3/2^+$	0.9205	$3/2^+$	0.9205	$3/2^+$
				0.9500	$7/2^-$
1.0040	$3/2^-$	1.0040	$3/2^-$	1.004	$3/2^-$
1.0729	$5/2^-$	1.0729	$5/2^-$	1.073	$5/2^-$
		1.0814	$9/2^+$		
1.1293	$1/2^-$	1.1293	$1/2^-$	1.129	$1/2^-$
1.1420	$3/2^-$	1.142	$3/2^-$	1.142	$3/2^-$
1.199	$3/2^-$	1.199	$3/2^-$		

<u>0.5091 level</u> Log ft = 8.4 from ^{99}Mo ($1/2^+$) suggests $1/2^-$, $3/2^-$ or possibly $5/2^-$. No preferable reason exists for $3/2^-$.

<u>0.5343 level</u> No β from ^{99}Mo ($1/2^+$) suggests J>3/2. γ to $1/2^-$ selects $5/2^-$.

<u>0.6254 level</u> Angular distribution in Coulomb excitation[5] suggests $7/2^+$ or possibly $9/2^+$.

<u>0.7263 level</u> Angular distribution in Coulomb excitation suggests $11/2^+$ or possibly $9/2^+$. No γ to $5/2^+$ selects $11/2^+$.

<u>0.7616 level</u> Angular distribution in Coulomb excitation suggests $5/2^+$ or possibly $7/2^+$.

<u>0.7620 level</u> Angular distribution in Coulomb excitation suggests $13/2^+$.

<u>0.9500 level</u> No experimental information could be found.

$^{99}_{43}Tc$

<u>1.0814 level</u> Angular distribution in Coulomb excitation suggests $9/2^+$ or $11/2^+$. No preferable reason exists for $9/2^+$.

<u>1.199 level</u> β from ^{99}Mo ($1/2^+$) with log ft $\simeq$ 8 suggests $1/2^-$ $3/2^-$. γ to $5/2^+$ selects $3/2^-$.

2.8 $^{101}_{44}Ru$

Adopted ('74)		Revised		RCN	
0.0	$5/2^+$	0.0	$5/2^+$	0.0	$5/2^+$
0.1271	$3/2^+$	0.12722	$3/2^+$	0.1272	$3/2^+$
0.3067	$7/2^+$	0.30681	$7/2^+$	0.3068	$7/2^+$
0.3112	$5/2^+$	0.3113	$5/2^+$	0.3113	$5/2^+$
0.3254	$1/2^+$	0.3252	$1/2^+$	0.3252	$1/2^+$
		0.3441	$3/2^+$	0.3441	$3/2^+$
0.4224	$3/2^+$	0.4220	$3/2^+$	0.4220	$3/2^+$
		0.4623	$1/2^+$	0.4623	$1/2^+$
0.528	$11/2^-$	0.528	$11/2^-$	0.528	$11/2^-$
0.5447	$7/2^+$	0.5450	$7/2^+$	0.5450	$7/2^+$
0.6161	$7/2^+$	0.6163	$7/2^+$	0.6163	$7/2^+$
		0.6235	$7/2^+$	0.6235	$7/2^+$
		0.6438	$9/2^+$		
0.6742	$3/2^+$	0.6741	$3/2^+$		
0.720	$7/2^+$	0.7200	$9/2^+$		
0.8426	$7/2^+$	0.8427	$7/2^+$		
0.9111	$7/2^+$	0.9119	$7/2^+$		
0.9282	$9/2^+$	0.9289	$9/2^+$		
0.9381	$7/2^+$	0.9383	$7/2^+$		
		0.959	$15/2^-$		
1.0011	$11/2^+$	1.001	$11/2^+$		
		1.623	$19/2^-$		
		1.861	$15/2^+$		
		2.473	$23/2^-$		

<u>0.6438 level</u> Log ft =6.4 from ^{101m}Rh ($9/2^+$) suggests $7/2^+$, $9/2^+$, $11/2^+$. γ to $5/2^+$ but not to $3/2^+$ selects $9/2^+$.

<u>0.6741 level</u> ^{101m}Tc decay experiment[6),7)] proposed this level. No β from ^{101}Tc ($9/2^+$), γ to $5/2^+$ g.s. and γ from $7/2^+$ level suggest $5/2^+$ or $3/2^+$. Data of ref. 8 are not inconsistent with those of ref. 6. No reason exists to choose $3/2^+$.

$^{101}_{44}Ru$

<u>0.7200 level</u> Log ft = 6.7 from ^{101}Tc ($9/2^+$) suggests $7/2^+$, $9/2^+$, $11/2^+$. γ to $5/2^+$ but not to $3/2^+$ selects $9/2^+$. $\alpha\gamma(\theta)$ in $^{100}Mo(\alpha,3n\gamma)$.

<u>0.8427 level</u> Log ft = 5.6 from ^{101}Tc ($9/2^+$) suggests $7/2^+$, $9/2^+$, $11/2^+$. γ to $3/2^+$ level selects $7/2^+$.

<u>0.9119 level</u> Log ft = 6.8 from ^{101}Tc ($9/2^+$) suggests $7/2^+$, $9/2^+$, $11/2^+$. γ to $3/2^+$ level selects $7/2^+$.

<u>0.9289 level</u> Log ft = 6.5 from ^{101}Tc ($9/2^+$) suggests $7/2^+$, $9/2^+$, $11/2^+$. No γ to $3/2^+$ but to $5/2^+$ selects $9/2^+$.

<u>0.9383 level</u> Log ft = 5.8 from ^{101}Tc ($9/2^+$) suggests $7/2^+$, $9/2^+$, $11/2^+$. γ to $3/2^+$ level selects $7/2^+$.

<u>0.959 level</u> $\alpha\gamma(\theta)$ in $^{100}Mo(\alpha,3n\gamma)$.

<u>1.001 level</u> Log ft = 6.9 from ^{101}Tc ($9/2^+$) suggests $7/2^+$, $9/2^+$, $11/2^+$. No γ to $3/2^+$ or $5/2^+$ selects $11/2^+$. $\alpha\gamma(\theta)$ in $^{100}Mo(\alpha,3n\gamma)$.

<u>1.623 level</u> $\alpha\gamma(\theta)$ in $^{100}Mo(\alpha,3n\gamma)$.

<u>1.861 level</u> $\alpha\gamma(\theta)$ in $^{100}Mo(\alpha,3n\gamma)$.

<u>2.473 level</u> $\alpha\gamma(\theta)$ in $^{100}Mo(\alpha,3n\gamma)$.

2.9 $^{102}_{44}Ru$

Adopted		Revised		RCN	
0.0	0^+	0.0	0^+	0.0	0^+
0.4749	2^+	0.47507	2^+	0.4750	2^+
0.9437	0^+	0.94365	0^+	0.9440	0^+
1.1032	2^+	1.10315	2^+	1.1030	2^+
1.1066	4^+	1.10637	4^+	1.1070	4^+
1.5219	3^+	1.52166	3^+	1.5220	3^+
1.5808	2^+	1.58058	2^+	1.5810	2^+
		1.6027	4^+	1.6030	4^+
1.7990	4^+	1.79870	4^+	1.7990	4^+
1.8371	0^+	1.83710	0^+	1.8370	0^+
1.8732	6^+	1.87324	6^+	1.8730	6^+
				1.9970	5^+
2.0375	2^+	2.03692	2^+	2.0370	2^+
2.0441	3^-	2.0442	3^-	2.0440	3^-
				2.1550	1^+
2.2192	5^+	2.21917	5^+	2.2190	5^+
2.2613	2^+	2.26125	2^+	2.2610	2^-
2.372	5^-	2.372	5^-	2.3720	5^-
		2.4211	4^+	2.4210	4^+
		2.4419	4^+	2.4420	3^+

1.9970 level Uncertain β from ^{102}Rh (5^+ or 6^+) with log ft = 10.2. Only uncertain γ to 2^+ level. No other evidence. If this level is adopted, 3^- is more probable rather than 5^+.

2.1550 level Proposed by $^{100}Mo(\alpha,2n\gamma)$ as an uncertain level. Not populated in ^{102}Tc (1^+) and ^{102m}Rh (1^- or 2^-) decays, thus assignment of 1^+ is not consistent even if this level exists.

2.26125 level Log ft = 6.5 from ^{102m}Rh (1^- or 2^-) suggests $0^{\pm}$, $1^{\pm}$, $2^{\pm}$, $3^{\pm}$. γ's to 0^+, 2^+, 3^+, and possibly 4^+ levels select 2^+.

2.4419 level 4.35 m ^{102}Tc decays to 4^+ levels but not to 0^+, 2^+, 3^+ levels in ^{102}Ru, thus suggesting $J \geq 5$ for ^{102m}Tc. Log ft = 6.32 suggests $4^{\pm}$, ≥ 5 to 2.4419 level. γ to 2^+ level selects 4^+.

2.10 $^{104}_{44}Ru$

Adopted		Revised		RCN	
0.0	0^+	0.0	0^+	0.0	0^+
0.358	2^+	0.35799	2^+	0.3586	2^+
0.889	2^+	0.8885	4^+	0.8892	4^+
0.893	4^+	0.8930	2^+	0.8937	2^+
0.983	0^+	0.9881	0^+	0.9830	0^+
		1.2423	3^+	1.2423	3^+
				1.3558	2^+
				1.5020	4^+
				1.5160	0^+
				1.7560	4^+
				1.8747	6^+
				1.8790	3^+
				1.9710	1^+
				1.9930	2^+

1.3558 level ^{104}Tc decay experiment[8] proposed this level by placing 462 keV γ between this and 0.8930 levels, but ref. 9) did not observe 462 keV γ in ^{104}Tc decay.

1.5020 level 18.2 m ^{104}Tc decay to 0.35799 (2^+) level in ^{104}Ru with log ft = 7.4 and to 0.8885 (4^+) level with log ft = 7.7, thus suggesting 2^-, $3^{\pm}$ and 4^- for 18.2 m ^{104}Tc. Log ft = 8.1 to 1.5020 level suggests 0^+, $1^{\pm}$, $2^{\pm}$, $3^{\pm}$, $4^{\pm}$, $5^{\pm}$, 6^+. γ's to 2^+ and 4^+ but no γ to 0^+ selects $3^{\pm}$ or 4^+. Not possible to select unique J^{π} from these possibilities.

1.5160 level Log ft ≳ 8. γ's to 2^+, 3^+, but no γ to 0^+, 4^+. Possible assignment is 2^-.

1.7560 level No experimental evidence could be found.

1.8747 level Log ft > 8.0. γ's to 2^+, 4^+ but no γ to 0^+. Possible assignment is $3^{\pm}$ or 4^+.

1.8790 level No experimental evidence could be found.

1.9710 level Log ft = 7.2 suggests $1^{\pm}$, $2^{\pm}$, $3^{\pm}$, $4^{\pm}$, $5^{\pm}$. γ's to 0^+, 2^+ selects $1^{\pm}$ or 2^+.

1.9930 level ^{104}Tc decay experiment[8] proposed this level with 2^+, but no evidence supporting this assignment is seen in ref. 9).

2.11 $^{103}_{45}Rh$

Adopted ('74)		Revised		RCN	
0.0	$1/2^-$	0.0	$1/2^-$	0.0	$1/2^-$
0.040	$7/2^+$	0.039750	$7/2^+$	0.0398	$7/2^+$
0.093	$9/2^+$	0.093035	$9/2^+$	0.0930	$9/2^+$
0.298	$3/2^-$	0.29498	$3/2^-$	0.2949	$3/2^-$
0.360	$5/2^-$	0.35746	$5/2^-$	0.3574	$5/2^-$
0.537	$5/2^+$	0.53684	$5/2^+$	0.5368	$5/2^+$
		0.60763	$7/2^+$	0.6072	$7/2^+$
0.651	$7/2^+$	0.65009	$7/2^+$	0.6500	$5/2^+$
		0.65180	$3/2^+$	0.6517	$3/2^+$
0.798	$5/2^+$			0.7980	$9/2^+$
		0.8036	$3/2^-$	0.8031	$3/2^-$
0.843	$3/2^-$	0.8477	$7/2^-$	0.8475	$7/2^-$
0.877	$5/2^-$	0.8804	$5/2^-$	0.8806	$5/2^-$
0.915	$5/2^-$	0.9200	$9/2^-$	0.9200	$9/2^-$
				0.9680	$5/2^-$
				1.0100	$5/2^+$
				1.0350	$9/2^+$
				1.0800	$7/2^-$
1.102	$7/2^+$			1.1070	$5/2^-$
				1.1400	$5/2^+$
				1.1970	$9/2^-$
				1.220	$3/2^+$
1.247	$9/2^-$				
				1.2520	$5/2^+$
				1.2520	$5/2^-$
1.270	$1/2^-$			1.2770	$3/2^-$

<u>0.65009 level</u> Log ft = 5.9 from ^{103}Ru ($5/2^+$) suggests $3/2^+$, $5/2^+$, $7/2^+$. No γ to $1/2^-$, $3/2^-$ select $7/2^+$.

<u>0.7980 level</u> Observed in (p,p'), but could be identified with 0.8036 level.

<u>0.9680 level</u> Experimental information was not available.

<u>1.0100 level</u> No experimental evidence could be found.

