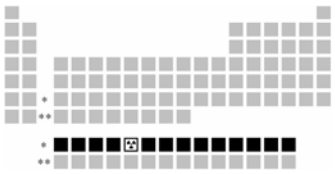

Table L.2 Ground electronic configurations of the lanthanides

Element	Symbol	Atomic number	Electronic Configuration
Lanthanum	**La**	57	[Xe] $4f^0\ 5d^1\ 6s^2$
Cerium	**Ce**	58	[Xe] $4f^1\ 5d^1\ 6s^2$
Praseodymium	**Pr**	59	[Xe] $4f^3\ 6s^2$
Neodymium	**Nd**	60	[Xe] $4f^4\ 6s^2$
Promethium	**Pm**	61	[Xe] $4f^5\ 6s^2$
Samarium	**Sm**	62	[Xe] $4f^6\ 6s^2$
Europium	**Eu**	63	[Xe] $4f^7\ 6s^2$
Gadolinium	**Gd**	64	[Xe] $4f^7\ 5d^1\ 6s^2$
Terbium	**Tb**	65	[Xe] $4f^9\ 6s^2$
Dysprosium	**Dy**	66	[Xe] $4f^{10}\ 6s^2$
Holmium	**Ho**	67	[Xe] $4f^{11}\ 6s^2$
Erbium	**Er**	68	[Xe] $4f^{12}\ 6s^2$
Thulium	**Tm**	69	[Xe] $4f^{13}\ 6s^2$
Ytterbium	**Yb**	70	[Xe] $4f^{14}\ 6s^2$
Lutetium	**Lu**	71	[Xe] $4f^{14}\ 5d^1\ 6s^2$

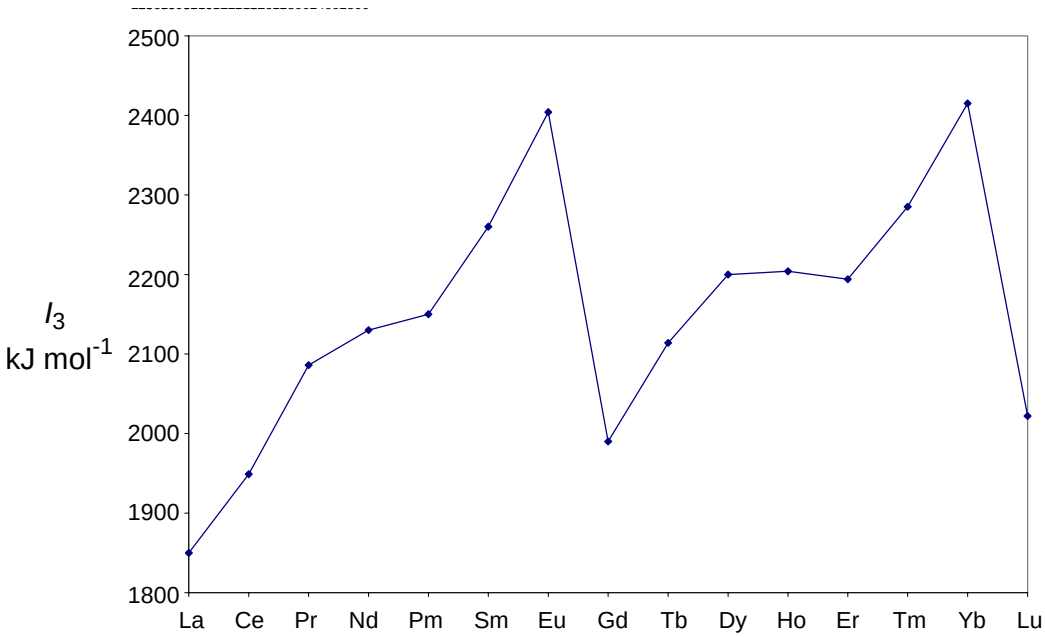

Figure L.1 The variation of the third ionization energy (I_3) of the lanthanides

Table L.3. Number of pairs of parallel spins for the f^n configurations.

