

Contents for Genetics

VOLUME 1

Contents for Genomics	xv
Contents for Proteomics	xxiii
Contents for Bioinformatics	xxxi
List of Contributors to Genetics	xxxix
Preface	xlv
1. Genetic Variation and Evolution	1
Introductory Review	
1. Population genomics: patterns of genetic variation within populations	3
<i>Greg Gibson</i>	
Specialist Reviews	
2. Modeling human genetic history	11
<i>Lounès Chikhi and Mark A. Beaumont</i>	
3. Homeobox gene repertoires: implications for the evolution of diversity	31
<i>Claudia Kappen</i>	
Short Specialist Reviews	
4. Studies of human genetic history using the Y chromosome	52
<i>Mark A. Jobling</i>	
5. Studies of human genetic history using mtDNA variation	56
<i>Antonio Torroni and Chiara Rengo</i>	
6. The genetic structure of human pathogens	60
<i>Daniel J. Wilson and Daniel Falush</i>	
7. Genetic signatures of natural selection	64
<i>Carlos D. Bustamante and Molly Przeworski</i>	
8. The role of gene regulation in evolution	71
<i>Matthew V. Rockman</i>	
9. Modeling protein evolution	75
<i>David D. Pollock and Richard A. Goldstein</i>	

Basic Techniques and Approaches

10. Measuring variation in natural populations: a primer 79
Henry Harpending

2. Cytogenetics 87

Introductory Reviews

11. Human cytogenetics and human chromosome abnormalities 89
Terry Hassold
12. The visualization of chromosomes 97
Stuart Schwartz

Specialist Reviews

13. Meiosis and meiotic errors 102
Hazel Baker, Maira Tankimanova and Maj Hultén
14. Acquired chromosome abnormalities: the cytogenetics of cancer 121
Susanne M. Gollin
15. Human X chromosome inactivation 134
Carolyn J. Brown and Samuel C. Chang

Short Specialist Reviews

16. Nondisjunction 151
Neil E. Lamb
17. Microdeletions 155
John A. Crolla
18. Mosaicism 161
Wendy P. Robinson
19. Uniparental disomy 166
Aaron P. Theisen and Lisa G. Shaffer
20. Cytogenetics of infertility 171
Maria Oliver-Bonet and Renée H. Martin
21. Preimplantation genetic diagnosis for chromosome abnormalities 176
Santiago Munné

Basic Techniques and Approaches

22. FISH 185
Mark J. Pettenati and P. Nagesh Rao
23. Comparative genomic hybridization 191
Brynn Levy
24. Cytogenetic analysis of lymphomas 200
Douglas E. Horsman
25. Human sperm-FISH for identifying potential paternal risk factors for chromosomally abnormal reproductive outcomes 210
Andrew J. Wyrobek, Francesco Marchetti and Thomas E. Schmid

3. Epigenetics	217
Introductory Review	
26. Imprinting and epigenetic inheritance in human disease <i>Constantin Polychronakos</i>	219
Specialist Reviews	
27. The histone code and epigenetic inheritance <i>Andrew R. Hoffman and Thanh H. Vu</i>	226
28. Imprinting and epigenetics in mouse models and embryogenesis: understanding the requirement for both parental genomes <i>Melissa R. W. Mann</i>	236
29. Imprinting in Prader–Willi and Angelman syndromes <i>Bernhard Horsthemke and Karin Buiting</i>	245
30. Beckwith–Wiedemann syndrome <i>Benjamin Tycko and Marcel Mannens</i>	259
31. Imprinting at the <i>GNAS</i> locus and endocrine disease <i>Akio Sakamoto, Jie Liu, Lee S. Weinstein and Min Chen</i>	275
Short Specialist Reviews	
32. DNA methylation in epigenetics, development, and imprinting <i>Hiroyuki Sasaki</i>	285
33. Epigenetic reprogramming in germ cells and preimplantation embryos <i>Abraham L. Kierszenbaum</i>	292
34. Epigenetics and imprint resetting in cloned animals <i>K. John McLaughlin, Satoshi Kurosaka and Sigrid Eckardt</i>	297
35. Imprinted QTL in farm animals: a fortuity or a common phenomenon? <i>Martien A. M. Groenen</i>	304
36. Variable expressivity and epigenetics <i>Emma Whitelaw and Marnie E. Blewitt</i>	308
37. Evolution of genomic imprinting in mammals <i>Hamish G. Spencer</i>	315
38. Rapidly evolving imprinted loci <i>Joomyeong Kim and Lisa Stubbs</i>	320
39. Imprinting and behavior <i>Eric B. Keverne and James P. Curley</i>	325
40. Spreading of X-chromosome inactivation <i>Jason O. Brant and Thomas P. Yang</i>	329
41. Initiation of X-chromosome inactivation <i>Lygia V. Pereira and Raquel Stabellini</i>	336
42. Mechanisms of epigenetic loss of chromosomes in insects <i>Clara Goday and Maria-Fernanda Ruiz</i>	340

43. Epigenetic inheritance and RNAi at the centromere and heterochromatin	348
<i>Beth A. Sullivan and Kristin S. Caruana Scott</i>	
Basic Techniques and Approaches	
44. Techniques in genomic imprinting research	354
<i>Todd A. Gray</i>	
45. Bioinformatics and the identification of imprinted genes in mammals	358
<i>John M. Greally and Melissa J. Fazzari</i>	
46. UPD in human and mouse and role in identification of imprinted loci	363
<i>Aaron P. Theisen and Lisa G. Shaffer</i>	
4. Gene Mapping	367
Introductory Reviews	
47. Introduction to gene mapping: linkage at a crossroads	369
<i>Nancy J. Cox</i>	
48. Parametric versus nonparametric and two-point versus multipoint: controversies in gene mapping	373
<i>Joan E Bailey-Wilson</i>	
Specialist Reviews	
49. Gene mapping, imprinting, and epigenetics	379
<i>Konstantin Strauch</i>	
50. Gene mapping and the transition from STRPs to SNPs	389
<i>Ellen M. Wijsman</i>	
Short Specialist Reviews	
51. Choices in gene mapping: populations and family structures	399
<i>Jeffrey R. O'Connell and Toni I. Pollin</i>	
52. Algorithmic improvements in gene mapping	403
<i>Gonçalo R. Abecasis and Yu Zhao</i>	
53. Information content in gene mapping	409
<i>Dan L. Nicolae</i>	
54. Sex-specific maps and consequences for linkage mapping	414
<i>Daniel F. Gudbjartsson and Solveig K. Sieberts</i>	
55. Polymorphic inversions, deletions, and duplications in gene mapping	421
<i>Susan L. Christian</i>	
Basic Techniques and Approaches	
56. Computation of LOD scores	426
<i>Anthony L. Hinrichs and Brian K. Suarez</i>	

