

Contents

Contributors / ix
Preface / xiii

SECTION I

INTRODUCTION TO THE FILAMENTOUS FUNGI / 1

1 History and Importance to Human Affairs / 3

JOAN W. BENNETT, ROWLAND DAVIS, AND CARLENE RAPER

2 Hyphal Structure / 8

ROBERT W. ROBERSON, MARITZA ABRIL, MEREDITH BLACKWELL, PETER LETCHER, DAVID J. McLAUGHLIN, ROSA R. MOURINO-PÉREZ, MERITXELL RIQUELME, AND MAHO UCHIDA

3 A Top-Down Systems Biology Approach for the Identification of Targets for Fungal Strain and Process Development / 25

MACHTELT BRAAKSMA, ROBERT A. VAN DEN BERG, MARIËT J. VAN DER WERF, AND PETER J. PUNT

4 Phylogenetics and Phylogenomics of the Fungal Tree of Life / 36

JOSEPH W. SPATAFORA AND BARBARA ROBERTSE

5 Signal Transduction Pathways / 50

GYUNGSOON PARK, CAROL A. JONES, AND KATHERINE A. BORKOVICH

SECTION II

REPLICATION AND EXPRESSION OF THE GENETIC CODE / 61

6 Mitotic Cell Cycle Control / 63

COLIN P. C. DE SOUZA AND STEPHEN A. OSMANI

7 Meiosis / 81

CLAIRE BURNS, PATRICIA J. PUKKILA, AND MIRIAM E. ZOLAN

8 DNA Repair and Recombination / 96

P. JANE YEADON, HIROKAZU INOUE, FREDERICK J. BOWRING, KEIICHIRO SUZUKI, AND DAVID E. A. CATCHESIDE

9 Chromatin Structure and Modification / 113

ZACHARY A. LEWIS AND ERIC U. SELKER

10 Transposable Elements and Repeat-Induced Point Mutation / 124

A. JOHN CLUTTERBUCK AND ERIC U. SELKER

11 Meiotic *trans*-Sensing and Silencing in *Neurospora* / 132

RODOLFO ARAMAYO AND ROBERT J. PRATT

12 Mycoviruses / 145

DONALD L. NUSS

SECTION III

ORGANELLES / 153
13 Mitochondria and Respiration / 155

FRANK E. NARGANG AND JOHN C. KENNEL

14 Vacuoles in Filamentous Fungi / 179

EMMA JEAN BOWMAN AND BARRY J. BOWMAN

15 Peroxisomes in Filamentous Fungi / 191

LEONARDO PERAZA-REYES, ERIC ESPAGNE, SYLVIE ARNAISE, AND VÉRONIQUE BERTEAUX-LECELLIER

SECTION IV

HYPHAL GROWTH / 207
16 The Cytoskeleton in Filamentous Fungi / 209

XIN XIANG AND BERL OAKLEY

17 The Cell Wall of Filamentous Fungi / 224

NIR OSHEROV AND ODED YARDEN

18 Hyphal Growth and Polarity / 238

STEVEN D. HARRIS

19 Hyphal Fusion / 260

NICK D. READ, ANDRÉ FLEIBNER, M. GABRIELA ROCA, AND N. LOUISE GLASS

20 Biology and Genetics of Vegetative Incompatibility in Fungi / 274

DUUR K. AANEN, ALFONS J. M. DEBETS, N. LOUISE GLASS, AND SVEN J. SAUPE

SECTION V

METABOLISM / 289
21 Glucose / 291

MARGARET E. KATZ AND JOAN M. KELLY

22 Gluconeogenesis / 312

MICHAEL J. HYNES

23 Nitrogen Metabolism in Filamentous Fungi / 325

MERYL A. DAVIS AND KOON HO WONG

24 Amino Acids and Polyamines: Polyfunctional Proteins, Metabolic Cycles, and Compartmentation / 339

ROWLAND H. DAVIS

25 Sulfur, Phosphorus, and Iron Metabolism / 359

JOHN V. PAIETTA

26 Secondary Metabolism / 376

B. GILLIAN TURGEON AND KATHRYN E. BUSHLEY

27 Plant Cell Wall and Chitin Degradation / 396

CHRISTIAN P. KUBICEK, VERENA SEIDL, AND BERNHARD SEIBOTH

SECTION VI

PHOTOBIOLOGY AND CIRCADIAN RHYTHMS / 415
28 Light Sensing / 417

LUIS M. CORROCHANO AND JAVIER AVALOS

29 Circadian Rhythms / 442

MICHAEL W. VITALINI, JAY C. DUNLAP, CHRISTIAN HEINTZEN, YI LIU, JENNIFER LOROS, AND DEBORAH BELL-PEDERSEN

SECTION VII

NUTRIENT, pH, AND STRESS SENSING / 467
30 How Fungi Sense Sugars, Alcohols, and Amino Acids / 469

CHAOYANG XUE, DANIEL J. EBBOLE, AND JOSEPH HEITMAN

31 Regulation of Gene Expression by Ambient pH / 480

JOAN TILBURN, HERBERT N. ARST, JR., AND MIGUEL A. PEÑALVA

32 Heat Shock Response / 488

NORA PLESOFKY

SECTION VIII

SEXUAL DEVELOPMENT / 499
33 Mating Systems and Sexual Morphogenesis in Ascomycetes / 501

ROBERT DEBUCHY, VÉRONIQUE BERTEAUX-LECELLIER, AND PHILIPPE SILAR

34 Mating and Sexual Morphogenesis in Basidiomycete Fungi / 536

LORNA CASSELTON AND MICHAEL FELDBRÜGGE

SECTION IX

ASEXUAL SPORULATION / 557

35 Regulation of *Aspergillus*
Conidiation / 559MIN NI, NA GAO, NAK-JUNG KWON, KWANG-SOO
SHIN, AND JAE-HYUK YU

36 The Conidium / 577

DANIEL J. EBBOLE

SECTION X

INTERACTIONS OF FUNGI WITH PLANTS
OR OTHER FUNGI / 59137 *Magnaporthe oryzae* and Rice Blast
Disease / 593CHANG HYUN KHANG AND
BARBARA VALENT38 *Fusarium* Genetics and
Pathogenicity / 607

JOHN F. LESLIE AND JIN-RONG XU

39 *Ustilago maydis* and Maize: a Delightful
Interaction / 622

FLORA BANUETT

40 Necrotrophic Fungi: Live and
Let Die / 645MARTY DICKMAN, JAN VAN KAN, AND
CHRISTOPHER LAWRENCE41 *Epichloë* Endophytes: Models of an
Ecological Strategy / 660

CAROLYN YOUNG AND HEATHER H. WILKINSON

42 Mycoparasitism / 676

ADA VITERBO AND BENJAMIN A. HORWITZ

SECTION XI

ANIMAL PATHOGENS / 695

43 *Aspergillus fumigatus* / 697

JUDITH C. RHODES AND DAVID S. ASKEW

44 *Cryptococcus neoformans*: Budding Yeast
and Dimorphic Filamentous Fungus / 717JAMES W. KRONSTAD, JENNIFER K. LODGE, AND
JOSEPH HEITMAN45 *Histoplasma capsulatum* / 736

CHAD A. RAPPLEYE

46 The Fungal Pathogen *Candida*
albicans / 751

SARANNA FANNING AND AARON P. MITCHELL

Index / 769