Configuration		m	δm*	Configuration	m	δm*
f^1		0	0	f^8	21	0
f^2		1	1	f^9	22	1
f^3		3	2	f^{10}	24	2
f^4		6	3	f^{11}	27	3
f^5		10	4	f^{12}	31	4
f^6		15	5	f^{13}	36	5
f^7		21	6	f^{14}	42	6

*** δm** refers to the number of pairs of parallel spins lost for the process $f^n \rightarrow f^{n-1}$

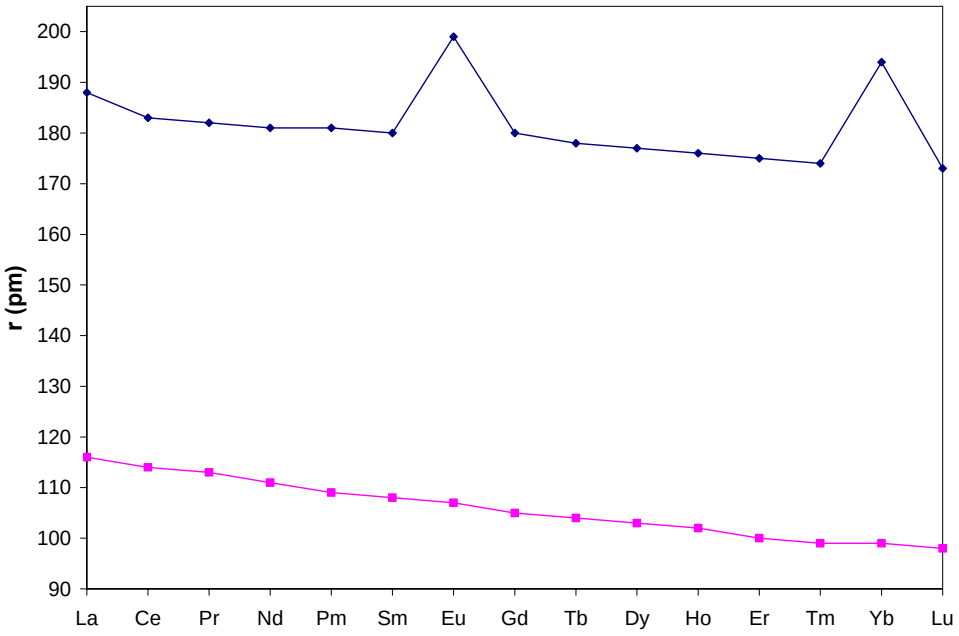

Figure L.2 Variation of metal radius and +3 ionic radius for the lanthanide elements

Table L.4. Summary of the properties of Ln^{III} ions.

Ln^{3+}	$4f^n$	ground level	color	g $[J(J+1)]^{1/2}$	Observed
La	0		colorless		0
Ce	1		colorless		2.3-2.5
Pr	2		green		3.4-3.6
Nd	3	$^4I_{9/2}$	lilac	3.62	3.5-3.6
Pm	4		pink		-
Sm	5		yellow		1.4-1.7
Eu	6		pale pink		3.3-3.5
Gd	7		colorless		7.9-8.0
Tb	8		pale pink		9.5-9.8
Dy	9		yellow		10.4-10.6
Ho	10		yellow		10.4-10.7
Er	11		rose-pink		9.4-9.6
Tm	12		pale green		7.1-7.5
Yb	13	$^2F_{7/2}$	colorless	4.54	4.3-4.9
Lu	14	$^1S_0$	colorless	0	0