VOLUME 2

5. Complex Traits and Diseases	433
Introductory Review	
57. Genetics of complex diseases: lessons from type 2 diabetes <i>Leif Groop and Peter Almgren</i>	435
Specialist Reviews	
58. Concept of complex trait genetics <i>Anne V. Buchanan and Kenneth M. Weiss</i>	444
59. The common disease common variant concept <i>Deborah S. Cunninghame Graham and Timothy J. Vyse</i>	455
60. Population selection in complex disease gene mapping <i>Leena Peltonen and Teppo Varilo</i>	465
Short Specialist Reviews	
61. Allergy and asthma <i>Miriam F. Moffatt and William O.C. Cookson</i>	479
62. Inflammation and inflammatory bowel disease <i>Christopher G. Mathew</i>	485
63. Hypertension genetics: under pressure <i>Anna F. Dominiczak, Fadi J. Charchar and Maciej Tomaszewski</i>	491
64. Genetics of cognitive disorders <i>Brett S. Abrahams and Daniel H. Geschwind</i>	496
65. Complexity of cancer as a genetic disease <i>Tea Vallenius and Tomi P. Mäkelä</i>	508
66. The mitochondrial genome <i>Douglas C. Wallace</i>	512
6. Genetic Medicine and Clinical Genetics	523
Introductory Reviews	
67. Approach to rare monogenic and chromosomal disorders <i>Marc S. Williams</i>	525
68. Approach to common chronic disorders of adulthood <i>Maren T. Scheuner</i>	535
Specialist Reviews	
69. Current approaches to prenatal screening and diagnosis <i>Paula C. Cosper</i>	551
70. Advances in newborn screening for biochemical genetic disorders <i>Harvey L. Levy and Inderneel Sahai</i>	558
71. Advances in cytogenetic diagnosis <i>Daynna J. Wolff</i>	578
72. Current approaches to molecular diagnosis <i>O. Thomas Mueller</i>	594

73. The clinical and economic implications of pharmacogenomics	625
<i>David L. Veenstra</i>	
Short Specialist Reviews	
74. Molecular dysmorphology	646
<i>Leslie G. Biesecker</i>	
75. Changing paradigms of genetic counseling	650
<i>Katherine A. Schneider and Vickie Venne</i>	
76. Ethical and legal issues in medical genetics	655
<i>Mary Kay Pelias</i>	
Basic Techniques and Approaches	
77. Mechanisms of inheritance	661
<i>Arthur S. Aylsworth</i>	
78. Genetic family history, pedigree analysis, and risk assessment	670
<i>Robin L. Bennett</i>	
79. The physical examination in clinical genetics	679
<i>Marni J. Falk and Nathaniel H. Robin</i>	
80. Genetic testing and genotype–phenotype correlations	684
<i>Elfride De Baere and Ludwine Messiaen</i>	
81. Genetic counseling process	689
<i>Gretchen H. Schneider</i>	
82. Treatment of monogenic disorders	693
<i>Joseph R. Biggio Jr and Maria Descartes</i>	
83. Carrier screening: a tutorial	699
<i>Jean A. Amos and Wayne W. Grody</i>	
84. Prenatal aneuploidy screening	702
<i>Katharine D. Wenstrom</i>	
85. Gene identification in common disorders: a tutorial	707
<i>Jerome I. Rotter and Mark O. Goodarzi</i>	
86. Uses of databases	711
<i>Roberta A. Pagon</i>	
87. The microdeletion syndromes	715
<i>Elaine H. Zackai and Jodi D. Hoffman</i>	
88. Cancer genetics	718
<i>Anu B. Chittenden, Katherine A. Schneider, Kelly J. Branda and Kristen M. Shannon</i>	
89. Familial adenomatous polyposis	726
<i>C. Sue Richards and Madhuri R. Hegde</i>	
7. Gene Therapy	737
Introductory Reviews	
90. Gene therapy I: principles and clinical applications	739
<i>J. Wesley Ulm</i>	

91. Gene therapy II: viral vectors and treatment modalities 747
J. Wesley Ulm

Specialist Reviews

92. Hematopoietic stem cell gene therapy 759
Adrian J. Thrasher and Fabio Candotti
93. Gene therapy in the central nervous system 771
Maria G. Castro, Pedro R. Lowenstein and Shyam Goverdhana
94. Cardiovascular gene therapy 780
Himadri Roy, Seppo Ylä-Herttuala and Shalini Bhardwaj

Short Specialist Reviews

95. Artificial self-assembling systems for gene therapy 793
Pierre Lehn
96. Adenovirus vectors 798
Monika Lusky
97. Adeno-associated viral vectors: depend(o)ble stability 806
Richard O. Snyder
98. Retro/lentiviral vectors 812
Andrew M. L. Lever and Douglas E. Brown
99. Immunity and tolerance induction in gene therapy 817
Jean Davoust, Nicolas Bertho, Carole Masurier and David Gross
100. Gene transfer vectors as medicinal products: risks and benefits 826
Christian J. Buchholz and Klaus Cichutek

Basic Techniques and Approaches

101. Gene transfer to skeletal muscle 831
Jeffrey S. Chamberlain
102. Gene transfer to the liver 836
Katherine Parker Ponder
103. Gene transfer to the skin 839
Flavia Spirito, Guerrino Meneguzzi and Laurent Gagnoux-Palacios
104. Control of transgene expression in mammalian cells 843
Beat P. Kramer and Martin Fussenegger

Contents for Genomics

VOLUME 3

1. Genome Sequencing	849
Introductory Reviews	
1. Eukaryotic genomics <i>Mark D. Adams</i>	851
2. Genome sequencing of microbial species <i>Claire M. Fraser and Jacques Ravel</i>	859
3. Hierarchical, ordered mapped large insert clone shotgun sequencing <i>Bruce A. Roe</i>	868
Specialist Reviews	
4. Sequencing templates – shotgun clone isolation versus amplification approaches <i>Carl W. Fuller and Rebecca Deadman</i>	873
5. Robotics and automation <i>Elaine R. Mardis</i>	882
Short Specialist Reviews	
6. Microelectrophoresis devices for DNA sequencing <i>Brian McKenna, Daniel J. Ehrlich, Elizabeth A. Gismondi, James H. Aborn, Roger Lam, Sameh A. El-Difrawy and Thomas O'Neil</i>	888
7. Single molecule array-based sequencing <i>Simon T. Bennett and Tony J. Smith</i>	893
8. Real-time DNA sequencing <i>Susan H. Hardin</i>	899
2. Mapping	903
Introductory Reviews	
9. Genome mapping overview <i>Michael Lovett and Wesley C. Warren</i>	905
10. Linking DNA to production: the mapping of quantitative trait loci in livestock <i>Changxi Li, Christiane Hansen and Stephen S. Moore</i>	911