<u>1.0350 level</u> No experimental evidence could be found.

<u>1.0800 level</u> No experimental evidence could be found.

$^{103}_{45}Rh$

1.1070 level	$3/2^-$ or $5/2^-$ from Coulomb excitation.
1.1400 level	No experimental evidence could be found.
1.1970 level	No experimental evidence could be found.
1.220 level	No experimental evidence could be found.
1.2520 level	No experimental evidence could be found.
1.2520 level	No experimental evidence could be found.
1.2770 level	$3/2^-$ from Coulomb excitation.

2.12 $^{104}_{46}Pd$

Adopted		Revised		RCN	
0.0	0^+	0.0	0^+	0.0	0^+
0.55581	2^+	0.55581	2^+	0.5557	2^+
1.32359	4^+	1.32359	4^+	1.3230	4^+
1.33359	0^+	1.33359	0^+	1.3240	0^+
1.34168	2^+	1.34168	2^+	1.3410	2^+
1.79286	0^+	1.79286	0^+	1.7930	0^+
1.79383	$2^+(1^+)$	1.79383	2^+	1.7940	2^+
1.82065	2^+	1.82065	3^+	1.8210	3^+
1.9416	5^+	1.9416	5^+	1.9410	5^+
1.948	6^+				
2.08238	4^+	2.08238	4^+	2.0820	4^+
				2.1020	2^+
				2.1260	4^+
				2.1390	2^+
				2.1790	3^+
				2.1820	4^+

2.1020 level	No experimental evidence could be found.
2.1260 level	(d,t) shows ℓ=2+4?. No selection for J. π=+.
2.1390 level	Found in (p,p') and (n,n'γ). γ to 2^+.
2.1790 level	(d,t) shows ℓ=2+4?. γ to 2^+ in (n,n'γ).
2.1820 level	(^{13}C,3nγ)[10] suggests 4^+.

2.13 $^{105}_{46}Pd$

Adopted ('74)		Revised		RCN	
0.0	$5/2^+$	0.0	$5/2^+$	0.0	$5/2^+$
0.2804	$3/2^+$	0.28051	$3/2^+$	0.2851	$3/2^+$
0.3062	$7/2^+$	0.30626	$7/2^+$	0.3063	$7/2^+$
0.3191	$5/2^+$	0.31918	$5/2^+$	0.3192	$5/2^+$
0.3444	$1/2^+$	0.34452	$1/2^+$	0.3445	$1/2^+$
0.4427	$7/2^+$	0.44223	$7/2^+$	0.4422	$5/2^+$
0.4890	$11/2^-$	0.48911	$11/2^-$	0.4891	$11/2^-$
0.5607	$3/2^+$	0.56075	$5/2^+$	0.5608	$5/2^+$
0.6444	$7/2^-$	0.64450	$7/2^-$	0.6445	$7/2^-$
0.6506	$3/2^+$	0.65069	$3/2^+$	0.6507	$3/2^+$
0.6731	$7/2^+$	0.67318	$1/2^+$	0.6732	$1/2^+$
		0.694	$7/2^+$	0.6940	$7/2^+$
0.7271	$5/2^+$	0.72717	$5/2^+$	0.7272	$5/2^+$
0.78	$9/2^-$	0.7813	$9/2^+$	0.7813	$5/2^+$
		0.787	$1/2^+$	0.7870	$1/2^+$
				0.8500	$5/2^-$
		0.9294	$7/2^+$	0.9294	$7/2^+$
		0.939	$1/2^+$	0.9390	$1/2^+$
0.9623	$5/2^+$	0.96237	$1/2^+$	0.9624	$3/2^+$
		0.9702	$15/2^-$		
		0.979	$5/2^+$	0.9790	$5/2^+$
1.0015	$5/2^+$				
		1.0118	$11/2^+$		
				1.0400	$3/2^+$
		1.0722	$5/2^+$	1.0720	$5/2^+$
		1.075	$1/2^+$	1.0750	$1/2^+$
1.0878	$3/2^-$	1.08793	$3/2^-$	1.0880	$3/2^-$
		1.0984	$5/2^+$	1.0980	$5/2^+$
		1.141	$1/2^+$	1.1410	$7/2^+$
				1.1710	$7/2^-$
				1.2010	$3/2^+$
				1.2200	$1/2^+$
				1.2500	$9/2^-$

$^{105}_{46}Pd$

0.44223 level	(^{12}C,3nγ) [11] suggests $7/2^+$.
0.7813 level	(^{12}C,3nγ) shows $9/2^+$.
0.8500 level	No experimental evidence could be found.
0.96237 level	Log ft = 7.7 from $1/2^-$ ^{105}Ag suggests $1/2^+$, $3/2^+$. No γ to $7/2^+$ prefers $1/2^+$.
0.9702 level	(^{12}C,3nγ) suggests $15/2^-$.
1.0118 level	(^{12}C,3nγ) suggests $11/2^+$.
1.0440 level	No experimental evidence could be found.
1.141 level	ℓ=0 in (d,p) and (d,t) suggests $1/2^+$.
1.1710 level	No experimental evidence could be found.
1.2010 level	ℓ=2 in (d,p) and (d,t) suggests $3/2^+$ or $5/2^+$.
1.2200 level	No experimental evidence could be found.
1.2500 level	No experimental evidence could be found.

2.14 $^{106}_{46}Pd$

Adopted		Revised		RCN	
0.0	0^+	0.0	0^+	0.0	0^+
0.51185	2^+	0.51185	2^+	0.5119	2^+
1.12802	2^+	1.12802	2^+	1.1280	2^+
1.1336	0^+	1.1336	0^+	1.1340	0^+
1.2292	4^+	1.2292	4^+	1.2290	4^+
1.5580	3^+	1.5580	3^+	1.5580	3^+
1.5621	2^+	1.5621	2^+	1.5620	2^+
1.7061	0^+	1.7061	0^+	1.7060	0^+
1.9104	2^+	1.9104	2^+	1.9090	2^+
1.9323	4^+	1.9323	4^+	1.9320	4^+
2.0012	0^+	2.0012	0^+	2.0010	0^+
2.0761	6^+	2.0761	6^+	2.0760	6^+
2.0774	4^+	2.0774	4^+	2.0770	4^+
2.0843	3^-	2.0843	3^-	2.0840	3^-
				2.1900	2^+
2.2424	2^+	2.2424	2^+	2.2420	2^+
2.2780	0^+	2.2780	0^+	2.2780	0^+
2.2829	4^+	2.2829	4^+	2.2830	4^+
2.3060	4^-	2.3060	4^-	2.3060	4^-
2.3086	2^+	2.3086	2^+	2.3090	2^+
2.3508	4^+	2.3508	4^+	2.3510	4^+
2.3660	4^+	2.3660	4^+		
		2.3973	5^-		
2.4014	3^-	2.4014	3^-		
2.4386	2^+	2.4386	2^+		

2.1900 level No experimental evidence could be found.

2.3660 level γ-ray angular distribution from polarized ^{106m}Ag nuclei[12] suggests 4^+.

2.3973 level $(^{13}C,3n\gamma)$[10,13] suggests 3^-.

2.4014 level (n,γ) suggests 4^+.

2.4386 level γ's to 0^+, 2^+, 4^+ levels suggest 2^+.

2.15 $^{107}_{46}Pd$

Adopted ('74)		Revised		RCN	
0.0	$5/2^+$	0.0	$5/2^+$	0.0	$5/2^+$
0.1157	$1/2^+$	0.1157	$1/2^+$	0.1157	$1/2^+$
0.214	$11/2^-$	0.214	$11/2^-$	0.2140	$11/2^-$
0.3028	$5/2^+$	0.3028	$5/2^+$	0.3028	$5/2^+$
0.3122	$7/2^+$	0.3122	$7/2^+$	0.3122	$7/2^+$
0.3482	$3/2^+$	0.3482	$1/2^+$	0.3482	$5/2^+$
0.366	$9/2^+$	0.366	$9/2^+$	0.3660	$9/2^+$
0.3819	$3/2^+$	0.3819	$3/2^+$	0.3819	$3/2^+$
0.3924	$7/2^+$	0.3924	$7/2^+$	0.3924	$5/2^-$
0.412	$1/2^+$	0.412	$1/2^+$	0.4120	$1/2^+$
0.4712	$3/2^+$	0.4712	$3/2^+$	0.4712	$3/2^+$
0.5677	$5/2^+$	0.5677	$5/2^+$	0.5677	$5/2^+$
				0.6200	$7/2^-$
0.6701	$5/2^+$	0.6701	$5/2^+$	0.6701	$5/2^+$
0.685	$7/2^-$	0.685	$7/2^-$	0.6850	$7/2^+$
0.698	$1/2^+$	0.698	$1/2^+$	0.6980	$1/2^+$
0.759	$3/2^+$	0.759	$3/2^+$	0.7590	$3/2^+$
0.781	$3/2^-$	0.781	$3/2^-$	0.7810	$3/2^-$
0.806	$1/2^-$	0.806	$3/2^-$	0.8060	$5/2^+$
		0.809	$5/2^+$	0.8070	$5/2^-$
0.889	$1/2^+$	0.889	$1/2^+$	0.8890	$1/2^+$
				0.9300	$3/2^+$
				0.9500	$9/2^+$
				0.9800	$7/2^+$
1.023	$5/2^+$	1.023	$3/2^+$	1.023	$3/2^+$
				1.0400	$3/2^+$
				1.0600	$3/2^-$
				1.0710	$3/2^+$
				1.1020	$7/2^+$
				1.1130	$5/2^+$
				1.1200	$1/2^+$
				1.1490	$5/2^-$
				1.1600	$3/2^+$
				1.1670	$1/2^+$
				1.2140	$5/2^+$

$^{107}_{46}Pd$

0.3482 level No β from ^{107}Rh ($5/2^+$, $7/2^+$) suggests J=1/2 or J>9/2. γ's from $5/2^+$ and to $1/2^+$, $5/2^+$ prefers $1/2^+$.

0.3924 level Log ft =5.8 in ^{107}Rh ($5/2^+$, $7/2^+$) decay suggests $3/2^+$ to $9/2^+$. γ's to $5/2^+$, $7/2^+$ but no γ to $1/2^+$ prefers $7/2^+$ or $9/2^+$. No reason exists to choose $7/2^+$.

0.6200 level No experimental evidence could be found.

0.685 level ℓ=3 in (d,p) suggests $7/2^-$.

0.806 and 0.809 levels Doublet of ℓ=1 and 2 is suggested in (d,p), thus $1/2^-$, $3/2^-$ and $3/2^+$, $5/2^+$ are probable to both levels. $5/2^+$ is suggested in (d,p) to 0.809 level. $3/2^-$ is suggested in (d,p) to one of 0.806-0.809 doublet.

0.9300 level No experimental evidence could be found.

0.9500 level No experimental evidence could be found.

0.9800 level No experimental evidence could be found.

1.0400 level No experimental evidence could be found.

1.0600 level No experimental evidence could be found.

1.0710 level (d,p) and (d,t) suggest $3/2^+$ or $5/2^+$.

1.1020 level Log ft = 5.8 from ^{107}Rh ($5/2^+$,$7/2^+$) decay suggests $3/2^+$ to $9/2^+$. No γ to $1/2^+$ suggests $7/2^+$ or $9/2^+$.

1.1130 level (d,p) suggests $3/2^+$, but $5/2^+$ is still possible.

1.1200 level ℓ=0 in (d,t) shows $1/2^+$.

1.1490 level Probable β from ^{107}Rh ($5/2^+$, $7/2^+$) with log ft = 6.0 suggests $3/2^+$ to $9/2^+$. No γ to $1/2^+$ suggests $7/2^+$ or $9/2^+$.

1.1600 level $3/2^+$ is suggested in (d,p).

1.1670 level ℓ=0 in (d,t) shows $1/2^+$.

1.2140 level ℓ=2 in (d,p) and (d,t) suggests $3/2^+$ or $5/2^+$.

2.16 $^{108}_{46}Pd$

Adopted		Revised		RCN	
0.0	0^+	0.0	0^+	0.0	0^+
0.4340	2^+	0.4340	2^+	0.4340	2^+
0.9312	2^+	0.9312	2^+	0.9312	2^+
1.0483	4^+	1.0483	4^+	1.0480	4^+
1.0528	0^+	1.0528	0^+	1.0530	0^+
1.3142	0^+	1.3142	0^+	1.3140	0^+
1.3356	3^+	1.3356	3^+	1.3350	3^+
1.4411	2^+	1.4411	2^+	1.4410	2^+
1.5400	1^+	1.5400	1^+	1.5400	2^+
				1.6100	0^+
				1.7000	4^+
1.771	6^+	1.771	6^+		
2.046	3^-	2.046	3^-		
		2.141	0^+		
		2.214	2^+		
		2.2825	5^+		
		2.318	5^-		
		2.362	2^+		
		2.392	2^+		

1.5400 level (n,n'γ) suggests 1^+, 2^+. No γ to 4^+ selects 1^+.

1.6100 level Observed in (p,p') and (d,d'). No evidence for spin assignment.

1.7000 level No experimental evidence could be found.

1.771 level (n,n'γ) and (t,p)[14] show 6^+.

2.046 level (n,n'γ) and (t,p) show 3^-.