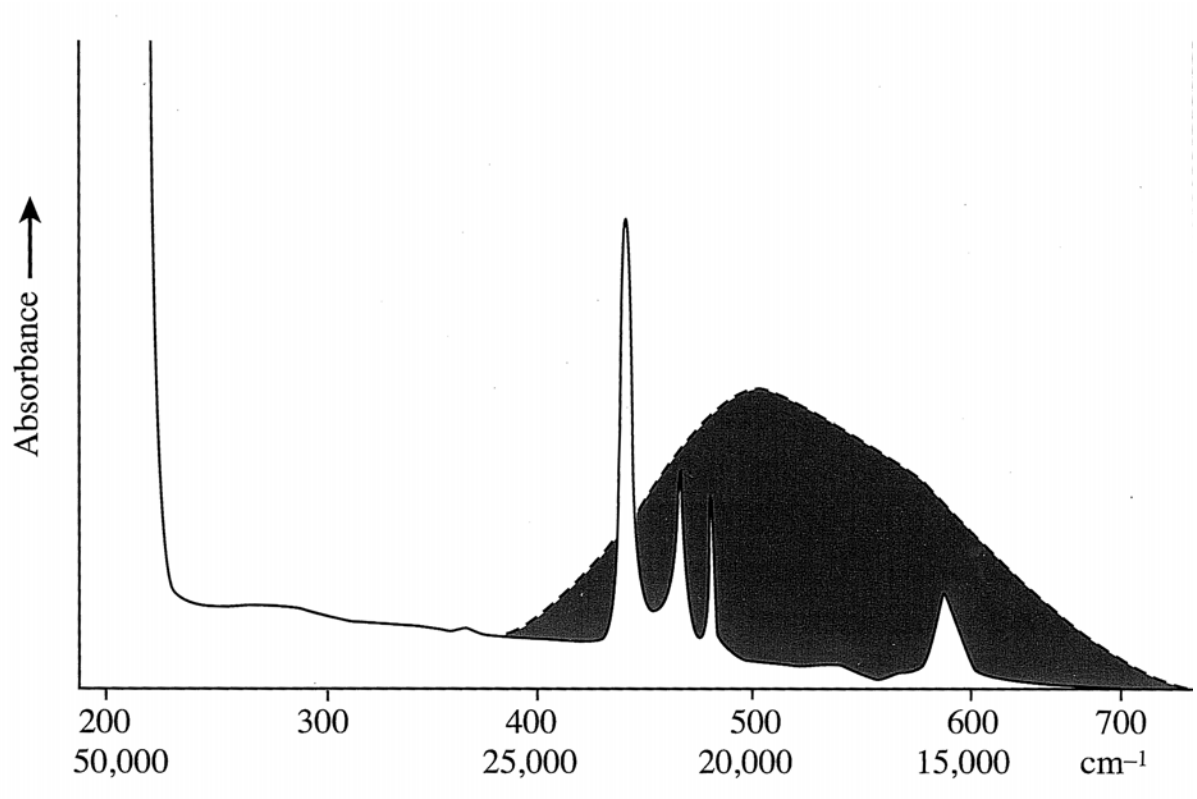

Figure L.3 The electronic spectrum of Pr^{3+} (solid line) and Ti^{3+} (broken line). Like d-d transitions, f-f transitions are Laporte-forbidden and give weak absorptions.

