



# Contents

<b>1. Introduction.....</b>	<b>1</b>
1.1 Quarks with Colour.....	1
1.2 The Lagrangian of Quantum Chromodynamics.....	3
1.3 The Coupling at High Energies.....	7
<b>2. Electron-Positron Annihilation into Hadron Jets.....</b>	<b>12</b>
2.1 $e^+e^-$ Annihilation in the Parton Model.....	12
2.2 First Experimental Evidence for Jets.....	16
2.3 On Jet Measures.....	23
2.4 Fragmentation of Quarks and Gluons.....	26
2.4.1 Fragmentation of Quarks.....	26
2.4.2 Phenomenological Models for Quark and Gluon Fragmentation.....	29
<b>3. <math>e^+e^-</math> Annihilation into Jets in QCD Perturbation Theory.....</b>	<b>34</b>
3.1 Jets in Order $\alpha_s$ .....	34
3.1.1 Introduction.....	34
3.1.2 Cross Section for $e^+e^- \rightarrow q\bar{q}g$ .....	35
3.1.3 Thrust Distributions.....	41
3.1.4 $x_\perp$ Distributions.....	45
3.1.5 The Acoplanarity Distributions.....	48
3.1.6 Influence of Beam Polarization.....	51
3.1.7 Jet Multiplicities and the Total Cross Section.....	55
3.1.8 The Scalar Gluon Model.....	62
3.1.9 Evidence for $q\bar{q}g$ Production, Comparison with Experimental Data..	66
3.2 Jet up to Order $\alpha_s^2$ .....	89
3.2.1 Introduction.....	89
3.2.2 Three-Jet Cross Section up to $\mathcal{O}(\alpha_s^2)$ .....	91
3.2.3 Evidence for Four-Jet Production.....	113
3.2.4 Renormalization Scheme Dependence.....	121
3.2.5 Total Cross Section up to $\mathcal{O}(\alpha_s^2)$ .....	126
<b>4. Summary and Conclusions.....</b>	<b>132</b>
<b>References.....</b>	<b>135</b>