2.141 level (t,p) shows 0^+.

2.214 level (t,p) shows 2^+.

2.2825 level No β from low-spin ^{108}Rh, but populated indirectly from high-spin ^{108}Rh decay suggest J>3. No γ to 0^+, 2^+ but 3^+, 4^+ implies 5^+.

2.318 level (t,p) shows 5^-.

2.362 level (t,p) shows 2^+.

2.392 level (t,p) shows 2^+.

2.17 $^{110}_{46}Pd$

Adopted		Revised		RCN	
0.0	0^+	0.0	0^+	0.0	0^+
0.3738	2^+	0.3738	2^+	0.3738	2^+
0.8138	2^+	0.8138	2^+	0.8138	2^+
0.9205	4^+	0.9205	4^+	0.9205	4^+
0.9463	0^+	0.9463	0^+	0.9463	0^+
1.171	0^+	1.171	0^+	1.1710	0^+
1.2124	3^+	1.2124	3^+	1.2110	3^+
1.2145	2^+	1.2145	2^+	1.2150	2^+
				1.3090	4^+
1.3980	4^+	1.3980	4^+	1.3980	2^+
1.4701	1^+	1.4701	1^+	1.4700	1^+
1.5739	6^+	1.5739	6^+		

<u>1.3090 level</u> Observed in (p,p') only at 4 angles.

<u>1.3980 level</u> (n,n'γ) suggests 2^+, 3^+, 4^+. No γ to 0^+ rules out 2^+ possibility. No reason exists to choose 4^+.

<u>1.5739 level</u> (n,n'γ) suggests 6^+.

2.18 $^{107}_{47}Ag$

Adopted		Revised		RCN	
0.0	$1/2^-$	0.0	$1/2^-$	0.0	$1/2^-$
0.0931	$7/2^+$	0.0931	$7/2^+$	0.0931	$7/2^+$
0.1257	$9/2^+$	0.1257	$9/2^+$	0.1254	$7/2^+$
0.3246	$3/2^-$	0.3246	$3/2^-$	0.3248	$3/2^-$
0.4226	$5/2^-$	0.4226	$5/2^-$	0.4230	$5/2^-$
				0.6000	$5/2^+$
0.7864	$3/2^-$	0.7864	$3/2^-$	0.7867	$3/2^-$
				0.8500	$3/2^+$
0.9220	$5/2^+$	0.9220	$5/2^+$	0.9221	$5/2^+$
0.9490	$5/2^-$	0.9490	$5/2^-$	0.9497	$5/2^-$
0.9732	$7/2^-$	0.9732	$7/2^-$		
1.060	$1/2^-$	1.060	$1/2^-$		
1.1424	$9/2^-$	1.1424	$9/2^-$		
1.160	$(5/2^-)$	1.160	$5/2^-$		
		1.221	$11/2^-$		
1.224	$5/2^+$	1.224	$5/2^+$		

<u>0.1257 level</u> No ε-transition from ^{107}Cd $(5/2^+)$ decay suggests J=1/2 or J>7/2. M1 transition to $7/2^+$ prefers $9/2^+$.

<u>0.6000 level</u> No experimental evidence could be found.

<u>0.8500 level</u> No experimental evidence could be found.

<u>0.9732 level</u> (p,t) reaction[15] suggests $7/2^-$.

<u>1.060 level</u> (p,t) reaction suggests $1/2^-$.

<u>1.1424 level</u> (p,t) reaction suggests $9/2^-$.

<u>1.160 level</u> Weakly populated directly in ^{107}Cd $(5/2^+)$ decay suggests $3/2^-$, $5/2^-$, $7/2^-$. γ's to $1/2^-$, $3/2^-$, $5/2^-$ implies $3/2^-$ or $5/2^-$, but $5/2^-$ is more probable since γ to $1/2^-$ is weaker than others.

<u>1.221 level</u> (p,t) reaction[15] suggests $11/2^-$.

<u>1.2224 level</u> Log ft = 6.7 in ^{107}Cd $(5/2^+)$ decay suggests $3/2^+$, $5/2^+$, $7/2^+$. E1 γ to $3/2^-$ and γ to $9/2^+$ imply $5/2^+$.

2.19 $^{109}_{47}Ag$

Adopted		Revised		RCN	
0.0	$1/2^-$	0.0	$1/2^-$	0.0	$1/2^-$
0.088032	$7/2^+$	0.088032	$7/2^+$	0.0880	$7/2^+$
0.1328	$9/2^+$	0.1328	$9/2^+$	0.1328	$9/2^+$
0.3114	$3/2^-$	0.3114	$3/2^-$	0.3114	$3/2^-$
0.4153	$5/2^-$	0.4153	$5/2^-$	0.4153	$5/2^-$
				0.6970	$7/2^+$
0.7019	$3/2^-$	0.7019	$3/2^-$	0.7019	$3/2^-$
				0.7070	$3/2^+$
0.7244	$3/2^+$	0.7244	$3/2^+$	0.7244	$5/2^+$
0.7353	$5/2^+$	0.7353	$5/2^+$	0.7353	$5/2^+$
				0.8110	$3/2^+$
0.8398	$7/2^-$	0.8398	$7/2^-$	0.8398	$1/2^-$
0.8627	$5/2^-$	0.8627	$5/2^-$	0.8627	$5/2^-$
0.8695	$5/2^+$	0.8695	$5/2^+$	0.8695	$5/2^+$
0.9110	$7/2^-$	0.9110	$7/2^-$	0.9110	$7/2^+$
0.9123	$3/2^+$	0.9123	$3/2^+$		
		1.0906	$9/2^-$		

0.6970 level No experimental evidence could be found.

0.7070 level No experimental evidence could be found.

0.7244 level E1 γ's to $3/2^-$ and $5/2^-$ level implies $3/2^+$ or $5/2^+$. γ to $1/2^-$ selects $3/2^+$.

0.8110 level No experimental evidence could be found.

0.8398 level Log ft = 8.9 in ^{109}Pd ($5/2^+$) decay suggests $3/2^-$, $5/2^-$, $7/2^-$. γ to $9/2^+$ and no γ to $1/2^-$ select $7/2^-$.

0.9110 level Log ft = 8.5 in ^{109}Pd ($5/2^+$) decay suggests $3/2^-$, $5/2^-$, $7/2^-$. γ's to $9/2^+$, $7/2^+$ and no γ to $1/2^-$ select $7/2^-$.

0.9123 level Log ft = 6.7 in ^{109}Pd ($5/2^+$) decay suggests $3/2^+$, $5/2^+$, $7/2^+$. No γ to $9/2^+$ but γ's to $3/2^-$, $5/2^-$ prefers $3/2^+$.

1.0906 level (p,t) reaction[14] suggests $9/2^-$.

2.20 $^{127}_{53}I$

Adopted		Revised		RCN	
0.0	$5/2^+$	0.0	$5/2^+$	0.0	$5/2^+$
0.05760	$7/2^+$	0.0576	$7/2^+$	0.0576	$7/2^+$
0.20284	$3/2^+$	0.20284	$3/2^+$	0.2028	$3/2^+$
0.37496	$1/2^+$	0.37496	$1/2^+$	0.3750	$1/2^+$
0.4179	$5/2^+$	0.4179	$5/2^+$	0.4179	$5/2^+$
0.6184	$3/2^+$	0.6184	$3/2^+$	0.6184	$3/2^+$
0.6286	$7/2^+$	0.6286	$7/2^+$	0.6286	$7/2^+$
0.6510	$9/2^+$	0.6510	$9/2^+$	0.6510	$9/2^+$
0.7165	$11/2^+$	0.7165	$11/2^+$	0.7165	$11/2^+$
0.7446	$9/2^+$	0.7446	$9/2^+$	0.7446	$9/2^+$
		0.9910	$3/2^+$	0.9910	$3/2^+$
				1.0440	$5/2^+$
				1.0950	$5/2^+$

<u>1.0440 level</u> Not possible to find unique J^π from existing evidence.

<u>1.0950 level</u> Not possible to select unique J^π from existing data.

2.21 $^{129}_{53}I$

Adopted ('74)		Revised		RCN	
0.0	$7/2^+$	0.0	$7/2^+$	0.0	$7/2^+$
0.02777	$5/2^+$	0.02777	$5/2^+$	0.0278	$5/2^+$
0.27842	$5/2^+$	0.27842	$3/2^+$	0.2784	$3/2^+$
0.48738	$3/2^+$	0.48738	$5/2^+$	0.4874	$5/2^+$
				0.5597	$1/2^+$
0.55957	$1/2^+$	0.55957	$1/2^+$	0.5610	$1/2^+$
0.69598	$11/2^+$	0.69598	$11/2^+$	0.6960	$11/2^+$
0.72962	$9/2^+$	0.72962	$9/2^+$	0.7296	$9/2^+$
0.7689	$7/2^-$	0.7689	$7/2^+$	0.7688	$7/2^+$
0.8299	$3/2^+$	0.8299	$3/2^+$	0.8300	$3/2^+$
0.8450	$7/2^-$	0.8450	$7/2^+$	0.8450	$7/2^+$
		1.047	$3/2^+$		
1.0504	$9/2^+$	1.0504	$7/2^+$		
1.052	$5/2^+$				
1.11175	$3/2^+$	1.11175	$5/2^+$		
1.210	$1/2^+$	1.210	$1/2^+$		
1.2608	$5/2^+$	1.2608	$5/2^+$		
1.2821	$3/2^+$	1.2821	$3/2^+$		
1.2922	$3/2^+$	1.2922	$1/2^+$		
1.4016	$9/2^+$	1.04016	$9/2^+$		
		1.4835	$1/2^+$		

<u>0.5597 level</u> No experimental evidence could be found for $5/2^+$ level.

<u>1.047 level</u> $\ell=2$ in (^{3}He,d) suggests $3/2^+$, $5/2^+$. No reason exists to choose $3/2^+$.

<u>1.0504 level</u> Log ft=10.5 from $11/2^-$ ^{129}Te suggests $7/2^+$ or $15/2^+$. γ to $7/2^+$ selects $7/2^+$.

<u>1.11175 level</u> Log ft=5.7 from $3/2^+$ ^{129}Te suggests $1/2^+$, $3/2^+$, $5/2^+$. γ to $7/2^+$ rules out $1/2^+$ possibility. No reason exists to choose $5/2^+$.

<u>1.210 level</u> $\ell=0$ in (^{3}He,d) shows $1/2^+$.

<u>1.2608 level</u> $\ell=2$ in (^{3}He,d) suggests $3/2^+$, $5/2^+$. No reason exists to choose $5/2^+$.

$^{129}_{53}I$

<u>1.2821 level</u> Log ft=7.2 from $3/2^+$ ^{129}Te suggests $1/2^+$, $3/2^+$, $5/2^+$. γ to $7/2^+$ rules out $1/2^+$ possibility. No reason exists to choose $3/2^+$.

<u>1.2922 level</u> Log ft=6.8 from $3/2^+$ ^{129}Te suggests $1/2^+$, $3/2^+$, $5/2^+$. No γ to $7/2^+$ but to $1/2^+$, $3/2^+$, $5/2^+$ prefers $1/2^+$.

<u>1.4016 level</u> Log ft=8.5 from $11/2^-$ ^{129}Te suggests $9/2^+$, $11/2^+$, $13/2^+$. γ to $5/2^+$ selects $9/2^+$.

<u>1.4835 level</u> ℓ =0 in (^3He,d) shows $1/2^+$.

2.22 $^{133}_{55}Cs$

Adopted ('74)		Revised		RCN	
0.0	$7/2^+$	0.0	$7/2^+$	0.0	$7/2^+$
0.0810	$5/2^+$	0.080977	$5/2^+$	0.0810	$5/2^+$
0.1605	$5/2^+$	0.161618	$5/2^+$	0.1606	$5/2^+$
0.3828	$3/2^+$	0.383851	$3/2^+$	0.3839	$3/2^+$
0.4371	$1/2^+$	0.437002	$1/2^+$	0.437	$1/2^+$
0.605	$11/2^-$	0.605	$11/2^-$	0.605	$11/2^-$
0.633	$11/2^+$	0.6325	$11/2^+$	0.633	$11/2^+$
0.641	$3/2^+$	0.6412	$3/2^+$	0.642	$3/2^+$
0.706	$7/2^+$	0.7060	$7/2^+$	0.706	$7/2^+$
0.768	$9/2^+$	0.7687	$9/2^+$	0.769	$9/2^+$
0.787	$7/2^+$	0.787	$7/2^+$	0.787	$7/2^+$
0.819	$7/2^+$	0.819	$9/2^+$	0.819	$5/2^+$
0.873	$9/2^+$	0.8718	$9/2^+$	0.872	$9/2^+$
0.917	$3/2^+$	0.917	$3/2^+$	0.917	$3/2^+$

<u>0.819 level</u> (n,n'γ) suggests $5/2^+$,$7/2^+$,$9/2^+$.
No γ to $1/2^+$ and $3/2^+$ levels select $9/2^+$.