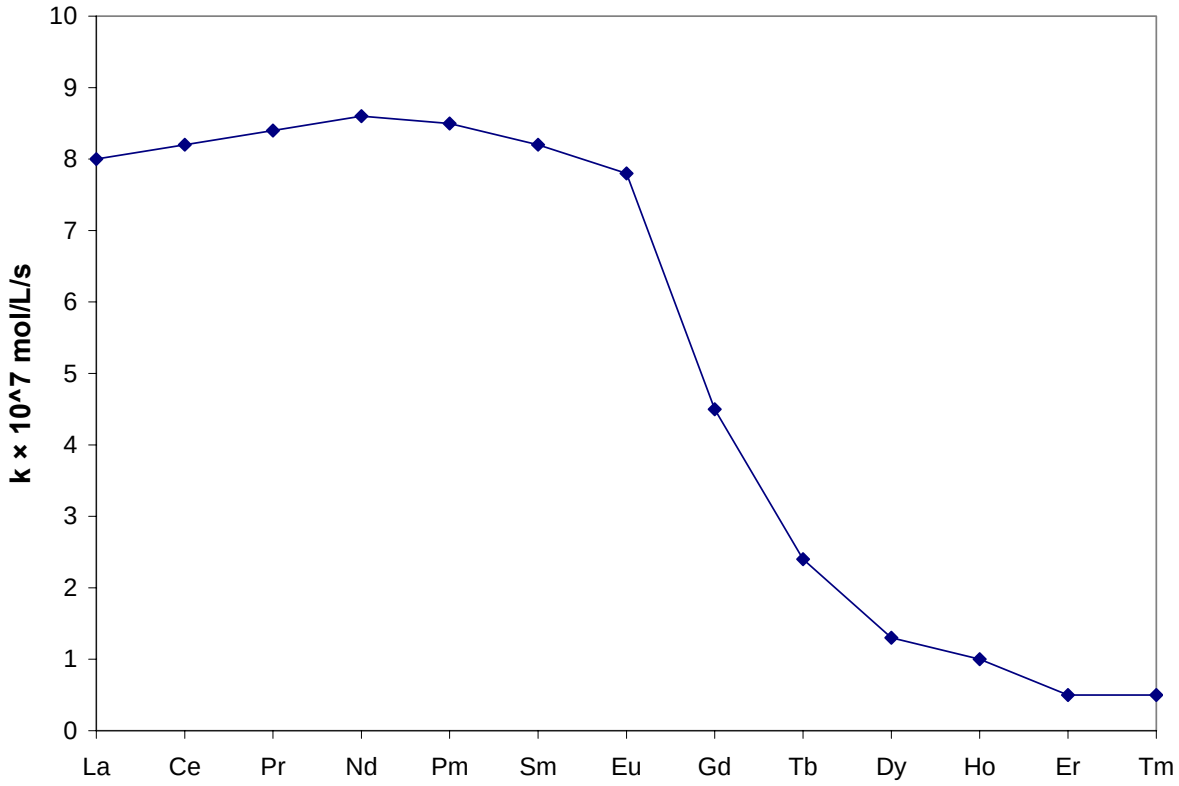

Figure L.4 Rate constants for the formation of 1:1 Ln^{3+}/oxalate complexes at 25°C.

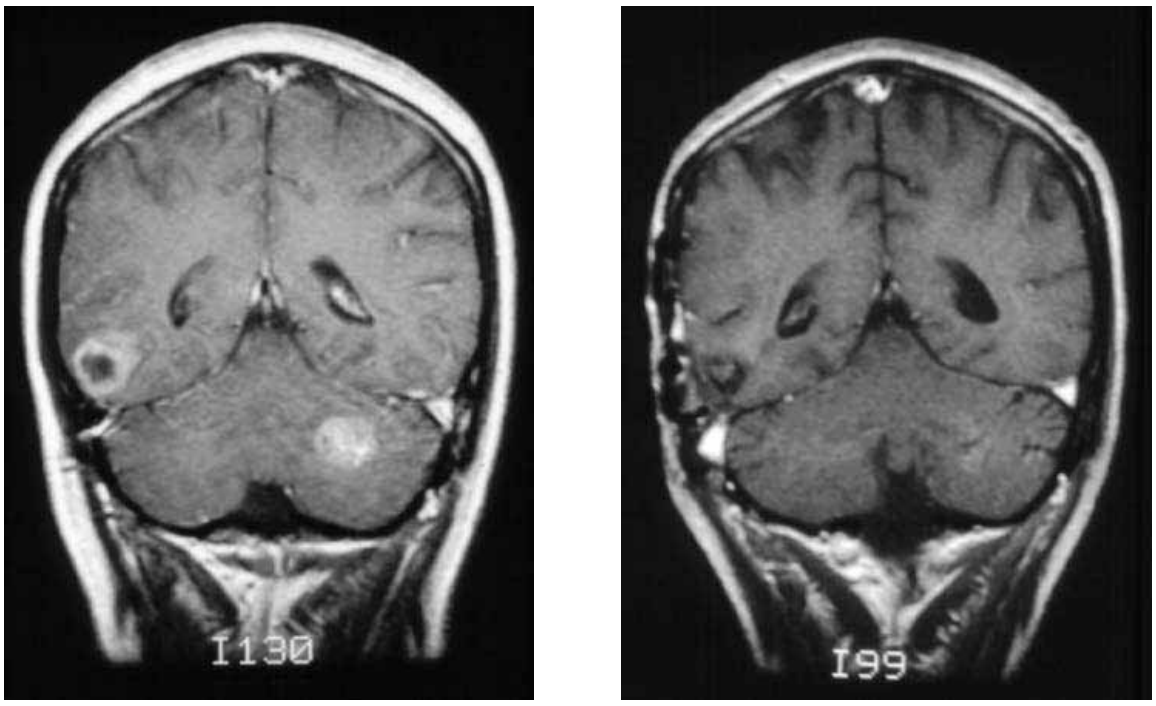

Figure L.5. MRI scans with Gd enhancement before and after surgery and radiotherapy. The follow-up study shows only minimal enhancement in the left cerebellar region, consistent with almost complete disappearance of the tumor mass.

