

# Contents

Preface	v
<b>Chapter 1 INTRODUCTION</b>	<b>1</b>
<b>Chapter 2 ANDERSON LOCALIZATION AND METAL-INSULATOR TRANSITION IN DISORDERED SYSTEMS</b>	<b>7</b>
2.1 Basic Concepts of Localization . . . . .	7
2.2 Elementary Scaling Theory of Localization . . . . .	13
2.3 Self-Consistent Theory of Localization . . . . .	20
2.3.1 Isotropic Systems . . . . .	20
2.3.2 Quasi-Two-Dimensional Systems . . . . .	33
2.3.3 Self-Consistent Theory of Localization in Magnetic Field	36
2.3.4 NMR Relaxation and Localization . . . . .	40
2.4 Phase Transition Analogy and Scaling for Correlators . . . . .	44
2.5 Interaction <b>Effects and Anderson Transition</b> . . . . .	<b>50</b>
2.5.1 Self-consistent theory with interactions . . . . .	57
2.5.2 Disorder in “Marginal” Fermi-liquid . . . . .	70
<b>Chapter 3 SUPERCONDUCTIVITY AND LOCALIZATION: STATISTICAL MEAN-FIELD APPROACH</b>	<b>73</b>
3.1 BCS Model and Anderson Theorem . . . . .	73
3.2 $T_c$ Degradation . . . . .	79
3.2.1 Coulomb Kernel . . . . .	83
3.2.2 Electron-Phonon Interaction . . . . .	86
3.2.3 Metallic Region . . . . .	90

3.2.4	Localization Region . . . . .	93
3.2.5	Spin Fluctuations . . . . .	95
3.2.6	Density of States Effects . . . . .	97
3.2.7	Localization and d-wave Pairing . . . . .	103
3.3	Ginzburg-Landau Theory and Anderson Transition . . . . .	117
3.3.1	General Analysis . . . . .	117
3.3.2	Upper critical field . . . . .	128
3.3.3	Anisotropic pairing . . . . .	142
3.4	Fluctuation Conductivity Near Anderson Transition . . . . .	151
3.5	Superconductivity in Anderson Insulator at $T = 0$ . . . . .	155
<b>Chapter 4 STATISTICAL FLUCTUATIONS OF SUPER- CONDUCTING ORDER PARAMETER</b>		<b>159</b>
4.1	Statistical Critical Region . . . . .	160
4.2	Superconducting Transition at Strong Disorder . . . . .	165
<b>Chapter 5 SUPERCONDUCTIVITY IN STRONGLY DIS- ORDERED METALS: EXPERIMENT</b>		<b>177</b>
5.1	Traditional Superconductors . . . . .	177
5.2	High-T, Superconductors . . . . .	192
<b>Chapter 6 CONCLUSION</b>		<b>223</b>
<b>Appendix A Spectral Densities and Criterion for Localiza- tion</b>		<b>227</b>
<b>Appendix B Linearized Gap Equation in Disordered System</b>		<b>231</b>
<b>Appendix C Derivation of Ginzburg-Landau Coefficients</b>		<b>237</b>
<b>Appendix D Anisotropic scattering</b>		<b>243</b>
<b>Appendix E Instanton solution</b>		<b>247</b>
Bibliography		249