Specialist Reviews

11. Mapping complex disease phenotypes 916
David A. Collier
12. Haplotype mapping 936
Alexandre Montpetit, Fanny Chagnon and Thomas J. Hudson
13. YAC-STS content mapping 947
Claudia Gosele, Heike Zimdahl and Norbert Hubner
14. The construction and use of radiation hybrid maps in genomic research 958
André Eggen and Mathieu Gautier
15. Linkage mapping 971
Marie-Pierre Dubé and Mark E. Samuels

Short Specialist Reviews

16. Microarray comparative genome hybridization 989
Martin Krzywinski and Robert A. Holt
17. Linkage disequilibrium and whole-genome association studies 997
Angela R. Brooks-Wilson and Karen L. Novik
18. Fingerprint mapping 1002
Jacqueline E. Schein and Martin I. Krzywinski
19. Restriction fragment fingerprinting software 1013
Carol A. Soderlund
20. Synteny mapping 1017
Simon G. Gregory
21. Hitchhiking mapping 1021
Christian Schlötterer
22. The Happy mapping approach 1025
Francis Galibert
3. The Human Genome 1031

Introductory Reviews

23. The technology tour de force of the Human Genome Project 1033
Elaine R. Mardis
24. The Human Genome Project 1038
Tim Hubbard

Specialist Reviews

25. Genome assembly 1047
Asif T. Chinwalla, John W. Wallis, LaDeana W. Hillier, Michael C. Wendl and Shiaw-Pyng Yang

26. Segmental duplications and the human genome	1058
<i>Evan E. Eichler and Rhea U. Vallente</i>	
27. Noncoding RNAs in mammals	1076
<i>David A. Hume and Timothy Ravasi</i>	
Short Specialist Reviews	
28. The distribution of genes in human genome	1088
<i>Giorgio Bernardi</i>	
29. Pseudogenes	1096
<i>David Torrents</i>	
30. Alternative splicing: conservation and function	1101
<i>Evgenia V. Kriventseva and Mikhail S. Gelfand</i>	
31. Overlapping genes in the human genome	1105
<i>Izabela Makalowska</i>	
32. Comparisons with primate genomes	1109
<i>Mariano Rocchi and Nicoletta Archidiacono</i>	
33. Transcriptional promoters	1114
<i>Wyeth W. Wasserman</i>	
34. Human microRNAs	1119
<i>Sam Griffiths-Jones</i>	
35. Endogenous retroviruses	1125
<i>Jens Mayer</i>	
4. Model Organisms: Functional and Comparative Genomics	1129
Introductory Reviews	
36. Genome archaeology	1131
<i>Samuel Aparicio</i>	
37. Functional analysis of genes	1135
<i>Carol Bult and Rick Woychik</i>	
Specialist Reviews	
38. Mouse models	1142
<i>Michelle E. Goldsworthy and Roger D. Cox</i>	
39. The rat as a model physiological system	1154
<i>Dominique Gauguier</i>	
40. Farm animals	1171
<i>Leif Andersson</i>	
41. Mouse mutagenesis and gene function	1184
<i>Ralf Kühn and Wolfgang Wurst</i>	
42. Systematic mutagenesis of nonmammalian model species	1201
<i>David Sattelle and Marcel van den Heuvel</i>	

Short Specialist Reviews

- | | |
|---|------|
| 43. Functional genomics in <i>Saccharomyces cerevisiae</i>
<i>Kara Dolinski and Olga Troyanskaya</i> | 1217 |
| 44. The <i>C. elegans</i> genome
<i>Jonathan Hodgkin</i> | 1224 |
| 45. The <i>Drosophila</i> genome(s)
<i>Casey M. Bergman and Steven Russell</i> | 1226 |
| 46. The Fugu and Zebrafish genomes
<i>Greg Elgar</i> | 1230 |
| 47. The mouse genome sequence
<i>Ian J. Jackson</i> | 1235 |
| 48. Comparative sequencing of vertebrate genomes
<i>Eric D. Green and Matthew E. Portnoy</i> | 1239 |

VOLUME 4

- | | |
|---------------------------------|------|
| 5. Bacteria and Other Pathogens | 1249 |
|---------------------------------|------|

Introductory Reviews

- | | |
|---|------|
| 49. Bacterial pathogens of man
<i>Julian Parkhill</i> | 1251 |
| 50. Eukaryotic parasite genome projects
<i>Neil Hall</i> | 1256 |

Specialist Reviews

- | | |
|--|------|
| 51. Genomics of enterobacteriaceae
<i>Jeremy D. Glasner and Nicole T. Perna</i> | 1261 |
| 52. Genomics of the <i>Mycobacterium tuberculosis</i> complex and
<i>Mycobacterium leprae</i>
<i>Roland Brosch and Stephen V. Gordon</i> | 1273 |
| 53. The Mycoplasmas – a congruent path toward minimal life
functions
<i>Leka Papazisi and Scott N. Peterson</i> | 1289 |
| 54. The nuclear genome of apicomplexan parasites
<i>Elizabeth T. Brooke-Powell, James W. Ajioka and Kiew-Lian Wan</i> | 1303 |
| 55. Reverse vaccinology: a critical analysis
<i>Guido Grandi</i> | 1320 |

Short Specialist Reviews

- | | |
|--|------|
| 56. The staphylococci
<i>Steven R. Gill</i> | 1331 |
| 57. Genome-wide analysis of group A <i>Streptococcus</i>
<i>James M. Musser and Nicole M. Green</i> | 1336 |
| 58. <i>Yersinia</i>
<i>Nicholas R. Thomson</i> | 1342 |