2.23 $^{139}_{57}La$

Adopted		Revised		RCN	
0.0	$7/2^+$	0.0	$7/2^+$	0.0	$7/2^+$
0.1658	$5/2^+$	0.1658	$5/2^+$	0.1660	$5/2^+$
(0.570	$3/2^+$)				
(0.830	$3/2^+$)				
(0.930	$9/2^+$)				
(1.070	$7/2^+$)				
1.206	$1/2^+$	1.206	$1/2^+$	1.206	$1/2^+$
1.2191	$9/2^+$	1.2191	$9/2^+$	1.219	$9/2^+$
1.2566	$5/2^+$	1.2566	$5/2^+$	1.257	$5/2^+$
1.3813	$7/2^+$	1.3813	$7/2^+$	1.382	$7/2^+$
1.4205	$7/2^+$	1.4205	$7/2^+$	1.421	$7/2^+$
1.439	$11/2^-$	1.439	$11/2^-$	1.439	$11/2^-$
1.4764	$5/2^+$	1.4764	$7/2^+$	1.477	$7/2^+$
1.5363	$7/2^+$	1.5363	$7/2^+$	1.536	$7/2^+$
1.5582	$3/2^+$	1.5582	$3/2^+$	1.558	$3/2^+$
1.5782	$9/2^+$	1.5782	$9/2^+$	1.578	$9/2^+$
1.6831	$7/2^+$	1.6831	$7/2^+$	1.683	$7/2^+$
				1.714	$5/2^+$
				1.756	$7/2^+$
				1.762	$3/2^+$
				1.767	$9/2^+$
				1.775	$1/2^+$
				1.820	$5/2^+$
				1.838	$7/2^-$
				1.857	$3/2^+$
				1.894	$11/2^+$
				1.922	$5/2^+$
				1.943	$13/2^+$

<u>1.714 level</u> No β from ^{139}Ba ($7/2^-$) suggests $1/2^{\pm}$, $3/2^-$, or $11/2^-$, >11/2. γ to $7/2^+$ in (n,n'γ) and (α,α') suggests π=+. Spin assignment is impossible based on these evidences.

<u>1.756 level</u> No β from ^{139}Ba ($7/2^-$) suggests $1/2^{\pm}$, $3/2^-$ or $11/2^-$, >11/2. γ to $7/2^+$ in (n,n'γ) and the (n,n'γ) data

$^{139}_{57}La$

suggests π=+. Spin assignment is impossible based on these evidences.

1.762 level Log ft=8.8 from ^{139}Ba ($7/2^-$) suggests $3/2^+$, $5/2^+$, $7/2^+$, $9/2^+$, $11/2^+$. Nuclear Data Sheets indentified this level with 9/2 level found in (γ,γ').

1.767 level Log ft=9.5 from ^{139}Ba ($7/2^-$) suggests $3/2^+$, $11/2^+$ or $5/2^+$, $7/2^+$, $9/2^+$. γ's to $7/2^+$ and $5/2^+$ prefers $3/2^+$.

1.775 level No β from ^{139}Ba ($7/2^-$) suggests $1/2^{\pm}$, $3/2^-$ or $11/2^-$, >11/2. π=+ in (α,α').

1.820 level No β from ^{139}Ba ($7/2^-$) suggests $1/2^{\pm}$, $3/2^-$ or $11/2^-$, >11/2. γ to $7/2^+$ in (n,n'γ). =0, 2 in (^{3}He,d) suggests π=+. Spin assignment is impossible based on these evidences.

1.838 level No β from ^{139}Ba ($7/2^-$) suggests $1/2^{\pm}$, $3/2^-$ or $11/2^-$, >11/2. γ to $7/2^+$ in (n,n'γ).

1.857 level Log ft=9.5 from ^{139}Ba ($7/2^-$) suggests $3/2^+$, $11/2^+$ or $5/2^+$, $7/2^+$, $9/2^+$. ℓ =2 in (^{3}He,d) suggests $3/2^+$, $5/2^+$.

1.894 level No β from ^{139}Ba ($7/2^-$) suggests $1/2^{\pm}$, $3/2^-$, $11/2^-$, >11/2. γ from $9/2^-$ in (γ,γ').

1.922 level Log ft=9.4 from ^{139}Ba ($7/2^-$) suggests $3/2^+$, $11/2^+$ or $5/2^+$, $7/2^+$, $9/2^+$. γ's to $5/2^+$ and $7/2^+$.

1.943 level No β from ^{139}Ba ($7/2^-$) suggests $1/2^{\pm}$, $3/2^-$, $11/2^-$, >11/2. π=+ in (α,α').

2.24 $^{141}_{59}Pr$

Adopted		Revised		RCN	
0.0	$5/2^+$	0.0	$5/2^+$	0.0	$5/2^+$
0.145440	$7/2^+$	0.145440	$7/2^+$	0.1455	$7/2^+$
1.118	$11/2^-$	1.118	$11/2^-$	1.118	$11/2^-$
1.1270	$3/2^+$	1.1270	$3/2^+$	1.127	$3/2^+$
1.2927	$5/2^+$	1.2927	$5/2^+$	1.293	$5/2^+$
1.2986	$1/2^+$	1.2986	$1/2^+$	1.299	$1/2^+$
1.4350	$3/2^+$	1.4350	$3/2^+$	1.435	$3/2^+$
1.4502	$7/2^+$	1.4502	$7/2^+$	1.451	$7/2^+$
1.4561	$5/2^-$	1.4561	$5/2^-$	1.456	$5/2^+$
				1.493	$9/2^+$
				1.513	$5/2^+$
				1.520	$9/2^+$
				1.570	$11/2^+$
				1.578	$5/2^+$
				1.604	$7/2^+$
				1.608	$3/2^+$
				1.651	$9/2^+$
				1.655	$3/2^+$
				1.657	$1/2^+$
				1.764	$5/2^-$
				1.767	$13/2^+$
				1.783	$5/2^+$
				1.809	$3/2^-$
				1.823	$5/2^+$
				1.846	$5/2^+$

<u>1.4561 level</u> Log ft=8.7 from ^{141}Nd ($3/2^+$) suggests $1/2^-$, $3/2^-$, $5/2^-$, or possibly $7/2^-$. $\gamma\gamma'(\theta)$ suggests 5/2 or 9/2, thus $5/2^-$ is selected. However, (d,d') suggests π=+ probably.

<u>1.493 level</u> No ε-decay from ^{141}Nd ($3/2^+$) suggests $7/2^+$, >7/2. γ to $7/2^+$ but not to $5/2^+$.

<u>1.513 level</u> No ε-decay from ^{141}Nd ($3/2^+$) suggests $7/2^+$, >7/2. Probable γ's from 7/2 and $5/2^+$ in (γ,γ').

$^{141}_{59}Pr$

<u>1.520 level</u> No ε-decay from ^{141}Nd ($3/2^+$) suggests $7/2^+$, $>7/2$. γ's to $5/2^+$ and $7/2^+$. (d,d') suggests π=+.

<u>1.570 level</u> No ε-decay from ^{141}Nd ($3/2^+$) suggests $7/2^+$, $>7/2$. Only a γ to $11/2^-$ level in (α,2nγ).

<u>1.578 level</u> If this is identified with 1.5802 level populated in ^{141}Nd decay, log ft=7.0 suggests $1/2^{\pm}$, $3/2^{\pm}$, $5/2^{\pm}$. γ's to $5/2^+$ and $7/2^+$ selects $3/2^+$ and $5/2^{\pm}$.

<u>1.604 level</u> No ε-decay from ^{141}Nd ($3/2^+$) suggests $7/2^+$, $>7/2$. ℓ=2 in (^3He,d).

<u>1.608 level</u> Log ft=6.9 from ^{141}Nd ($3/2^+$) suggests $1/2^+$, $3/2^+$, $5/2^+$. No γ to $7/2^+$ but $5/2^+$ prefers $1/2^+$.

<u>1.651 level</u> No ε-decay from ^{141}Nd ($3/2^+$) suggests $7/2^+$, $>7/2$. Only a γ to $5/2^+$ in (n,n'γ).

<u>1.655 level</u> Probable γ's from $5/2^-$ and $5/2^+$.

<u>1.657 level</u> Log ft=7.9 from ^{141}Nd ($3/2^+$) suggests $1/2^{\pm}$, $3/2^{\pm}$, $5/2^{\pm}$. No γ to $7/2^+$ but $5/2^+$ selects $1/2^+$, $3/2^-$.

<u>1.764 level</u> Observed in (d,d').

<u>1.767 level</u> Only a γ to $11/2^-$ in (α,2nγ).

<u>1.783 level</u> γ's to $5/2^+$ and $7/2^+$ in (n,n'γ).

<u>1.809 level</u> γ's to $5/2^+$ and $7/2^+$ in (n,n'γ).

<u>1.823 level</u> Reported in (n,n') experiment.

<u>1.846 level</u> γ from $5/2^+$ in (γ,γ').

3. Step-wise Diagrams for Distribution of Low-lying levels

The step-wise diagrams for the different distribution of low-lying levels are illustrated in Figs. 3.1~3.24, where the solid lines are those revised by us and dashed lines by Gruppelaar. The straight lines are obtained by fitting the level distribution with

$$N(E) = k\ e^{E/T},$$

where E is excitation energy of nucleus (in MeV), T is the nuclear temperature (in MeV) and N(E) is number of the excited levels up to the excitation energy E. The values of k and T are tabulated in Table 1 for odd-A and even-even nuclides. It seems to be seen the even-odd effect in T or k, T is larger or k is smaller for even-even nuclide compared to odd-A, if quite rough consideration is applicable. The exceptions are seen in the cases of ^{139}La and ^{141}Pr. There exist, however, the large energy gaps near the ground state as shown in Figs. 3.23 and 3.24, because these nuclei have neutron magic number (N=82). We gave, therefore, the additional values of k and T, which were obtained by fitting the level distribution above the second excited states with $N(E)-2 = k.e^{(E-Eo)/T}$. The results give good trends for the above mentioned systematics.

Fig. 3.1~3.24 Step-wide diagrams for distribution of low-lying levels for 24 nuclides by the present authors (solid lines) and by Gruppelaar[2)] (dashed lines). The straight lines are fitted by N(E)=k exp(E/T). The notations are the followings; N(E) : Number of levels up to excitation energy E

E : excitation energy of nucleus (in MeV)

T : nuclear temperature (in MeV)

k : proportional constant.

4. Examples of Calculated Inelastic Scattering and Capture Cross Sections

Calculated inelastic scattering cross sections for typical cases, ^{101}Ru, ^{103}Rh and ^{139}La, are compared using different level schemes, previously adopted and revised recently by JAERI, and reported by Petten. The computer code CASTHY has been used with optical potential parameters obtained by fitting the total cross sections.

Partial cross sections of inelastic scattering from each level are tabulated in Table 2~4. Total inelastic scattering cross sections are illustrated as a function of the neutron energy in Figs. 4.1(a)~4.3(a). The cross sections for (n,γ) reactions are also illustrated in Figs.4.1(b)~4.3(b).

5. Remarks

This report was a part of works on evaluation of fission product nuclear data for about 100 important nuclides. The purpose of this work was to clarify the present status of the level information and how the ambiguity of the experimental data affects the evaluation of inelastic scattering and capture cross sections. However, the level scheme proposed here are still not so satisfactory because of the very complex and poor information of the experimental data. In many cases, we were

obliged to construct our level schemes using not only strong argument but also weak argument. In some cases, the spin-parities have been unwillingly selected without any reasonable arguments only when the assignments were necessary in calculating the cross section. Therefore, it is very desirable for our purpose to obtain more acculate information of the nuclear structure of FP nuclides.

We wish to propose the level schemes of about 100 important nuclides in the near future as the next step of this evaluation work.

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Table 1 Values of parameters, k and T, for distribution of low-lying levels of 24 important nuclides.

odd-A					even-even A				
	T[MeV]		k			T[MeV]		k	
Nuclide	Revised	RCN	Revised	RCN	Nuclide	Revised	RCN	Revised	RCN
^{93}Nb	0.591	0.568	1.307	1.271	^{96}Mo	0.910	0.892	0.897	0.873
^{95}Mo	0.632	0.561	1.267	1.092	^{98}Mo	0.859	0.770	0.920	0.804
^{97}Mo	0.507	0.455	1.041	1.035	^{100}Mo	0.979	0.792	1.265	1.070
^{99}Tc	0.499	0.525	1.856	1.826	^{102}Ru	0.865	0.822	1.125	1.064
^{101}Ru	0.365	0.257	1.777	1.183	^{104}Ru	0.708	0.803	1.070	1.726
^{103}Ru	0.445	0.482	1.783	1.934	^{104}Pd	0.920	0.840	0.991	0.905
^{105}Pd	0.383	0.403	1.572	1.696	^{106}Pd	0.777	0.786	0.912	0.931
^{107}Pd	0.356	0.421	1.995	2.432	^{108}Pd	0.919	0.704	1.306	0.990
^{107}Ag	0.610	0.527	1.790	1.727	^{110}Pd	0.644	0.610	1.027	0.978
^{109}Ag	0.475	0.412	1.662	1.545					
^{127}I	0.433	0.488	1.580	1.726					
^{129}I	0.561	0.415	1.707	1.382					
^{133}Cs	0.395	0.395	1.473	1.474					
$^{139}La_{82}$	0.738	0.620	1.079	0.874					
	*0.339	0.396	1.247	1.343					
$^{141}Pr_{82}$	0.829	0.581	1.188	0.857					
	*0.386	0.349	1.141	1.144					

* obtained by fitting the levels above 2nd excited state (E_o) with $N(E)-2=k\cdot e^{(E-E_o)/T}$.

