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Third Edition

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Foreword

This book originates from almost 60 years of living in the company of microorganisms, mainly with *Escherichia coli*. My scientific life has taken place almost exclusively at the Institute Pasteur in Paris, where many concepts of modern molecular biology were born or developed.

The present work emphasizes the interest of microbial physiology, biochemistry and genetics. It takes into account the considerable advances which have been made in the field in the last 30 years by the introduction of gene cloning and sequencing and by the exponential development of physical methods such as X-ray crystallography of proteins.

The younger generation of biochemists is legitimately interested in the problems raised by differentiation and development in higher organisms, and also in neurosciences. It is however my feeling that the study of prokaryotes will remain for a long time the best introduction to general biology.

A particular emphasis has been given to particular systems which have been extensively studied from historical, physiological, enzymological, structural, genetic and evolutionary points of view: I present my apologies to those who may find that this choice is too personal and reflects too much my personal interest in subjects in which I have either a personal contribution or where important results have been obtained by some of my best friends.

I am grateful to the Philippe Foundation for the help it has given to me and to many of my students for many years.

I dedicate this book to the memory of my wife, Louisette Cohen, for her patience and help, not only while this book was written, but also during our 68 years of common and happy life.

This work is a tribute to the memory of my beloved colleagues, my mentor Jacques Monod, and the late Harold Amos, Dean B. Cowie, Michael Doudoroff, François Jacob, Ben Nisman, Earl R. Stadtman, Roger Y. Stanier, Germaine Stanier, Huguette and Kissel Szulmajster and Elie Wollman.

Paris, France — Georges N. Cohen

Abbreviations

aceA	Isocitrate lyase
aceB	Malate synthase A
aceK	Isocitrate dehydrogenase kinase/phosphatase
acnA	Aconitase A
acnB	Aconitase B
ACP	Acyl carrier protein
ADP	Adenosine diphosphate
ADPG	Adenosinediphosphoglucose
AICAR	5-aminoimidazole-4-carboxami-do-1-b-ribofuranosyl-5′-phosphate
AIR	Aminoimidazole ribonucleotide
AK	Aspartokinase
ALA	d-aminolevulinic acid
alr	Alanine racemase
AMP	Adenosine monophosphate
APS	Adenosine-5′-phosphosulfate
arcA	Global regulatory network
AS	Anthranilate synthetase
ATCase	Aspartate transcarbamylase
ATP	Adenosine diphosphate
BCCP	Biotin carboxyl carrier protein
CAIR	5-amino-4-imidazole carboxylate ribonucleotide
cAMP	Cyclic AMP
CAP	Catabolite activator protein
cDNA	Complementary DNA
CDP	Cytidine diphosphate
CDRP	Anthranilate deoxyribulotide
CH2THF	5–10 methylene tetrahydrofolate
citA	Citrate synthase (*B. subtilis*)
citC	Isocitrate dehydrogenase (*B. subtilis*)
citH	Malate dehydrogenase (*B. subtilis*)
citR	Citrate synthase regulator (*B. subtilis*)

citZ	Citrate synthase (*B. subtilis*)
CMP	Cytidine monophosphate
CoA	Coenzyme A
CRM	Cross-reacting material
CTP	Cytidine triphosphate
dADP	Deoxyadenosine diphosphate
DAHP	3-deoxy-D-arabino-heptulosonate-7-phosphate
DAP	Diaminopimelate
DAPA	7–8 diaminopelargonate
dATP	Deoxyadenosine triphosphate
dCDP	Deoxycytidine diphosphate
dCMP	Deoxycytidine monophosphate
dCTP	Deoxycytidine triphosphate
ddlB	D-alanyl-D-alanine ligase
DEAE	Dimethylaminoethyl
dGDP	Deoxyguanosine diphosphate
dGTP	Deoxyguanosine triphosphate
DHNA	1, 4-dihydroxy-2-naphthoic acid
DHQ	Dehydroquinate
DMK	Demethylmenaquinone
DNA	Deoxyribonucleic acid
dNDP	Deoxynucleoside diphosphate
dNTP	Deoxynucleoside triphosphate
dTDP	Deoxythymidine diphosphate
dTMP	Deoxythymidine monophosphate
dTTP	Deoxythymidine triphosphate
dUDP	Deoxyuridine diphosphate
dUMP	Deoxyuridine monophosphate
E4P	Erythrose-4-phosphate
eda	2-keto-3-deoxy-6-phosphogluconate aldolase
edd	6-phosphogluconate dehydrase
eno	Enolase
F	Female
FAD	Flavin adenine dinucleotide
FAICAR	5′-phosphoribosyl-4-carboxamide-5-formamidoimidazole
fbaA	Fructose 1, 6-bisphosphate aldolase
fbp	Fructose bisphosphatase
FeMoco	Iron-molybdenum cofactor
FGAM	Formylglycinamidine ribonucleotide
FGAR	Formylglycinamide ribonucleotide
fmd	Molybdenum-containing formylmethanofuran dehydrogenase
FMN	Flavin mononucleotide
FPP	Farnesylpyrophosphate
ftr	Formylmethanofuran tetrahydro-methanopterinformyltransferase