59. Chlamydiae	1351
<i>Timothy D. Read</i>	
60. Spirochete genomes	1356
<i>George Weinstock</i>	
61. Comparative genomics of the ϵ -proteobacterial human pathogens <i>Helicobacter pylori</i> and <i>Campylobacter jejuni</i>	1359
<i>Nick Dorrell and Brendan Wren</i>	
62. The neisserial genomes: what they reveal about the diversity and behavior of these species	1364
<i>Lori A. S. Snyder and Nigel J. Saunders</i>	
63. Kinetoplastid genomics	1369
<i>Christiane Hertz-Fowler and Chris Peacock</i>	
64. The organelles of apicomplexan parasites	1377
<i>Elizabeth T. Brooke-Powell, James W. Ajioka and Kiew-Lian Wan</i>	
65. Environmental shotgun sequencing	1386
<i>Gene W. Tyson and Philip Hugenholtz</i>	
66. Methods for detecting horizontal transfer of genes	1392
<i>Jeffrey G. Lawrence</i>	
6. SNPs/Haplotypes	1397
Introductory Reviews	
67. History of genetic mapping	1399
<i>Newton E. Morton</i>	
68. Normal DNA sequence variations in humans	1405
<i>Kenneth K. Kidd</i>	
Specialist Reviews	
69. Reliability and utility of single nucleotide polymorphisms for genetic association studies	1416
<i>C. Leigh Pearce and Joel N. Hirschhorn</i>	
70. Pharmacogenetics and the future of medicine	1431
<i>Alun D. McCarthy, James L. Kennedy and Lefkos T. Middleton</i>	
71. SNPs and human history	1449
<i>Jeffrey D. Wall</i>	
Short Specialist Reviews	
72. Evolutionary modeling in haplotype analysis	1457
<i>Peter Donnelly</i>	
73. Creating LD maps of the genome	1461
<i>Andrew Collins and Sarah Ennis</i>	

74. Finding and using haplotype blocks in candidate gene association studies <i>Daniel O. Stram</i>	1467
75. Avoiding stratification in association studies <i>Bernie Devlin and Kathryn Roeder</i>	1478
76. Mapping by admixture linkage disequilibrium (MALD) <i>Michael William Smith</i>	1486
77. Genotyping technology: the present and the future <i>Pui-Yan Kwok and Ting-Fung Chan</i>	1493
7. ESTs: Cancer Genes and the Anatomy Project	1499
Introductory Reviews	
78. What is an EST? <i>Andrey Ptitsyn and Winston A. Hide</i>	1501
79. Technologies for systematic analysis of eukaryotic transcriptomes <i>Robert L. Strausberg</i>	1504
Specialist Reviews	
80. EST resources, clone sets, and databases <i>Janet F. Kelso</i>	1515
81. Using ESTs for genome annotation – predicting the transcriptome <i>Eduardo Eyras</i>	1524
82. Using ORESTES ESTs to mine gene cancer expression data <i>Pedro A.F. Galante, Rodrigo Soares and Sandro J. de Souza</i>	1534
83. Proteome knowledge bases in the context of cancer <i>Djamel Medjahed and Peter A. Lemkin</i>	1542
Short Specialist Reviews	
84. Disease gene candidacy and ESTs <i>Mark I. McCarthy</i>	1567
85. The role of nonsense-mediated decay in physiological and pathological processes <i>Andreas E. Kulozik, Gabriele Neu-Yilik, Jill A. Holbrook and Matthias W. Hentze</i>	1571
86. Pilot gene discovery in plasmodial pathogens <i>Jane M. Carlton</i>	1579
Basic Techniques and Approaches	
87. Manufacturing EST libraries <i>Marcelo B. Soares and Maria F. Bonaldo</i>	1584
88. EST clustering: a short tutorial <i>Winston A. Hide</i>	1590

89. Using UniGene, STACK, and TIGR indices <i>Alan G. Christoffels</i>	1594
8. Expression Profiling	1601
Introductory Review	
90. Microarrays: an overview <i>Jörg D. Hoheisel</i>	1603
Specialist Reviews	
91. Creating and hybridizing spotted DNA arrays <i>Ivana V. Yang</i>	1608
92. Using oligonucleotide arrays <i>Eric P. Hoffman and Lindsay W. Mitchell</i>	1616
93. Microarray CGH <i>Denis A. Smirnov and Vivian G. Cheung</i>	1631
94. Expression and localization of proteins in mammalian cells <i>Jennifer L. Stow and Rohan D. Teasdale</i>	1643
95. Integrating genotypic, molecular profiling, and clinical data to elucidate common human diseases <i>Alan Sachs and Eric E. Schadt</i>	1660
96. The promise of gene signatures in cancer diagnosis and prognosis <i>Alice Y. Lee, Jimmy C. Sung and Timothy J. Yeatman</i>	1679
Short Specialist Reviews	
97. Seven years of yeast microarray analysis <i>Gavin Sherlock and Paul T. Spellman</i>	1688
98. Bacterial genome organization: comparative expression profiling, operons, regulons, and beyond <i>Scott N. Peterson</i>	1696
99. Genomic analysis of host pathogen interactions <i>Catherine V. Gale and Paul Kellam</i>	1707
100. Protein microarrays as an emerging tool for proteomics <i>Ji Qiu and Sam Hanash</i>	1714
101. Tissue microarrays <i>Guido Sauter, Martina Mirlacher and Ronald Simon</i>	1725
Basic Techniques and Approaches	
102. The use of external controls in microarray experiments <i>Dik van Leenen, Frank C.P. Holstege and Joop M.L.M. van Helvoort</i>	1731
103. SAGE <i>Seth Blackshaw</i>	1737

Contents for Proteomics

VOLUME 5

1. Core Methodologies	1743
Introductory Review	
1. Core methodologies	1745
<i>Gerard Cagney</i>	
Specialist Reviews	
2. Sample preparation for proteomics	1749
<i>Thierry Rabilloud</i>	
3. Tandem mass spectrometry database searching	1756
<i>Daniel B. Martin, Jimmy K. Eng and Ruedi Aebersold</i>	
4. Interpreting tandem mass spectra of peptides	1765
<i>Richard S. Johnson</i>	
5. FT-ICR	1778
<i>Mark P. Barrow, Peter J. Derrick and William I. Burkitt</i>	
6. Laser-based microdissection approaches and applications	1787
<i>Rosamonde E. Banks</i>	
Short Specialist Reviews	
7. Time-of-flight mass spectrometry	1799
<i>Robert J. Cotter</i>	
8. Quadrupole mass analyzers: theoretical and practical considerations	1809
<i>Frank A. Kero, Randall E. Pedder and Richard A. Yost</i>	
9. Quadrupole ion traps and a new era of evolution	1818
<i>Jac C. Schwartz</i>	
10. Hybrid MS	1826
<i>J. I. Langridge and R. H. Bateman</i>	
11. Nano-MALDI and Nano-ESI MS	1831
<i>Gyorgy Marko-Varga, Johan Nilsson and Thomas Laurell</i>	
12. Protein fingerprinting	1836
<i>David Fenyo</i>	
13. Multidimensional liquid chromatography tandem mass spectrometry for biological discovery	1844
<i>Claire M. Delahunty and John R. Yates III</i>	
Basic Techniques and Approaches	
14. Sample preparation for MALDI and electrospray	1850
<i>J. I. Langridge and M. Snel</i>	