Table 2 Partial cross section of inelastic scattering of neutron on each level of ^{101}Ru are tabulated for neutron energies of 0.5, 0.7 and 1.0 MeV. The first three columns are our level schemes, proposed previously and revised recently and those proposed by Gruppelaar, respectively. The next three columns are the partial cross section for each level in the three level schemes. The integrated inelastic scattering and capture cross sections are given in the last two lines for comparison.

						E_n=0.5 MeV			0.7 MeV			1.0 MeV		
Adopted		Revised		RCN		Adopt.	Revis.	RCN	Adopt.	Revis.	RCN	Adopt.	Revis.	RCN
0.0	$5/2^+$	0.0	$5/2^+$	0.0	$5/2^+$	1.621	1.530	1.530	1.009	0.8895	0.9024	0.5533	0.4658	0.5257
0.1271	$3/2^+$	0.12722	$3/2^+$	0.1272	$3/2^+$	0.3854	0.3498	0.3498	0.2694	0.2278	0.2298	0.1728	0.1448	0.1572
0.3067	$7/2^+$	0.30681	$7/2^+$	0.3068	$7/2^+$	0.4273	0.4103	0.4103	0.3699	0.3315	0.3382	0.2303	0.1926	0.2269
0.3112	$5/2^+$	0.3113	$5/2^+$	0.3113	$5/2^+$	0.4047	0.3785	0.3785	0.3563	0.3123	0.3164	0.2270	0.1924	0.2161
0.3254	$1/2^+$	0.3252	$1/2^+$	0.3252	$1/2^+$	0.0896	0.0783	0.0783	0.0885	0.0708	0.0712	0.0686	0.0555	0.0589
		0.3441	$3/2^+$	0.3441	$3/2^+$		0.1844	0.1844		0.1767	0.1782		0.1252	0.1356
0.422	$3/2^+$	0.4220	$3/2^+$	0.4220	$3/2^+$	0.0972	0.0872	0.0872	0.1792	0.1504	0.1516	0.1406	0.1176	0.1273
		0.4623	$1/2^+$	0.4623	$1/2^+$		0.0122	0.0122		0.0515	0.0518		0.0488	0.0517
0.528	$11/2^-$	0.528	$11/2^-$	0.528	$11/2^-$				0.0330	0.0302	0.0319	0.0501	0.0417	0.0476
0.5447	$7/2^+$	0.5450	$7/2^+$	0.5450	$7/2^+$				0.1867	0.1655	0.1692	0.1880	0.1570	0.1858
0.6161	$7/2^+$	0.6163	$7/2^+$	0.6163	$7/2^+$				0.0951	0.0837	0.0857	0.1711	0.1427	0.1692
		0.6235	$7/2^+$	0.6235	$7/2^+$					0.0748	0.0766		0.1411	0.1673
		0.6438	$9/2^+$	overlap.						0.0377	0.0038		0.1030	0.1637
0.6742	$3/2^+$	0.6741	$3/2^+$						0.0108	0.0089		0.1020	0.0849	
0.720	$7/2^+$	0.7200	$9/2^+$									0.1392	0.0864	
0.8426	$7/2^+$	0.8427	$7/2^+$									0.0842	0.0696	
0.9111	$7/2^+$	0.9119	$7/2^+$									0.0437	0.0357	
0.9282	$9/2^+$	0.9289	$9/2^+$									0.0278	0.0205	
0.9381	$7/2^+$	0.9383	$7/2^+$									0.0269	0.0222	
		0.959	$15/2^-$										0.0009	
1.0011	$11/2^+$	1.001	$11/2^+$											
		1.623	$19/2^-$											
		1.861	$15/2^+$											
		2.473	$23/2^-$											
					σ_{in}	1.404	1.501	1.501	1.589	1.722	1.705	1.627	1.780	1.707
					$\sigma_{n,\gamma}$	0.1491	0.1437	0.1437	0.1065	0.0925	0.0972	0.0855	0.0654	0.0780

Table 3 Partial cross section of inelastic scattering of neutron on ^{103}Rh. See the caption of Table 2.

						E_n=0.5 MeV			0.7 MeV			1.0 MeV		
Adopted		Revised		RCN		Adopt.	Revis.	RCN	Adopt.	Revis.	RCN	Adopt.	Revis.	RCN
0.0	$1/2^-$	0.0	$1/2^-$	0.0	$1/2^-$	1.8910	1.8841	1.8839	1.3242	1.3002	1.2934	0.8020	0.7666	0.7559
0.040	$7/2^+$	0.039750	$7/2^+$	0.0398	$7/2^+$	0.0736	0.0735	0.0735	0.0873	0.0804	0.0797	0.0905	0.0782	0.0747
0.093	$9/2^+$	0.093035	$9/2^+$	0.0930	$9/2^+$	0.0208	0.0208	0.0208	0.0291	0.0269	0.0269	0.0358	0.0302	0.0290
0.298	$3/2^-$	0.29498	$3/2^-$	0.2949	$3/2^-$	0.6293	0.6334	0.6335	0.5945	0.5865	0.5830	0.4152	0.3998	0.3936
0.360	$5/2^-$	0.35746	$5/2^-$	0.3574	$5/2^-$	0.3193	0.3230	0.3230	0.3878	0.3823	0.3802	0.3090	0.2931	0.2884
0.537	$5/2^+$	0.53684	$5/2^+$	0.5368	$5/2^+$				0.0848	0.0773	0.0751	0.0990	0.0855	0.0793
		0.60763	$7/2^+$	0.6072	$7/2^+$					0.0147	0.0147		0.0344	0.0327
0.651	$7/2^+$	0.65009	$7/2^+$	0.6500	$5/2^+$				0.0084	0.0076	0.0254	0.0369	0.0315	0.0663
		0.65180	$3/2^+$	0.6517	$3/2^+$					0.0463	0.0452		0.1095	0.1017
0.798	$5/2^+$			0.7980	$9/2^+$							0.0574		0.0068
		0.8036	$3/2^-$	0.8031	$3/2^-$								0.1959	0.1933
0.843	$3/2^-$	0.8477	$7/2^-$	0.8475	$7/2^-$							0.1657	0.0552	0.0545
0.877	$5/2^-$	0.8804	$5/2^-$	0.8806	$5/2^-$							0.0971	0.0887	0.0870
0.915	$5/2^-$	0.9200	$9/2^-$	0.9200	$9/2^-$							0.0620	0.0093	0.0093
		overlap		0.9680	$5/2^-$								0.0042	0.0120
				1.0100	$5/2^+$									
				1.0350	$9/2^+$									
				1.0800	$7/2^-$									
1.102	$7/2^+$			1.1070	$5/2^-$									
				1.1400	$5/2^+$									
				1.1970	$9/2^-$									
				1.220	$3/2^+$									
1.247	$9/2^-$													
				1.2520	$5/2^+$									
				1.2520	$5/2^-$									
1.270	$1/2^-$			1.2770	$3/2^-$									
					σ_{in}	1.0431	1.0506	1.0508	1.1918	1.2220	1.2300	1.3686	1.4153	1.4285
					$\sigma_{n,\gamma}$	0.1309	0.1303	0.1302	0.1049	0.0986	0.0975	0.0881	0.0767	0.0742

Table 4 Partial cross section of inelastic scattering of neutron on ^{139}La are tabulated for neutron energies of 1.0, 1.5 and 1.75 MeV. See the caption of Table 2.

						E_n= 1.0 MeV			1.5 MeV			1.75 MeV		
Adopted		Revised		RCN		Adopt.	Revis.	RCN	Adopt.	Revis.	RCN	Adopt.	Revis.	RCN
0.0	$7/2^+$	0.0	$7/2^+$	0.0	$7/2^+$	1.7315	1.9285	1.9286	1.1459	1.5099	1.5106	0.8421	1.0988	1.1070
0.1658	$5/2^+$	0.1658	$5/2^+$	0.1660	$5/2^+$	0.4817	0.5615	0.5614	0.3586	0.4981	0.4983	0.2759	0.3781	0.3780
0.570	$3/2^+$					0.1101			0.1395			0.1224		
0.830	$3/2^+$					0.0431			0.0916			0.0917		
0.930	$9/2^+$					0.1251			0.2639			0.2541		
1.070	$7/2^+$								0.1605			0.1689		
1.206	$1/2^+$	1.206	$1/2^+$	1.206	$1/2^+$				0.0121	0.0204	0.0204	0.0186	0.0295	0.0293
1.2191	$9/2^+$	1.2191	$9/2^+$	1.219	$9/2^+$				0.1341	0.1830	0.1831	0.1559	0.2051	0.2074
1.2566	$5/2^+$	1.2556	$5/2^+$	1.257	$5/2^+$				0.0598	0.0868	0.0867	0.0760	0.1075	0.1069
1.3813	$7/2^+$	1.3813	$7/2^+$	1.382	$7/2^+$				0.0559	0.0780	0.0778	0.0855	0.1145	0.1146
1.4205	$7/2^+$	1.4205	$7/2^+$	1.421	$7/2^+$				0.0427	0.0596	0.0594	0.0768	0.1027	0.1028
1.439	$11/2^-$	1.439	$11/2^-$	1.439	$11/2^-$				0.0326	0.0443	0.0443	0.0834	0.1073	0.1092
1.4764	$5/2^+$	1.4764	$7/2^+$	1.477	$7/2^+$				0.0112	0.0250	0.0244	0.0422	0.0868	0.0868
1.5363	$7/2^+$	1.5363	$7/2^+$	1.536	$7/2^+$							0.0530	0.0708	0.0710
1.5582	$3/2^+$	1.5582	$3/2^+$	1.558	$3/2^+$							0.0164	0.0264	0.0262
1.5782	$9/2^+$	1.5782	$9/2^+$	1.578	$9/2^+$							0.0583	0.0765	0.0773
1.6831	$7/2^+$	1.6831	$7/2^+$	1.683	$7/2^+$							0.0234	0.0314	0.0314
overlap		overlap		1.714	$5/2^+$							0.0206	0.0273	0.0142
				1.756	$7/2^+$									
				1.762	$3/2^+$									
				1.767	$9/2^+$									
				1.775	$1/2^+$									
				1.820	$5/2^+$									
				1.838	$7/2^-$									
				1.857	$3/2^+$									
				1.894	$11/2^+$									
				1.922	$5/2^+$									
				1.943	$13/2^+$									
					σ_{in}	0.7600	0.5615	0.5614	1.3625	0.9951	0.9944	1.6231	1.3639	1.3551
					$\sigma_{n,\gamma}$	0.0121	0.0136	0.0136	0.0112	0.0146	0.0146	0.0099	0.0122	0.0129

