

Contents

Contributors	xi
Foreword Sir George K. Radda, Medical Research Council, UK	xiii
<i>Section A: Background</i>	
1 Introduction Robert G. Shulman	1
2 <i>In Vivo</i> NMR Spectroscopy – Techniques; Direct Detection; MRS; Kinetics and Labels; Fluxes; Concentrations Robin de Graaf	7
3 Metabolic Control Analysis for the NMR Spectroscopist David A. Fell	31
<i>Section B: ^{13}C and ^{31}P NMR Studies of the Regulation of Glucose Metabolism</i>	
4 MRS Studies of the Role of the Muscle Glycogen Synthesis Pathway in the Pathophysiology of Type 2 Diabetes Gerald I. Shulman and Douglas L. Rothman	45
5 Phosphorylation of Allosteric Enzymes can serve Homeostasis rather than Control Flux: the Example of Glycogen Synthase James R.A. Schafer, David A. Fell, Douglas Rothman and Robert G. Shulman	59
6 Regulation of Glycogen Metabolism in Muscle during Exercise Thomas B. Price	73

x	Contents	
7	¹³ C NMR Studies of Heart Glycogen Metabolism Maren R. Laughlin, Douglas L. Rothman and Robert G. Shulman	87
8	Bioenergetics Implication of Metabolic Fluctuation during Muscle Contraction Thomas Jue	103
9	Lactate, Glycogen and Fatigue Robert G. Shulman and Douglas L. Rothman	125
10	Futile Cycling in Yeast: How to Control Gluttony in the Midst of Plenty Jan den Hollander and Robert G. Shulman	137
11	Trehalose Energetics in Yeast Spores Robert G. Shulman and Jan den Hollander	149
12	Metabolic Networks in the Liver by ² H and ¹³ C NMR A. Dean Sherry and Craig R. Malloy	159
13	Summarized Reflections on Metabolism Robert G. Shulman and James R. A. Schafer	175
Index		185