15. Handling membrane proteins	1857
<i>Richard J. Simpson and Robert J. A. Goode</i>	
16. Improvement of sequence coverage in peptide mass fingerprinting	1862
<i>Karin Hjærnø and Peter Roepstorff</i>	
17. Tutorial on tandem mass spectrometry database searching	1868
<i>Jimmy K. Eng</i>	
18. Techniques for ion dissociation (fragmentation) and scanning in MS/MS	1875
<i>Jack Throck Watson and O. David Sparkman</i>	
19. Making nanocolumns and tips	1882
<i>Claire Delahunty and John R. Yates III</i>	
2. Expression Proteomics	1887
Introductory Reviews	
20. Separation-dependent approaches for protein expression profiling	1889
<i>Michael J. Dunn and Stephen R. Pennington</i>	
21. Separation-independent approaches for protein expression profiling	1893
<i>Rosalind E. Jenkins and Stephen R. Pennington</i>	
Specialist Reviews	
22. Two-dimensional gel electrophoresis	1903
<i>Angelika Görg, Michael J. Dunn and Walter Weiss</i>	
23. ICAT and other labeling strategies for semiquantitative LC-based expression profiling	1916
<i>Connie Byrne and Gerard Cagney</i>	
24. Protein arrays	1926
<i>Derek Murphy and Dolores J. Cahill</i>	
Short Specialist Reviews	
25. 2D DIGE	1938
<i>Kathryn S. Lilley</i>	
26. Image analysis	1945
<i>Andrew W. Dowsey, Guang-Zhong Yang and Michael J. Dunn</i>	
27. Detecting protein posttranslational modifications using small molecule probes and multiwavelength imaging devices	1952
<i>Wayne F. Patton</i>	
28. Real-time measurements of protein dynamics	1955
<i>Caoimhín G. Concannon, Heiko Duessmann and Jochen H. M. Prehn</i>	
Basic Techniques and Approaches	
29. Two-dimensional gel electrophoresis (2-DE)	1960
<i>Emma McGregor and Michael J. Dunn</i>	

30. 2-D Difference Gel Electrophoresis – an accurate quantitative method for protein analysis	1966
<i>Edward Hawkins and Stephen O. David</i>	
31. MS-based methods for identification of 2-DE-resolved proteins	1970
<i>Achim Treumann and Christopher Gerner</i>	
32. Arraying proteins and antibodies	1975
<i>David S. Wilson and Steffen Nock</i>	
33. Basic techniques for the use of reverse phase protein microarrays for signal pathway profiling	1979
<i>Emanuel F. Petricoin III, Julia Wulfschlegel, Lance A. Liotta, Valerie S. Calvert and Virginia Espina</i>	
3. Mapping of Biochemical Networks	1987
Introductory Reviews	
34. Protein interactions in cellular signaling	1989
<i>Tony Pawson</i>	
35. Structural biology of protein complexes	1994
<i>Gabriel Waksman</i>	
Specialist Reviews	
36. Biochemistry of protein complexes	1999
<i>Bertrand Séraphin</i>	
37. Inferring gene function and biochemical networks from protein interactions	2008
<i>Stephen W. Michnick</i>	
38. The <i>C. elegans</i> interactome project	2020
<i>David E. Hill, Marc Vidal and Michael E. Cusick</i>	
39. The yeast interactome	2033
<i>Andrei Grigoriev and Peter Uetz</i>	
Short Specialist Reviews	
40. Human signaling pathways analyzed by protein interaction mapping	2052
<i>Frédéric Colland and Pierre Legrain</i>	
41. Investigating protein–protein interactions in multisubunit proteins: the case of eukaryotic RNA polymerases	2057
<i>Benjamin Guglielmi, Cécile Zaros, Michel Werner and Pierre Thuriaux</i>	
42. Membrane-anchored protein complexes	2063
<i>Igor Stagljar</i>	
43. Energy transfer–based approaches to study G protein–coupled receptor dimerization and activation	2074
<i>Michel Bouvier, Ralf Jockers and Stefano Marullo</i>	

44. Protein interaction databases <i>Henning Hermjakob and Rolf Apweiler</i>	2079
45. Computational methods for the prediction of protein interaction partners <i>Alfonso Valencia and David Juan</i>	2089
46. Functional classification of proteins based on protein interaction data <i>Anaïs Baudot, Bernard Jacq and Christine Brun</i>	2095
Basic Techniques and Approaches	
47. Bioluminescence resonance energy transfer <i>Ralf Jockers and Stefano Marullo</i>	2102
4. Functional Proteomics	2109
Introductory Review	
48. Probing cellular function with bioluminescence imaging <i>Gabriela da Silva Xavier, Guy A. Rutter, John W. Hanrahan, Kathryn J. Mitchell and Takashi Tsuboi</i>	2111
Specialist Reviews	
49. Small molecule fluorescent probes for protein labeling and their application to cell-based imaging (including FLAsH etc.) <i>Tony Cass</i>	2122
50. Using photoactivatable GFPs to study protein dynamics and function <i>Dmitry M. Chudakov and Konstantin A. Lukyanov</i>	2129
51. FRET-based reporters for intracellular enzyme activity <i>Moritoshi Sato and Yoshio Umezawa</i>	2138
Short Specialist Reviews	
52. High content screening <i>D. Lansing Taylor and Kenneth A. Giuliano</i>	2147
53. Photobleaching (FRAP/FLIP) and dynamic imaging <i>George Banting</i>	2150
54. Probing protein function in cells using CALI <i>Daniel G. Jay and Thomas J. Diefenbach</i>	2155
55. Imaging protein function using fluorescence lifetime imaging microscopy (FLIM) <i>Daniel Zicha and Yan Gu</i>	2162
56. Elucidating protein dynamics and function using fluorescence correlation spectroscopy (FCS) <i>Petra Schwille</i>	2170
57. Quantum dots for multiparameter measurements <i>Marcel P. Bruchez</i>	2174

Basic Techniques and Approaches

58. Immunofluorescent labeling and fluorescent dyes 2180
David J. Stephens, Krysten J. Palmer and Peter Watson
59. Quantitative image analysis and the Open Microscopy Environment 2187
Andrea Falconi, Chris Allan, Jason R. Swedlow and Jean-Marie Burel
60. siRNA approaches in cell biology 2194
Alexandra Gampel and Harry Mellor