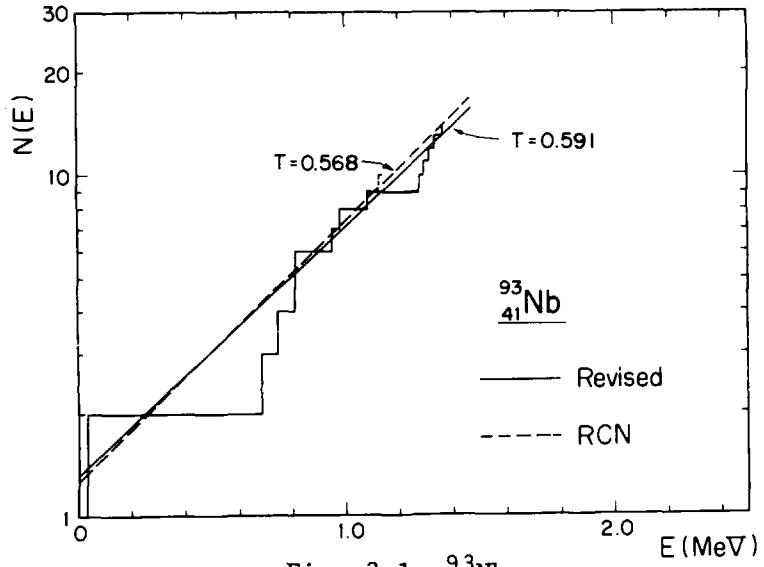


Fig. 3.1 ^{93}Nb

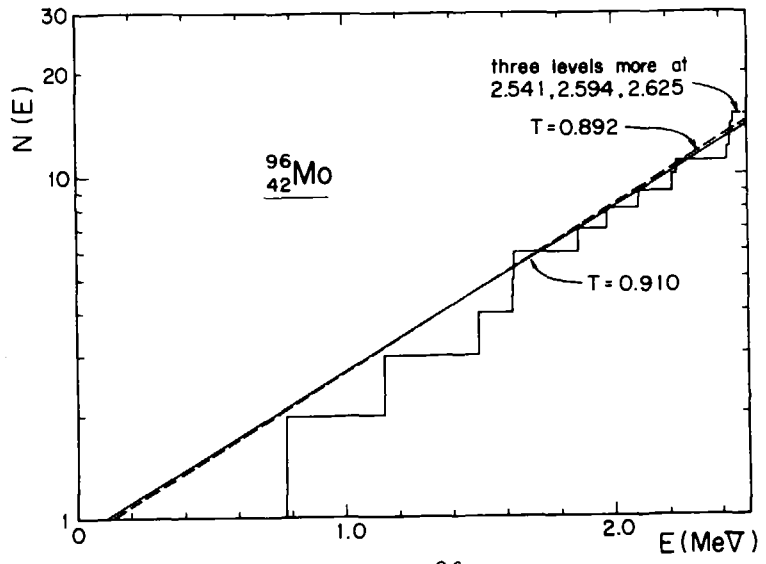


Fig. 3.3 ^{96}Mo

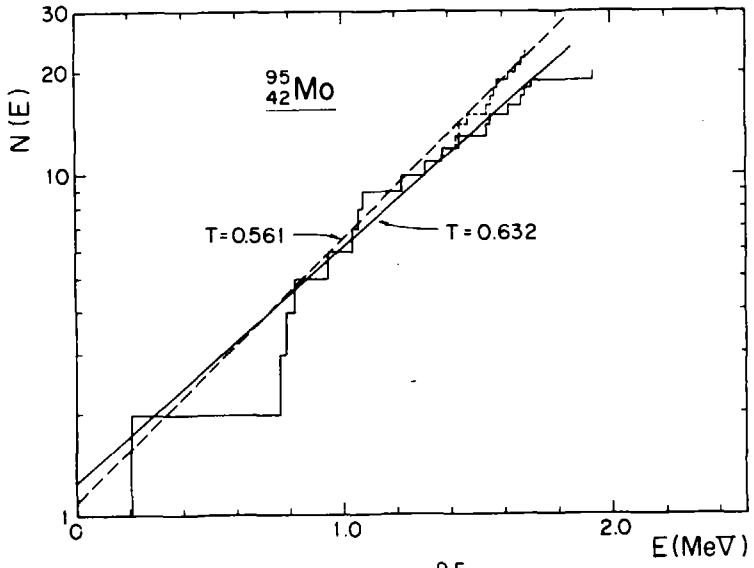


Fig. 3.2 ^{95}Mo

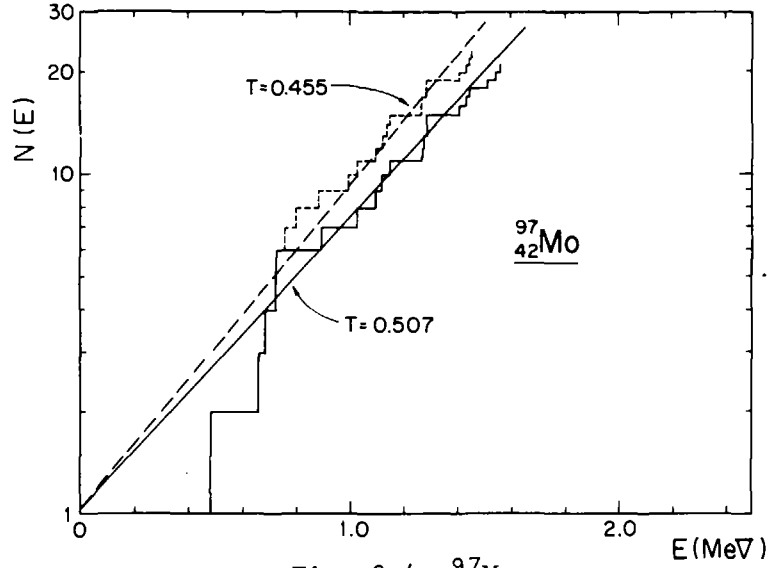


Fig. 3.4 ^{97}Mo

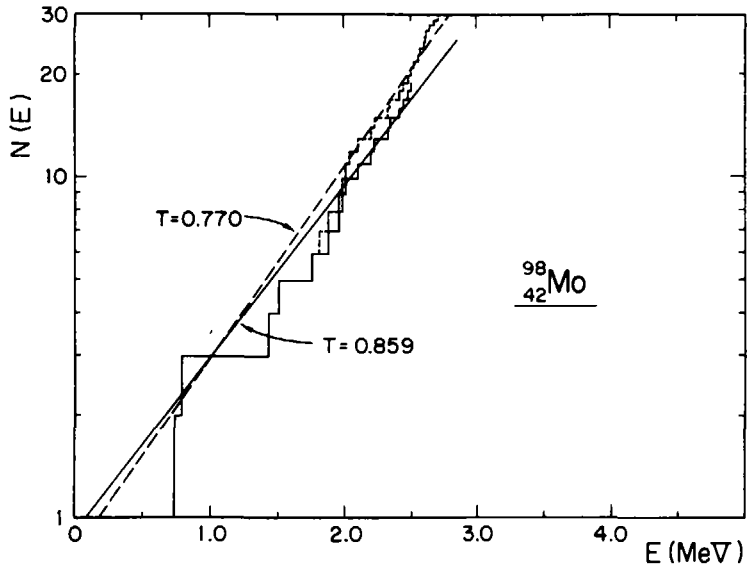


Fig. 3.5 ^{98}Mo

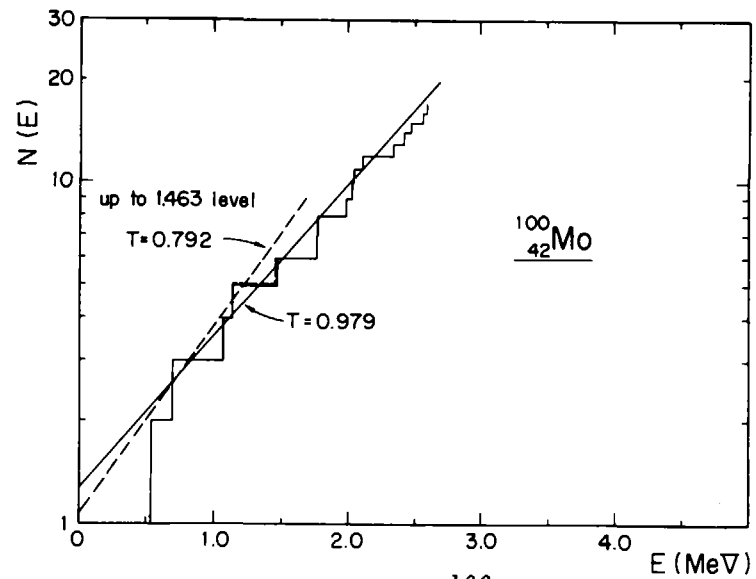


Fig. 3.6 ^{100}Mo

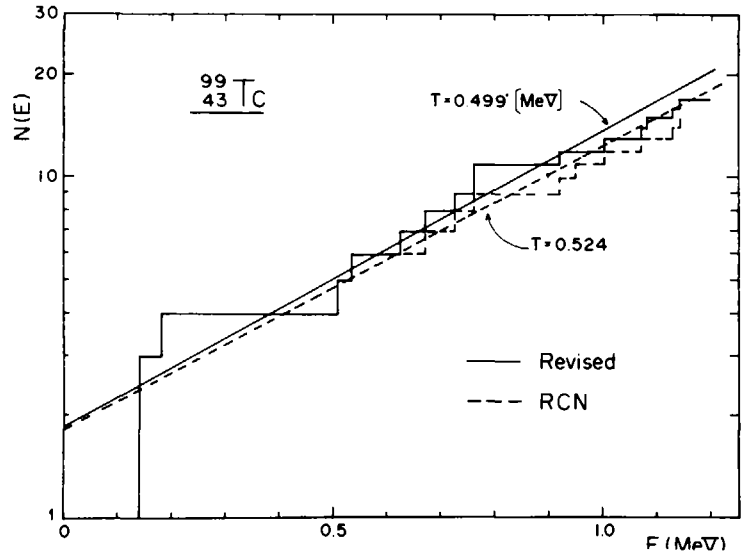


Fig. 3.7 ^{99}Tc

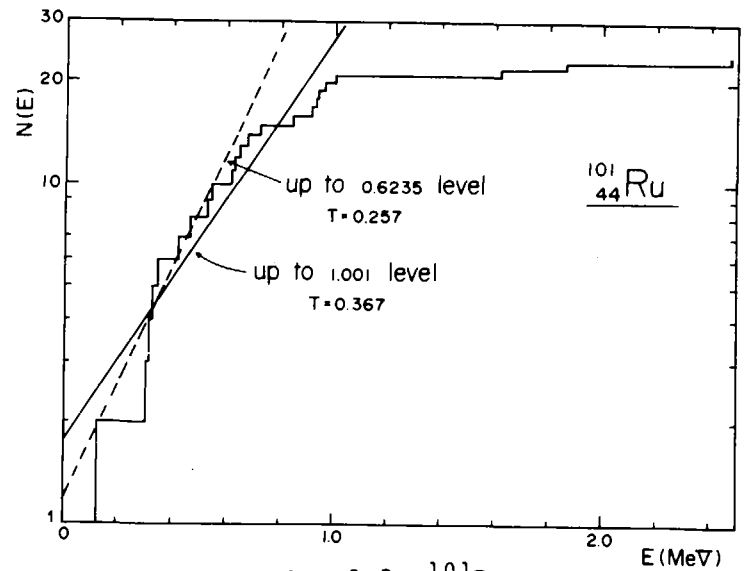


Fig. 3.8 ^{101}Ru

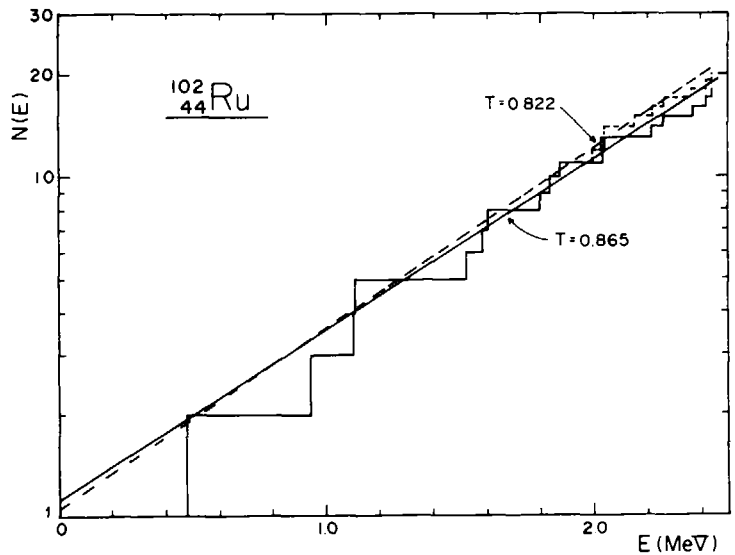


Fig. 3.9 ^{102}Ru

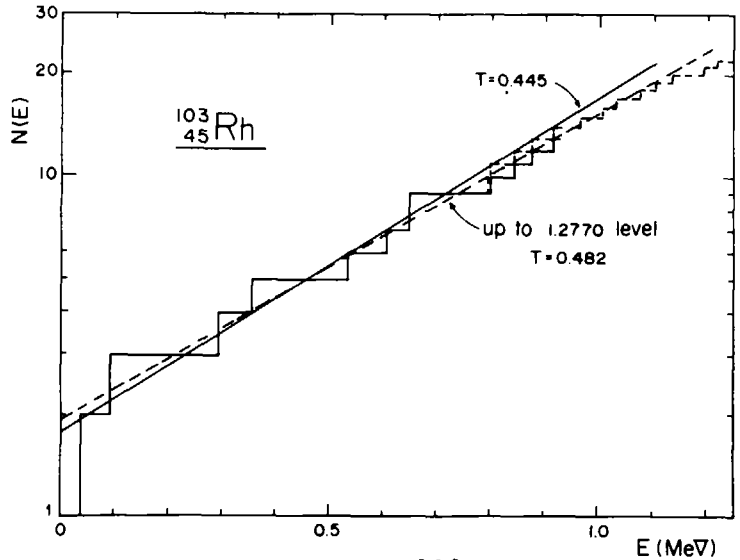


Fig. 3.11 ^{103}Rh

