

Contents

List of Figures	VII
1 Introduction	1
2 Fundamentals of heavy fermion systems	5
2.1 Heavy fermion systems	5
2.2 Fermi liquid and non-Fermi liquid theory	8
2.3 Quadrupolar ordering	10
3 A case study: Basic properties of CePt ₃ B	13
3.1 Basic properties of CePt ₃ B	13
3.2 Bulk methods	16
3.2.1 Magnetization	16
3.2.2 Resistivity	21
3.2.3 Hall effect	29
3.2.4 Specific Heat	33
3.3 Microscopic Methods	38
3.3.1 Neutron scattering	38
3.3.2 μ SR measurements	46
3.4 Conclusion of the investigation of CePt ₃ B _{1-x} Si _x	51
3.4.1 X-ray resonant scattering	52
4 Disorder effects in UPd ₂ X, X=Sb, Sn	57
4.1 Introduction	57
4.1.1 Review of the class of compounds: UT ₂ M	58
4.2 Structural and magnetic properties of UPd ₂ Sb	63
4.2.1 Crystal structure	64
4.2.2 Transport properties	64
4.2.3 Thermodynamic properties	65

4.2.4	Neutron scattering experiments	68
4.2.5	Conclusion	78
4.3	Fermi liquid state in UPd ₂ Sn	78
4.3.1	Introduction	78
4.3.2	Specific resistivity of UPd _{2-x} Sn	80
4.3.3	Hall effect in UPd ₂ Sn	88
4.3.4	Conclusion	92
5	UPt ₂ Si ₂ : Field induced phases in an antiferromagnet	93
5.1	Introduction	93
5.2	Crystallographic structure	93
5.3	Magnetic properties	97
5.4	Electronic transport properties	103
5.5	High magnetic field measurements	108
5.6	Conclusion	122
6	Ground state properties of U(Pd _{1-x} Pt _x) ₃	127
6.1	Introduction	127
6.2	UPd ₃ : An archetypical quadrupolar ordered system	128
6.3	Bulk properties of U(Pd _{1-x} Pt _x) ₃	133
6.3.1	Specific heat	133
6.3.2	Resistivity	137
6.3.3	Susceptibility	141
6.4	Conclusion	145
7	Quadrupolar vs. magnetic order in PrB ₆	151
7.1	Introduction	151
7.2	Experimental Methods	154
7.3	Experimental Results	155
7.3.1	Structural lattice distortion	155
7.3.2	Charge peaks	163
7.3.3	Magnetic peaks	166
8	Summary	173
	Bibliography	177