VOLUME 6

5. Proteome Diversity 2201

Introductory Reviews

61. Posttranslational modification of proteins 2203
Martin R. Larsen and Ole N. Jensen
62. Glycosylation 2211
Richard D. Cummings

Specialist Reviews

63. Protein phosphorylation analysis by mass spectrometry 2223
Hanno Steen and Judith A. Jebanathirajah
64. Structure/function of *N*-glycans 2242
Miriam V. Dwek and Susan Brooks
65. Structure/function of *O*-glycans 2252
Anthony P. Corfield
66. GPI anchors 2264
Nigel M. Hooper

Short Specialist Reviews

67. Posttranslational cleavage of cell-surface receptors 2275
Hsi-Hsien Lin, John Davies, Martin Stacey and Siamon Gordon
68. S-nitrosylation and thiolation 2281
Solomon H. Snyder and Yunfei Huang
69. Glycosylation in bacteria: that, what, how, why, now what? 2287
Ben J. Appelmek, Christina M. J. E. Vandenbroucke-Grauls and Wilbert Bitter
70. *O*-glycan processing 2292
Anthony P. Corfield
71. *O*-Mannosylation 2298
Tamao Endo
72. *O*-linked *N*-acetylglucosamine (*O*-GlcNAc) 2303
Gerald W. Hart and Stephen A. Whelan

Basic Techniques and Approaches

73. Protein phosphorylation analysis – a primer 2308
Hanno Steen and Judith A. Jebranathirajah
74. Glycoproteomics 2317
Miriam V. Dwek and Philippa Mills
75. Mass spectrometry 2322
David J. Harvey
76. Analysis of N- and O-linked glycans of glycoproteins 2332
Catherine M. Radcliffe, Louise Royle, Pauline M. Rudd, Raymond A. Dwek, Sviatlana A. Astrautsova and Tony H. Merry
77. Glycosylphosphatidylinositol anchors – a structural perspective 2344
Angela Mehlert

6. Proteome Families 2349**Introductory Review**

78. Classification of proteins into families 2351
Nicola J. Mulder and Rolf Apweiler

Specialist Reviews

79. Metalloproteins 2359
Kirill Degtyarenko
80. Peptidases, families, and clans 2387
Alan J. Barrett and Neil D. Rawlings
81. Transporter protein families 2399
Ian T. Paulsen and Qinghu Ren
82. Structure comparison and protein structure classifications 2412
Christine Orengo, Christopher Bennett and Oliver Redfern

Short Specialist Reviews

83. InterPro 2435
Nicola J. Mulder
84. Functionally and structurally relevant residues in PROSITE motif descriptors 2439
Amos Bairoch, Christian J. A. Sigrist, Edouard De Castro, Nicolas Hulo, Petra S. Langendijk-Genevaux and Virginie Le Saux
85. The PRINTS protein fingerprint database: functional and evolutionary applications 2445
Alexander L. Mitchell, Anna Gaulton, Georgina Moulton, Neil Maudling, Paul M. Bradley and Teresa K. Attwood
86. Pfam: the protein families database 2451
Robert D. Finn
87. The PIR SuperFamily (PIRSF) classification system 2456
Anastasia N. Nikolskaya, Cathy H. Wu, Raja Mazumder and Winona C. Barker

88. Equivalog protein families in the TIGRFAMs database	2462
<i>Daniel H. Haft and Jeremy D. Selengut</i>	
89. The CATH domain structure database	2465
<i>Christine Orengo, Christopher Bennett and Frances Pearl</i>	
90. COGs: an evolutionary classification of genes and proteins from sequenced genomes	2474
<i>Eugene V. Koonin</i>	
Basic Techniques and Approaches	
91. Classification of proteins by sequence signatures	2479
<i>Kay Hofmann</i>	
92. Classification of proteins by clustering techniques	2485
<i>Evgenia V. Kriventseva</i>	
93. Getting the most out of protein family classification resources	2492
<i>Nicola J. Mulder</i>	
7. Structural Proteomics	2501
Introductory Reviews	
94. What use is a protein structure?	2503
<i>Simon E. V. Phillips</i>	
95. History and future of X-ray structure determination	2509
<i>Caitriona Dennis and Joachim Jaeger</i>	
Specialist Reviews	
96. Fundamentals of protein structure and function	2514
<i>David R. Westhead, James R. Bradford and Jennifer A. Siepen</i>	
97. Structural genomics – expanding protein structural universe	2529
<i>Andrzej Joachimiak</i>	
98. Target selection for structural genomics	2552
<i>Dmitrij Frishman</i>	
Short Specialist Reviews	
99. Large complexes by X-ray methods	2565
<i>Poul Nissen</i>	
100. Large complexes and molecular machines by electron microscopy	2572
<i>H. Engelhardt and J. M. Plitzko</i>	
101. The importance of protein structural dynamics and the contribution of NMR spectroscopy	2578
<i>Arnout P. Kalverda, Gary S. Thompson and W. Bruce Turnbull</i>	
102. New approaches to bridging the timescale gap in the computer simulation of biomolecular processes	2583
<i>Chandra S. Verma and Leo S. D. Caves</i>	
103. Modeling membrane protein structures	2588
<i>Mark S.P. Sansom and Yalini Arinaminpathy</i>	

Basic Techniques and Approaches	
104. X-ray crystallography <i>Susan Firbank</i>	2593
105. NMR <i>C. Jeremy Craven</i>	2600
106. Electron microscopy as a tool for 3D structure determination in molecular structural biology <i>Neil A. Ranson</i>	2607
8. Systems Biology	2613
Introductory Review	
107. Integrative approaches to biology in the twenty-first century <i>Marvin Cassman</i>	2615
Specialist Reviews	
108. Functional networks in mammalian cells <i>Ravi Iyengar and Yuguang Xiong</i>	2621
109. Analyzing and reconstructing gene regulatory networks <i>Aaron Kershenbaum, Gustavo Stolovitzky and J. Jeremy Rice</i>	2632
110. Reverse engineering gene regulatory networks <i>James J. Collins, Michael E. Driscoll, Michael J. Thompson and Timothy S. Gardner</i>	2643
111. Functional inference from probabilistic protein interaction networks <i>Joel S. Bader</i>	2661
112. Constraint-based modeling of metabolomic systems <i>Daniel A. Beard and Hong Qian</i>	2672
113. Metabolic dynamics in cells viewed as multilayered, distributed, mass-energy-information networks <i>Miguel A. Aon and Sonia Cortassa</i>	2683
114. A complex systems approach to understand how cells control their shape and make cell fate decisions <i>Donald E. Ingber and Sui Huang</i>	2699
115. Systems biology of the heart <i>Denis Noble</i>	2713
116. Integrative modeling of the pancreatic β -cell <i>Arthur Sherman and Richard Bertram</i>	2721
Short Specialist Review	
117. EGFR network <i>Stanislav Y. Shvartsman</i>	2733
Basic Techniques and Approaches	
118. Data collection and analysis in systems biology <i>Trey Ideker</i>	2736