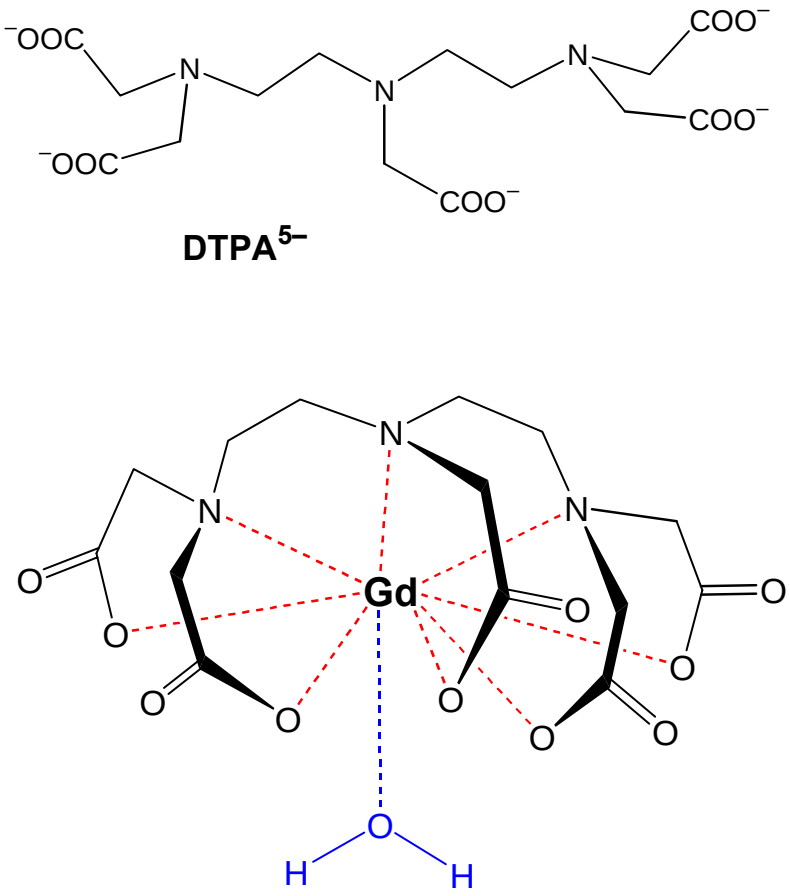

Figure L.6. The free $DTPA^{5-}$ ligand, and its gadolinium complex.
Note the additional coordination site available for water to bind to.

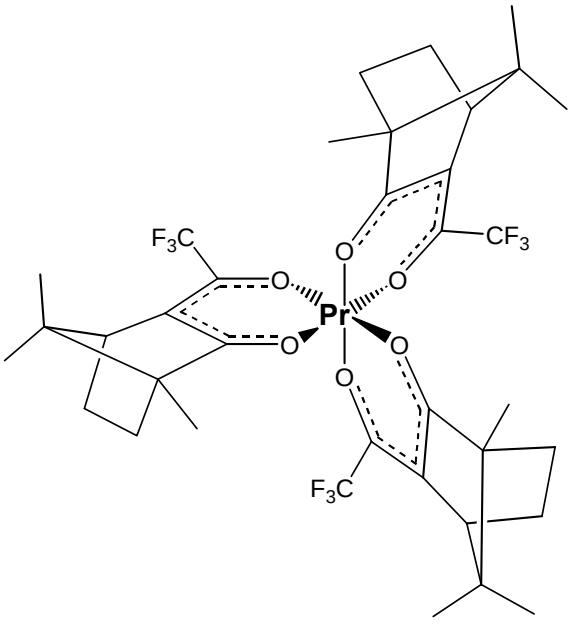

Figure L.7. Chiral praseodymium complex with three β-diketonate ligands.
Eu^{3+} and Pr^{3+} complexes are often used because their electronic relaxation times are very short, reducing line-broadening for the nucleus under study (usually ^{1}H).