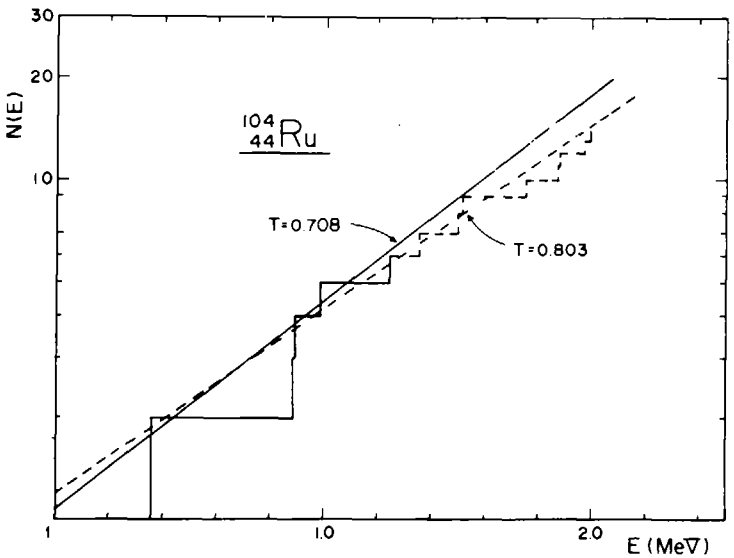


Fig. 3.10 ^{104}Ru

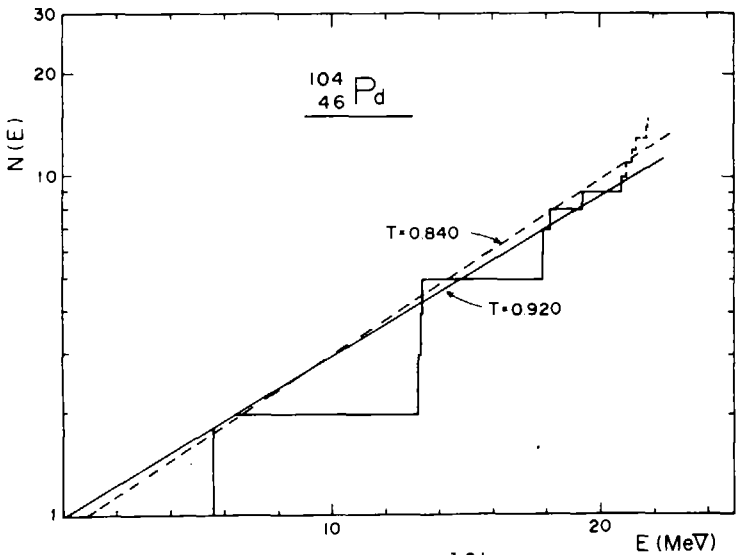


Fig. 3.12 ^{104}Pd

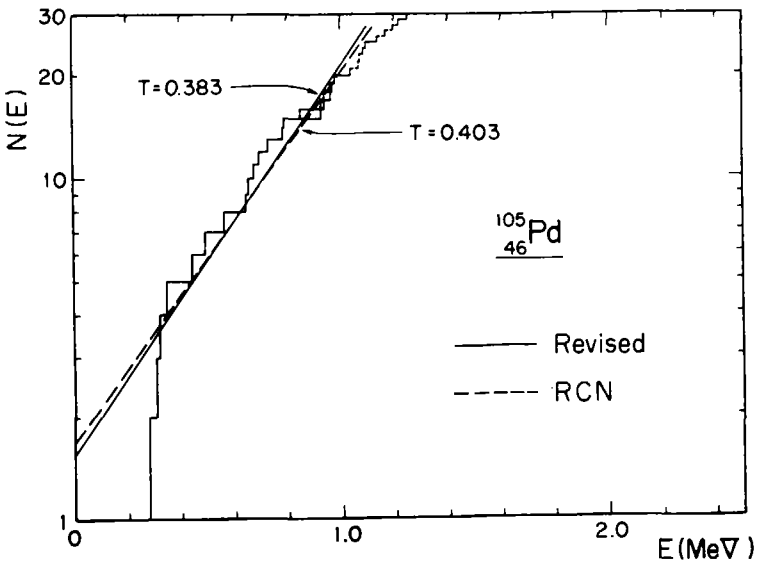


Fig. 3.13 ^{105}Pd

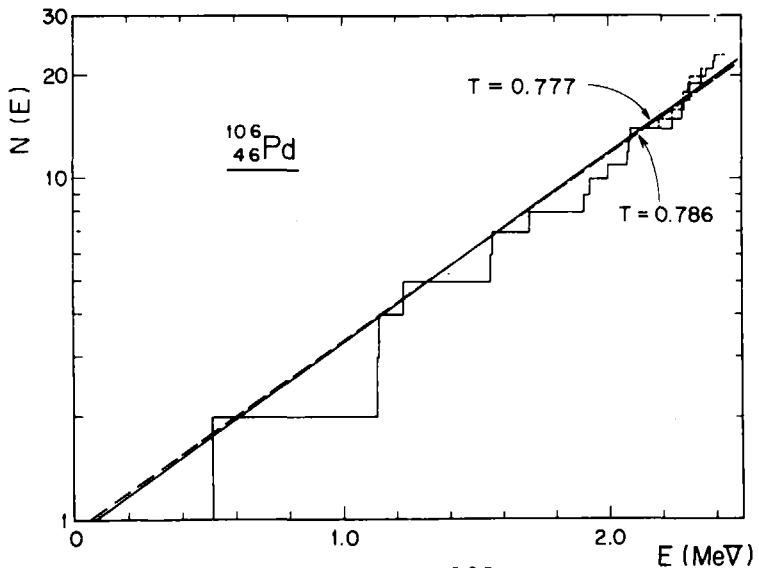


Fig. 3.14 ^{106}Pd

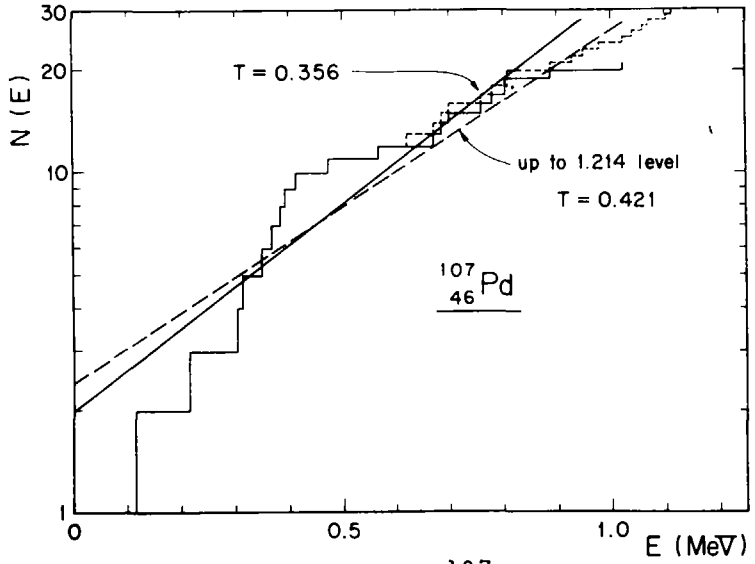


Fig. 3.15 ^{107}Pd

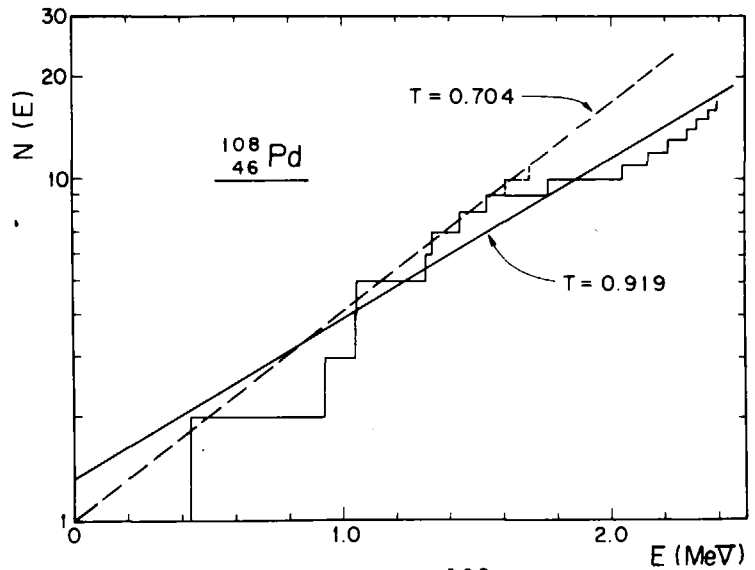


Fig. 3.16 ^{108}Pd

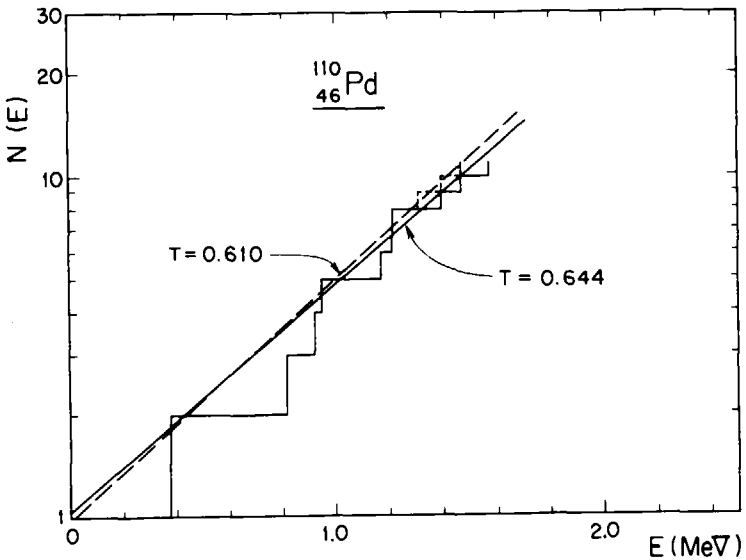


Fig. 3.17 ^{110}Pd

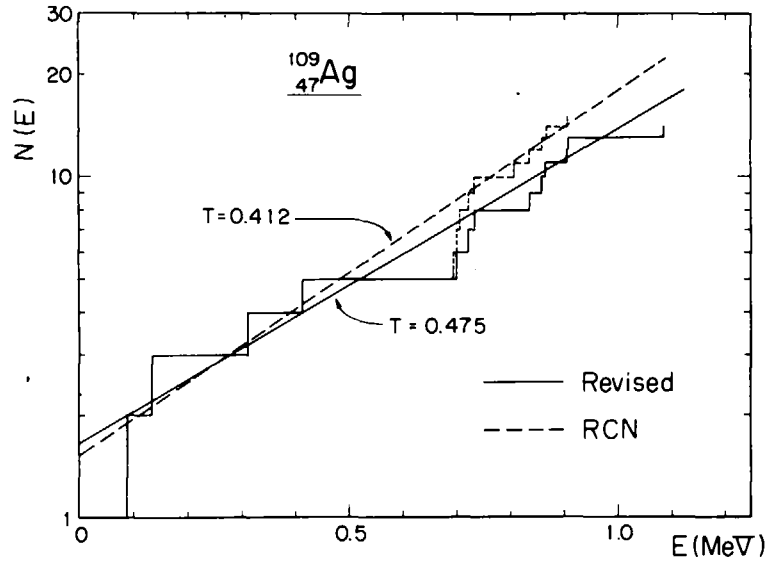
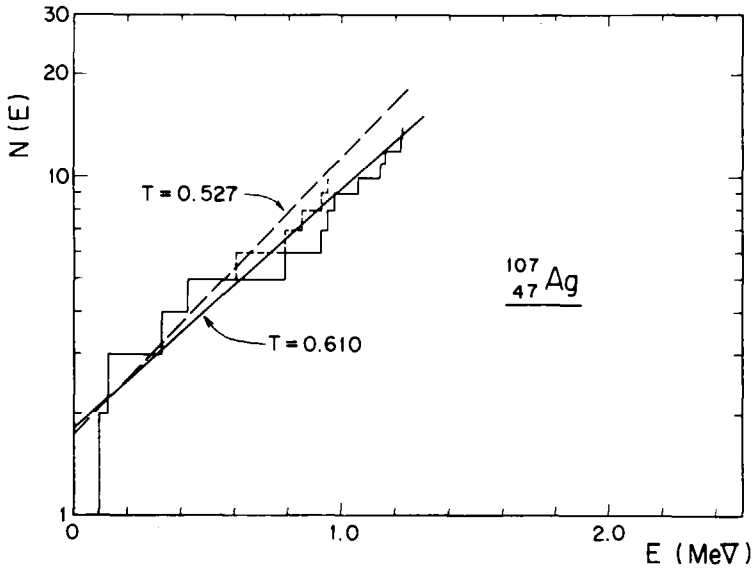


Fig. 3.19 ^{109}Ag



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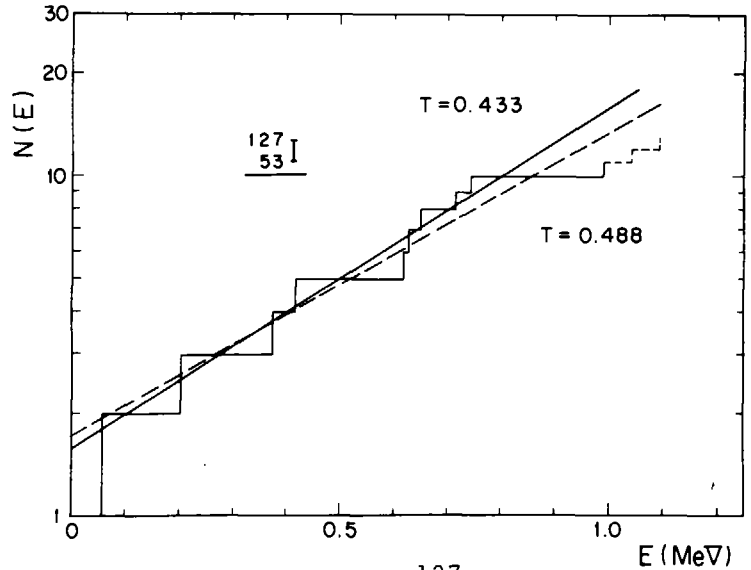