Contents for Bioinformatics

VOLUME 7

1. Genome Assembly and Sequencing	2745
Introductory Review	
1. Contig mapping and analysis <i>Asim Siddiqui and Steven Jones</i>	2747
Specialist Reviews	
2. Algorithmic challenges in mammalian whole-genome assembly <i>Serafim Batzoglou</i>	2756
3. Genome signals and assembly <i>Marek Kimmel</i>	2765
Short Specialist Reviews	
4. Microbial sequence assembly <i>George Weinstock</i>	2775
5. Comparative analysis for mapping and sequence assembly <i>Aleksandar Milosavljevic</i>	2777
6. Statistical signals <i>Andrew J. Gentles and Samuel Karlin</i>	2782
7. Errors in sequence assembly and corrections <i>Björn Andersson and Martti T. Tammi</i>	2788
Basic Techniques and Approaches	
8. Genome maps and their use in sequence assembly <i>Paul H. Dear</i>	2793
9. Repeatfinding <i>Richard Sucgang</i>	2799
10. Graphs and metrics <i>Andreas Dress</i>	2805
11. Algorithms for sequence errors <i>Björn Andersson and Martti T. Tammi</i>	2808
12. Polymorphism and sequence assembly <i>Brinda K. Rana, Douglas W. Smith and Nicholas J. Schork</i>	2815
2. Gene Finding and Gene Structure	2825
Introductory Reviews	
13. Prokaryotic gene identification <i>in silico</i> <i>Mark Borodovsky and Rajeev Azad</i>	2827

14. Eukaryotic gene finding <i>Roderic Guigó</i>	2833
Specialist Reviews	
15. Spliced alignment <i>Xiaoqiu Huang</i>	2841
16. Searching for genes and biologically related signals in DNA sequences <i>Mihaela Pertea</i>	2849
17. Pair hidden Markov models <i>Lior Pachter, Marina Alexandersson and Nicolas Bray</i>	2858
18. Information theory as a model of genomic sequences <i>Chengpeng Bi and Peter K. Rogan</i>	2869
Short Specialist Reviews	
19. Promoter prediction <i>Thomas Werner and Vladimir B. Bajic</i>	2881
20. Operon finding in bacteria <i>Maria D. Ermolaeva</i>	2886
21. Gene structure prediction in plant genomes <i>Volker Brendel</i>	2891
22. Eukaryotic regulatory sequences <i>Edgar Wingender and Mathias Krull</i>	2895
23. Alternative splicing in humans <i>Inna Dubchak and John G. Conboy</i>	2899
24. Exonic splicing enhancers and exonic splicing silencers <i>Stephen M. Mount</i>	2903
25. Gene finding using multiple related species: a classification approach <i>Manolis Kellis</i>	2908
Basic Techniques and Approaches	
26. Dynamic programming for gene finders <i>William H. Majoros</i>	2916
27. Gene structure prediction by genomic sequence alignment <i>Burkhard Morgenstern</i>	2920
28. Computational motif discovery <i>Martin Tompa</i>	2924
3. Protein Function and Annotation	2929
Introductory Review	
29. <i>In silico</i> approaches to functional analysis of proteins <i>L. Aravind</i>	2931

Specialist Reviews

30. Contextual inference of protein function 2943
Aswin Sai Narain Seshasayee and M. Madan Babu
31. Protein domains in eukaryotic signal transduction systems 2959
Kay Hofmann

Short Specialist Reviews

32. Sequence complexity of proteins and its significance in annotation 2970
Birgit Eisenhaber and Frank Eisenhaber
33. Protein repeats 2975
Carolina Perez-Iratxeta and Miguel A. Andrade
34. Large-scale protein annotation 2978
Sarah K. Kummerfeld
35. Measuring evolutionary constraints as protein properties reflecting underlying mechanisms 2984
Andrew F. Neuwald and Jun S. Liu
36. Large-scale, classification-driven, rule-based functional annotation of proteins 2993
C. R. Vinayaka, Cathy H. Wu and Darren A. Natale

Basic Techniques and Approaches

37. Signal peptides and protein localization prediction 3005
Henrik Nielsen
38. Transmembrane topology prediction 3011
Erik Sonnhammer and Lukas Käll
39. IMPALA/RPS-BLAST/PSI-BLAST in protein sequence analysis 3017
Yuri I. Wolf

4. Comparative Analysis and Phylogeny 3025

Introductory Reviews

40. The domains of life and their evolutionary implications 3027
Carl R. Woese
41. Phylogenetic profiling 3037
David Eisenberg, Matteo Pellegrini, Sorel T. Fitz-Gibbon and Todd O. Yeates

Specialist Reviews

42. Reconstructing vertebrate phylogenetic trees 3047
Alan Filipinski and Sudhir Kumar
43. Evolution of regulatory networks 3057
Amelie Veron and Erich Bornberg-Bauer

Short Specialist Reviews

44. Phylogenomic approaches to bacterial phylogeny 3074
Vincent Daubin

45. Phylogenomics for studies of microbial evolution <i>Hans-Henrik Fuxelius and Siv G. E. Andersson</i>	3080
46. Mapping mutations on phylogenies <i>Rasmus Nielsen</i>	3084
47. Phylogenetic analysis of BLAST results <i>Fiona S. L. Brinkman</i>	3093
48. Connecting genes by comparative genomics <i>Itai Yanai</i>	3097
49. Chromosome phylogeny <i>Guillaume Bourque</i>	3102
5. Computational Methods for High-throughput Genetic Analysis: Expression Profiling	3109
Introductory Reviews	
50. Integrating statistical approaches in experimental design and data analysis <i>Ernst Wit and Raya Khanin</i>	3111
51. Mass spectrometry and computational proteomics <i>Knut Reinert and Vineet Bafna</i>	3117
Specialist Reviews	
52. Experimental design <i>Kevin K. Dobbin and Richard M. Simon</i>	3127
53. Statistical methods for gene expression analysis <i>Russ D. Wolfinger, Shibing Deng, Tzu-Ming Chu and Young K. Truong</i>	3136
54. Algorithms for gene expression analysis <i>Aedín C. Culhane and Alvis Brazma</i>	3148
55. Differential expression with the Bioconductor Project <i>Anja von Heydebreck, Robert Gentleman and Wolfgang Huber</i>	3159
56. Mass spectrometric data mining for protein sequences <i>Christian Cole, Patrick J. Lester and Simon J. Hubbard</i>	3173
Short Specialist Reviews	
57. Low-level analysis of oligonucleotide expression arrays <i>Cheng Li, Wing Hung Wong and Xuemin Fang</i>	3187
58. CGH data analysis <i>Adam A. Margolin, Barbara L. Weber and Joel Greshock</i>	3193
59. A comparison of existing tools for ontological analysis of gene expression data <i>Purvesh Khatri and Sorin Draghici</i>	3201
60. Extracting networks from expression data <i>Eleftherios T. Papoutsakis and Vassily Hatzimanikatis</i>	3224

