Contents

1	Intr	oductio	n	I				
2		-	inzburg: The Ginzburg-Landau Theory of	0				
		uperconductivity						
	2.1	_	phical Notes	9				
	2.2		wn Story	10				
		2.2.1	Early Years	10				
		2.2.2	Education	11				
		2.2.3		11				
		2.2.4	Superconductivity, Landau	12				
		2.2.5	Superfluids and Low Dimensional Superconductors	13				
		2.2.6	How GL Theory Came to Be	14				
		2.2.7	Remarks About the Prize	16				
3	Alex	cei A. A	Abrikosov: The Magnetic Structure of Type II					
	Sup	ercondı	uctors	17				
	3.1	Biogra	phical Notes	17				
	3.2		wn Story	18				
		3.2.1	Childhood in Moscow	18				
		3.2.2	School and Education	19				
		3.2.3	Entering the Landau Group	20				
		3.2.4		21				
		3.2.5		22				
		3.2.6		26				
		3.2.7		26				
		3.2.8		27				
4	Leo	n N. Co	oper: The Microscopic Theory of Superconductivity	29				
	4.1			29				
	4.2	_		30				
		4.2.1	-	30				
		4.2.2	J	31				

x Contents

		4.2.3	Superconductivity, Bardeen	31
		4.2.4	Cooper Pairs	32
		4.2.5	Schrieffer	33
		4.2.6	The Paper	34
		4.2.7	Approximations	35
		4.2.8	Breaking the News	35
		4.2.9	Contributions from Other Scientists	36
			Present Problems (2001)	37
			In Between?	38
5	Johr		rt Schrieffer: The Microscopic Theory of	
			ictivity	41
	5.1		phical Notes	41
	5.2	_	vn Story	43
		5.2.1	Early Inspiration	43
		5.2.2	At MIT	44
		5.2.3	Ambitions	44
		5.2.4	First Publication	45
		5.2.5	Thinking Big	45
		5.2.6	Success!	46
		5.2.7	Ultrasound	47
		5.2.8	Transitions	48
		5.2.9	Finished Work	49
			Josephson	49
			Rating Superconductivity	50
6	Ivar	· Giaeve	er: Single Particle Tunnelling: Confirming the	
			y	53
	6.1		phical Notes	53
	6.2	_	wn Story	55
		6.2.1	Background	55
		6.2.2	Applying for the University	55
		6.2.3	Interests	56
		6.2.4	Lodging and Job	57
		6.2.5	Quantum Mechanics	59
		6.2.6	Tunnelling	60
		6.2.7	Reaction on the Paper	61
		6.2.8	The Josephson Effect: Seeing, but not Recognizing	63
		6.2.9	After Superconductivity: Biophysics, and Some More	63
			Vision?	64
	Refe	erence		65
7	Bris	an D. Jo	sephson: Cooper Pair Tunnelling: The Josephson Effects	67
-	7.1		obreviated Account Based on an Interview and Available	
		Literat	ture	67

Contents xi

8	Phili	p W. Ar	nderson: Superconductivity from a Broader Perspective.	73
	8.1	Biograp	phical Notes	73
	8.2	His Ow	n Story	74
		8.2.1	Early Influences	74
		8.2.2	Career Choice, Family and Politics	75
		8.2.3	Electronics Physics and Harvard	76
		8.2.4	Encountering Superconductivity	77
		8.2.5	Cooper	77
		8.2.6	Order Parameter	78
		8.2.7	1959	79
		8.2.8	More He3, and Phonons	80
		8.2.9	Concepts in Solids	81
		8.2.10	The Josephson Effect	81
		8.2.11	Kondo Effect and the Renormalization Group	83
		8.2.12	Resonance Valence Bond (RVB) Theory	84
		8.2.13	The Situation as Seen in 2001	85
		8.2.14	The Future, as Seen in 2001	86
9	Pier	re.Gilles	s de Gennes: The Orsay Group on Superconductivity	89
	9.1		phical Notes	89
	9.2		n Story	90
		9.2.1	Early Days	90
		9.2.2	Education	91
		9.2.3	Teachers and Masters	92
		9.2.4	PhD	93
		9.2.5	Becoming a Theorist	93
		9.2.6	Experimental Approach	94
		9.2.7	BCS and the Orsay Group	95
		9.2.8	Liquid Crystals	96
		9.2.9	Main Achievements at Orsay	
		9.2.10	Why Leave Superconductivity?	
		9.2.11	High-T _c	99
		9.2.12	Popular Lecturing	
10			eorg Bednorz: Discovery of Cuprate Superconductors	
			phical Notes	
	10.2		/n Story	
			Path to a Scientific Career	
			A Student's Experience of the "Real Word" of Research.	103
		10.2.3	PhD Studies at the ETH and First Encounter with	104
		10.2.4	Superconductivity	
		10.2.4	New Project	
		10.2.5	Risk	107
		10.2.6	Cu-Components	108
		10.2.7	Discovery!	109
		10.2.8	Identification	110

xii Contents

	10.2.9	The Meissner Effect Paper
	10.2.10	Reactions
	10.2.11	Visiting the German Physical Society
		Nobel Prize
		Applications
11	K. Alexander	Müller: Discovery of Cuprate Superconductors 117
	11.1 Biograp	hical Notes
	11.2 His Own	n Story
	11.2.1	Background
	11.2.2	At ETH
	11.2.3	SrTiO ₃ and Superconductivity Preliminaries 120
	11.2.4	Yorktown Heights: Learning by Doing. Conventional
		Superconductivity
	11.2.5	The New Beginning: Jahn-Teller Polarons 122
	11.2.6	The Discovery
	11.2.7	Definite Proof, Growing Attention
	11.2.8	Recognition and Priorities
	11.2.9	The Future, as Seen in 2001
	11.2.10	Concluding
12	The Anderso	on-Higgs Mechanism for the Meissner Effect in
	Superconduc A. Sudbø	etors
13	Concluding 1	Remarks
Ind	ex	