Fig. 3.20 ^{127}I

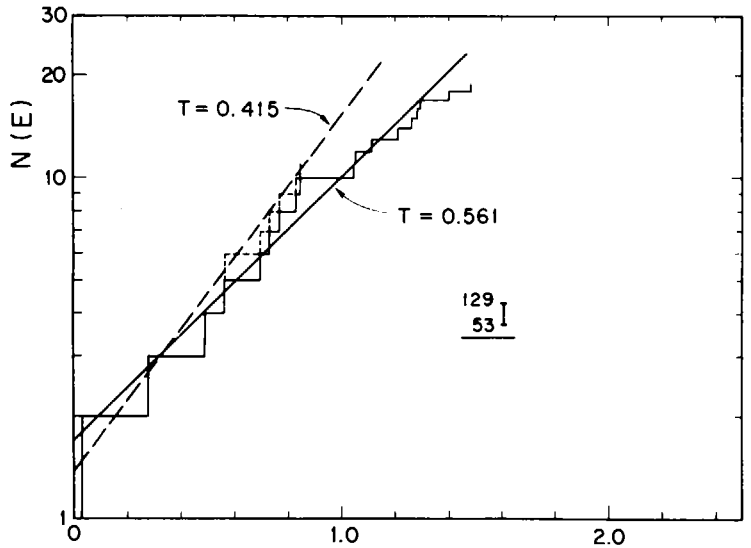

Fig. 3.21 ^{129}I

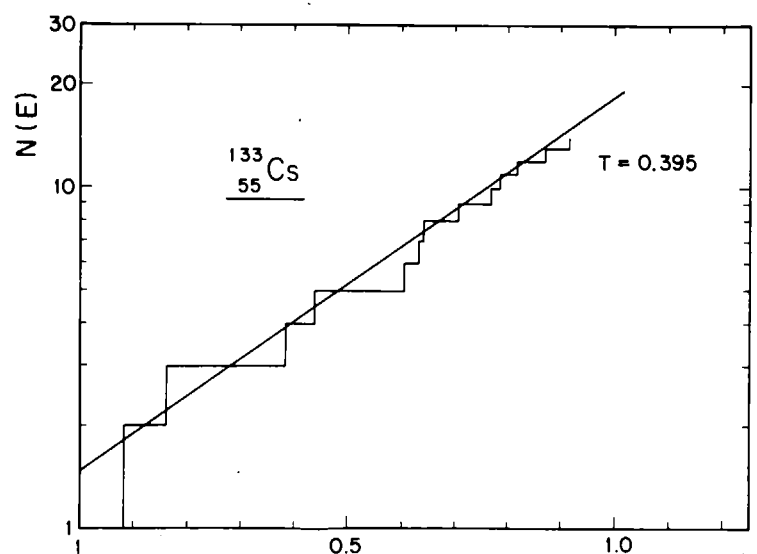

Fig. 3.22 ^{133}Cs

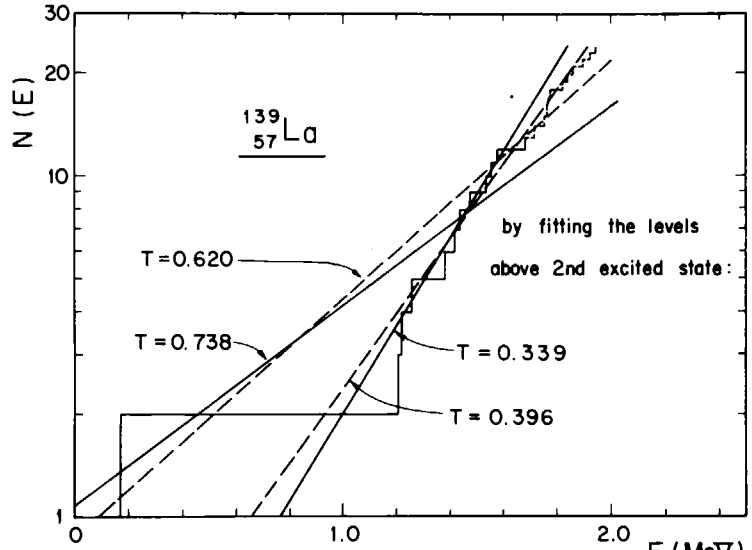

Fig. 3.23 ^{139}La

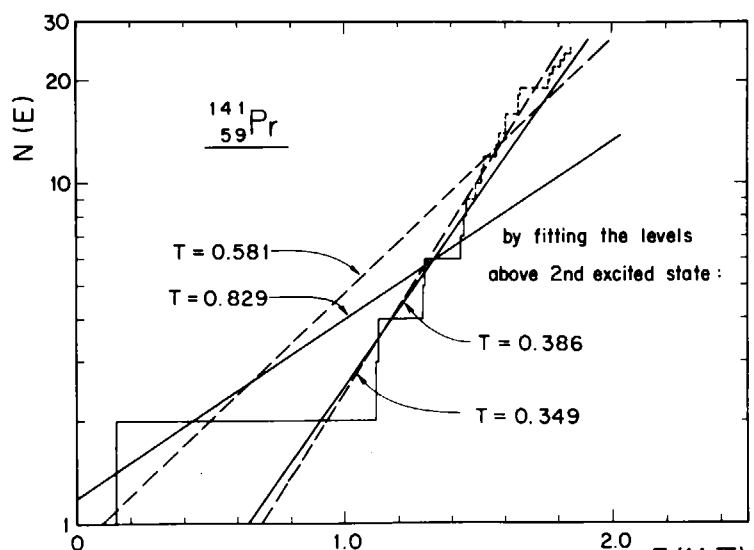

Fig. 3.24 ^{141}Pr

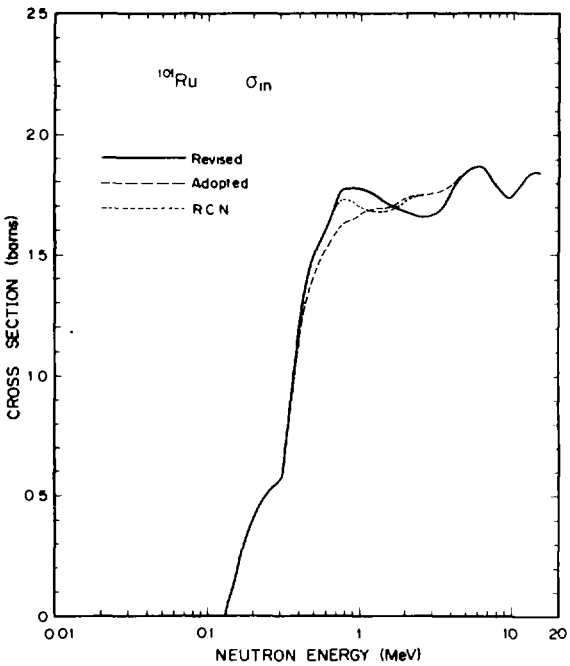

Fig. 4.1(a) Inelastic scattering cross section for ^{101}Ru

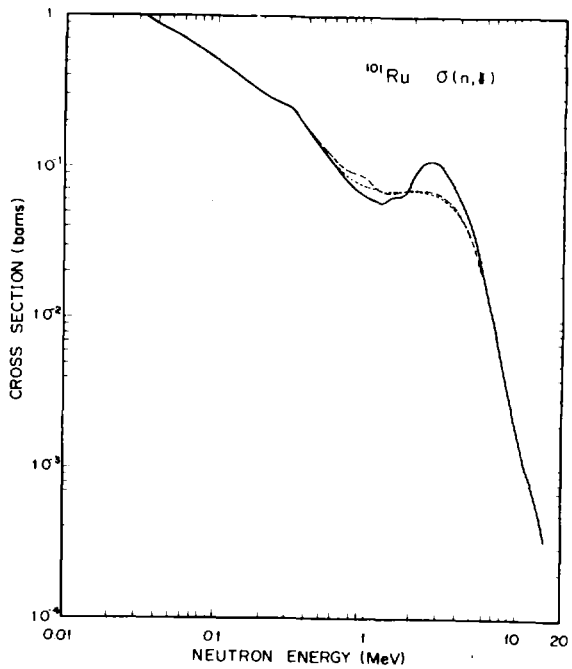

Fig. 4.1(b) Capture cross section for ^{101}Ru

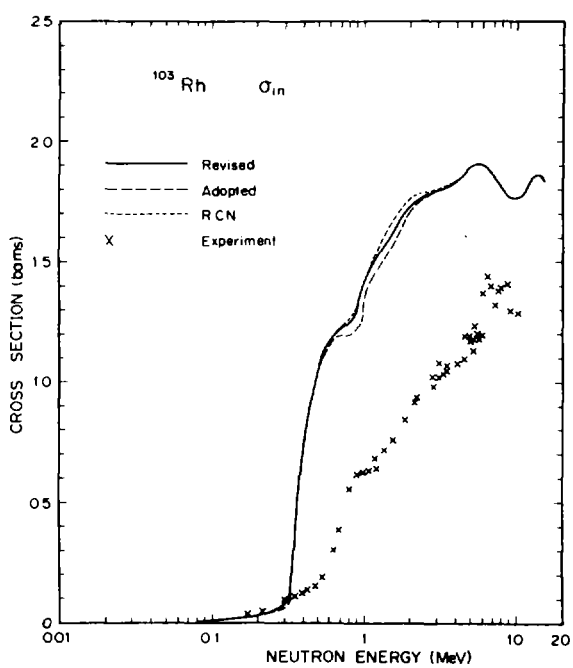

Fig. 4.2(a) Inelastic scattering cross section for ^{103}Rh

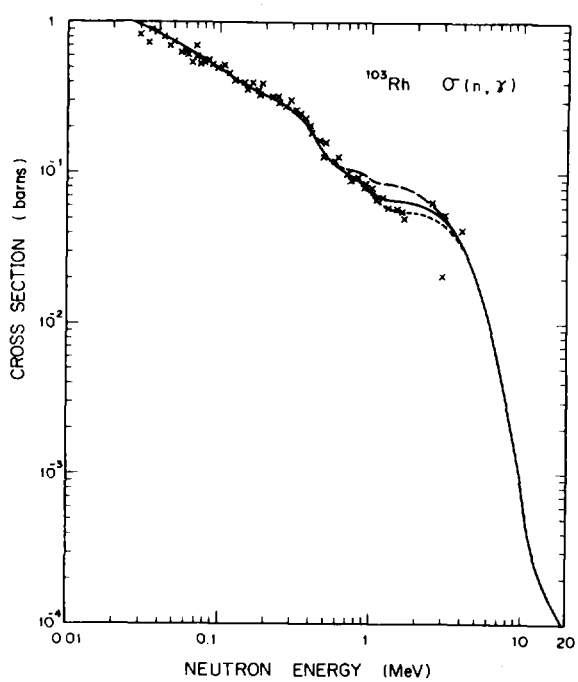

Fig. 4.2(b) Capture cross section for ^{103}Rh

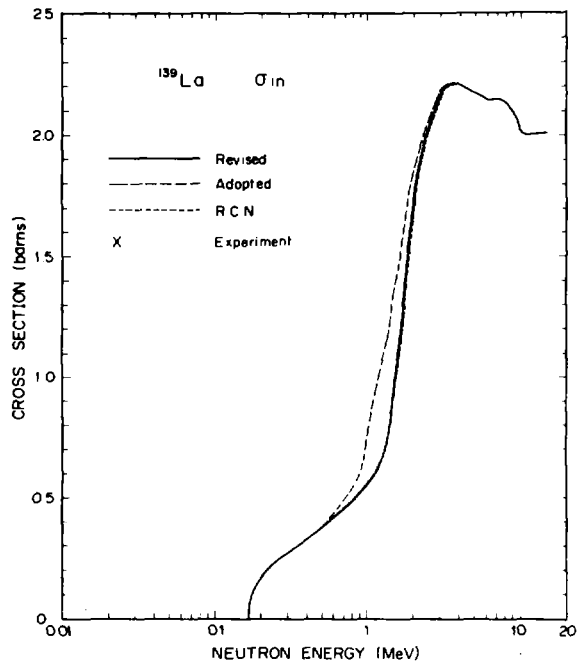

Fig. 4.3(a) Inelastic scattering cross section for ^{139}La

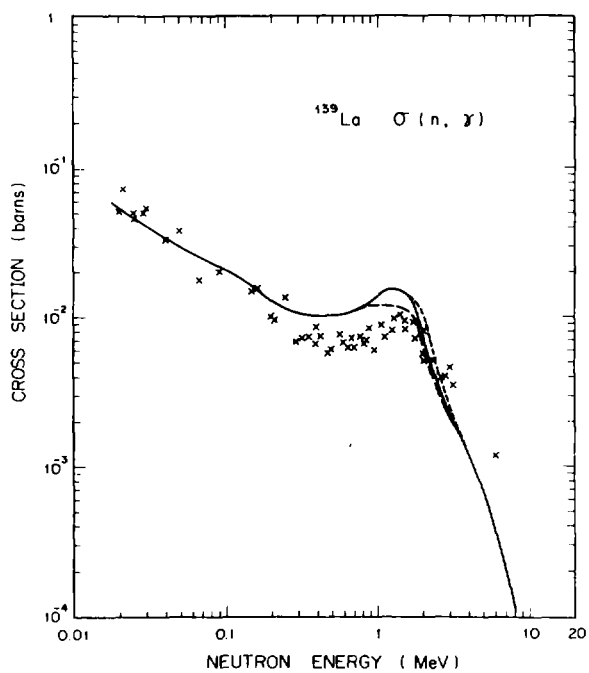

Fig. 4.3(b) Capture cross section for ^{139}La

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