61. Data standardization and the HUPO proteomics standards initiative	3229
<i>Chris Taylor, Henning Hermjakob, Rolf Apweiler, Sandra Orchard and Weimin Zhu</i>	
Basic Techniques and Approaches	
62. Large error models for microarray intensities	3234
<i>Anja von Heydebreck, Martin Vingron and Wolfgang Huber</i>	
63. Relevance networks	3239
<i>Atul J. Butte</i>	
6. Methods for Structure Analysis and Prediction	3243
Introductory Review	
64. Protein structure analysis and prediction	3245
<i>William R. Taylor</i>	
Specialist Reviews	
65. Analysis and prediction of membrane protein structure	3252
<i>Janet M. Thornton, Linda Partridge and Tina A. Eyre</i>	
66. <i>Ab initio</i> structure prediction	3264
<i>David Baker and William R. Taylor</i>	
67. Score functions for structure prediction	3272
<i>Richard A. Goldstein</i>	
68. Protein domains	3283
<i>Jaap Heringa</i>	
69. Complexity in biological structures and systems	3298
<i>Arthur M. Lesk</i>	
70. Modeling by homology	3321
<i>Kenji Mizuguchi</i>	
Short Specialist Reviews	
71. The Protein Data Bank (PDB) and the Worldwide PDB http://www.wwpdb.org	3335
<i>Haruki Nakamura, Helen Berman and Kim Henrick</i>	
72. Threading for protein-fold recognition	3340
<i>Kuang Lin</i>	
73. CASP	3343
<i>Krzysztof Fidelis</i>	
74. Molecular simulations in structure prediction	3346
<i>Franca Fraternali and Jens Kleinjung</i>	
75. Protein structure comparison	3353
<i>Liisa Holm</i>	
76. Secondary structure prediction	3358
<i>Ching Wai Tan and David T. Jones</i>	

77. DNA/protein modeling 3363
Richard Lavery
78. Modeling tertiary structure of RNA 3368
Benoît Masquida and Eric Westhof

VOLUME 8

7. Structuring and Integrating Data 3373

Introductory Review

79. Introduction to ontologies in biomedicine: from powertools to assistants 3375
Russ B. Altman

Specialist Reviews

80. Ontologies for the life sciences 3380
Barry Smith and Steffen Schulze-Kremer
81. Unified Medical Language System and associated vocabularies 3400
Christopher G. Chute
82. The Gene Ontology project 3409
Amelia Ireland, Jane Lomax, Jennifer I. Clark and Midori A. Harris
83. Ontologies for information retrieval 3419
William Richard Hersh
84. Ontologies for natural language processing 3428
Yves A. Lussier
85. TAMBIS: transparent access to multiple bioinformatics services 3445
Andy Brass, Carole Goble, Gary Ng, Martin Peim, Norman W. Paton, Patricia Baker, Robert Stevens and Sean Bechhofer

Short Specialist Reviews

86. Automatic concept identification in biomedical literature 3454
William H. Majoros
87. Merging and comparing ontologies 3458
Natalya F. Noy
88. Bioinformatics pathway representations, databases, and algorithms 3462
Peter D. Karp
89. Proteomics data representation and management 3470
Andrew Jones, Norman W. Paton and Stephen G. Oliver
90. Ontologies for three-dimensional molecular structure 3474
Helen M. Berman and John Westbrook

Basic Techniques and Approaches

91. Frame-based systems: Protégé 3481
Iwei Yeh

92. Description logics: OWL and DAML + OIL <i>Carole A. Goble, Ian Horrocks, Phillip Lord and Robert D. Stevens</i>	3485
8. Modern Programming Paradigms in Biology	3489
Introductory Reviews	
93. Detecting protein homology using NCBI tools <i>Scott D. McGinnis and Wayne T. Matten</i>	3491
94. Integrated bioinformatics software at NCBI <i>Fabrizio Ferre</i>	3500
Specialist Reviews	
95. Bioconductor: software and development strategies for statistical genomics <i>Robert Gentleman and Vincent Carey</i>	3510
96. RNA secondary structure prediction <i>David H. Mathews and Michael Zuker</i>	3523
97. Ensembl and UniProt (Swiss-Prot) <i>David Jackson and Reinhard Schneider</i>	3536
98. Hidden Markov models and neural networks <i>Pierre Baldi and Stefan C. Kremer</i>	3546
99. Threading algorithms <i>Jadwiga Bienkowska and Rick Lathrop</i>	3555
Short Specialist Reviews	
100. Acedb genome database <i>Edward Griffiths and Richard Durbin</i>	3569
101. Design of KEGG and GO <i>Minoru Kanehisa</i>	3572
102. Simulation of biochemical networks <i>Andrzej M. Kierzek</i>	3577
103. Using the Python programming language for bioinformatics <i>Michel F. Sanner</i>	3585
104. Perl in bioinformatics <i>Michael Gribskov, R. Hannes Niedner and T. Murlidharan Nair</i>	3594
105. The MATLAB bioinformatics toolbox <i>Lucio Cetto and Robert Henson</i>	3603
106. Gibbs sampling and bioinformatics <i>Xiaole Shirley Liu</i>	3613
107. Applications of RNA minimum free energy computations <i>Peter Clote</i>	3617
Basic Techniques and Approaches	
108. Cluster architecture <i>Chris Dagdigan</i>	3623

109. Relational databases in bioinformatics	3628
<i>Hans-Peter Kriegel, Peer Kröger and Stefan Schönaauer</i>	
110. Support vector machine software	3632
<i>William Stafford Noble</i>	
111. Brief Python tutorial for bioinformatics	3638
<i>Michael Poidinger</i>	
112. A brief Perl tutorial for bioinformatics	3648
<i>Michael J. Moorhouse</i>	