fumA	Fumarase A
fumB	Fumarase B
fumC	Fumarase C
fur	Global regulatory network
fwd	Tungsten-containing formylmethanofuran dehydrogenase
gapA	Glyceraldehyde 3-phosphate dehydrogenase
gapB	4-phosphoerythronate dehydrogenase
GAR	Glycinamide ribonucleotide
GAT	Glutamine amidotransferase
gcd	Glucose dehydrogenase
GDP	Guanosine diphosphate
glcB	Malate synthase induced by glycolate
glmU	Glc-NAc-1-phosphate uridylyltransferase
gltA	Citrate synthase (*E. coli*)
GMP	Guanosine monophosphate
gnd	Phosphogluconate dehydrogenase
gpm	Phosphoglyceromutase
GS	Glutamine synthetase
GSH	Glutathione
GSSG	Oxidized glutathione
GTP	Guanosine triphosphate
HDH	Homoserine dehydrogenase
Hfr	High frequency of recombination
hisM	Membrane-bound component of the histidine ABC transporter
hisP	ATP-binding membrane-bound protein of the histidine ABC transporter
hisQ	Membrane-bound component of the histidine ABC transporter
HPr	Heat-stable protein of the PTS system
iclR	Transcriptional repressor of the *ace* operon
idh	Isocitrate dehydrogenase
IGP	Indoleglycerol phosphate or imidazoleglycerol phosphate (cf. context)
IMP	Inosinic acid
IPTG	Isopropylthiogalactoside
7-KAP	7-keto-8-aminopelargonate
Lac	Lactose
LAO	Lysine-arginine-ornithine permeation system
Lrp	Leucine-responsive regulatory protein
MBP	Maltose-binding protein
mch	Methenyltetrahydromethanopterin cyclohydrolase
mdh	Malate dehydrogenase
mer	Methylenetetrahydromethanopterin dehydrogenase
MK	Menaquinone
mraY	Lipid I synthesis
mRNA	Messenger RNA

mtrEDCBAFGH	Methylreductase operon
murA	UDP-GlcNAc-enolpyruvoyltransferase
murB	UDP-GlcNac-enolpyruvate reductase
murC	Alanine addition
murD	Glutamate addition
murE	Meso-diaminopimelate addition
murF	D-alanyl D-alanine addition
murG	Lipid II synthesis
murI	Glutamate racemase
^{5}N-methyl-H_4PtGlu	^{5}N-methyltetrahydropteroylglutamate
NAD^+	Nicotinamide adenine dinucleotide
NADH	Reduced form of NAD^+
$NADP^+$	Nicotinamide adenine dinucleotide phosphate
NADPH	Reduced form of $NADP^+$
NDP	Nucleoside diphosphate
NEM	N-ethylmaleimide
NMR	Nuclear magnetic resonance
NTP	Nucleoside triphosphate
OMHMB	2-octaprenyl-3-methyl-5-hydroxy-6-methoxy-1, 4-benzoquinone
OMP	Orotidine-5′-phosphate
ONPF	*o*-nitrophenylfucoside
ONPG	*o*-nitrophenylgalactoside
ORF	Open reading frame
OSB	*o*-succinylbenzoate
OTCase	Ornithine transcarbamylase
p-AB	*p*-aminobenzoic acid
pabA	4-amino-4-deoxychorismate synthase, Gln amidotransferase subunit
pabB	4-amino-4-deoxychorismate synthase, amination subunit
pabC	Elimination of pyruvate from 4-amino-4-deoxychorismate
p-ABG	*p*-aminobenzoylglutamic acid
PALA	N-phosphonacetyl-L-aspartate
PAPS	3′-phosphoadenosine-5′-phosphosulfate
pdxb	4-phosphoerythronate dehydrogenase
PEP	Phosphoenolpyruvate
pfkA	Phosphofructokinase 1
pfkB	Phosphofructokinase 2
pgi	Glucose-6-phosphate isomerase
pgk	Phosphoglycerate kinase
pgl	6-phosphogluconolactonase
Pi	Inorganic phosphate
PII	Protein interacting with glutamine synthetase adenylyltransferase

PLP	Pyridoxal phosphate
PPi	Pyrophosphate
PQQ	Pyrroloquinoline quinone
PRPP	5-phosphoribosyl-1-pyrophosphate
PR-PRFAR	Phosphoribosyl-PR-formimino-5-aminoimidazole-4-carboxamide ribonucleotide
PRT	Anthranilate phosphoribosyltransferase
PTS	Phosphotransferase system
pykA	Pyruvate kinase activated by AMP
pykF	Pyruvate kinase activated by fructose 1, 6-bisphosphate
RNA	Ribonucleic acid
rpe	Phosphopentose isomerase
rpi	Ribose phosphate isomerase
SAH	S-adenosylhomocysteine
SAICAR	5-amino-4-imidazole-N-succinylcarboxamide ribonucleotide
SAM	S-adenosylmethionine
sdhA	FAD subunit of succinate dehydrogenase
sdhB	Non-heme iron subunit of succinate hydrogenase
sdhC	Membrane anchor of succinate dehydrogenase, cytochrome b661-5
sdhD	Membrane anchor of succinate dehydrogenase
soxRS	Global regulatory network
sucA	Dehydrogenase of the ketoglutarate dehydrogenase complex
sucB	Succinyltransferase of the ketoglutarate dehydrogenase complex
sucC	Succinyl CoA synthetase beta subunit
sucD	Succinyl CoA synthetase alpha subunit
tal	Transaldolase
TDG	Thiodigalactoside
tkt	Transketolase
TMG	Thiomethylgalactoside
TPEG	Thiophenylethylgalactoside
TPG	Thiophenylgalactoside
tpi	Triose phosphate isomerase
TPP	Thiamine pyrophosphate
TQQ	Tryptophyl tryptophanquinone
tRNA	Transfer RNA
UDP	Uridine diphosphate
UDPG	Uridine diphosphoglucose
UMP	Uridine monophosphate
UR	Uridylyl-removing enzyme
UTase	Uridylyltransferase
UTP	Uridine triphosphate
XMP	Xanthylic acid
zwf	Glucose 6-phosphate dehydrogenase

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