YOUR WILEY COMPANION DIGITAL EDITION

If you have purchased the e-book, Wiley Customer Care will provide an access code for the Digital Edition. Your Wiley Companion Digital Edition powered by Vital Source allows you to search, make notes and highlights, organize, clip figures, and link content.

This Wiley Companion Digital Edition also includes:

- The full chapter reference lists
- Postpublication updates to key chapters
- Bonus material for selected chapters

Please visit http://support.wiley.com to request your access code via the “Live Chat” or “Ask A Question” tabs within 90 days of purchase, and please have your receipt for verification.
From the preparation for the first edition throughout the next eight editions, Emil Frei III, Tom to us and to his legion of friends, was an Editor extraordinaire. His deep knowledge of cancer, his extensive professional and personal contacts, and his vision gave strength to the book and its production. He was a towering figure in world oncology, and through his participation in it and in this treatise promoted its creation as a medical discipline. He was a consummate clinician who trained many of the major oncologists of the United States during his leadership at the National Cancer Institute, MD Anderson Cancer Center and the Dana Farber Cancer Institute of Harvard University. He was a pioneer of translational research. His writings, lectures, and open friendship made him a valued, virtual companion to every working oncologist. His influence will outlive him.

We editors who treasured his fraternity miss him sorely, and dedicate this ninth edition of Cancer Medicine to this great man.

James F. Holland  
Robert C. Bast Jr.  
Donald W. Kufe  
Ralph R. Weichselbaum  
Raphael E. Pollock  
William N. Hait  
Waun Ki Hong
## Contents

List of contributors xi

Preface xxvii

Acknowledgments xxix

**Part 1: INTRODUCTION**

1 Cardinal manifestations of cancer  3  
   James F. Holland, Waun Ki Hong, Donald W. Kufe,  
   Robert C. Bast Jr., William N. Hait, Raphael E. Pollock,  
   and Ralph R. Weichselbaum

2 Biological hallmarks of cancer  7  
   Douglas Hanahan and Robert A. Weinberg

**Part 2: TUMOR BIOLOGY**

3 Molecular biology, genomics, proteomics, and  
   mouse models of human cancer  19  
   Srinivas R. Viswanathan, David A. Tuveson, and  
   Matthew Meyerson

4 Oncogenes  47  
   Marco A. Pierotti, Milo Frattini, Francesca Molinari,  
   Gabriella Sozzi, and Carlo M. Croce

5 Tumor suppressor genes  67  
   David Cosgrove, Ben Ho Park, and Bert Vogelstein

6 Epigenetic contributions to human cancer  85  
   James G. Herman and Stephen B. Baylin

7 Cancer genomics and evolution  93  
   William P. D. Hendricks, Aleksandar Sekulic,  
   Alan H. Bryce, Muhammed Murtaza, Pilar Ramos, and  
   Jeffrey M. Trent

8 Chromosomal aberrations in cancer  115  
   David J. Vander Weele, Megan E. McNerney, and  
   Michelle M. Le Beau

9 MicroRNA expression in cancer  131  
   Serge Patrick Nana-Sinkam, Mario Acunzo, and Carlo  
   M. Croce

10 Aberrant signaling pathways in cancer  137  
   Luca Grumolato and Stuart A. Aaronson

11 Differentiation therapy  147  
   Sai-Juan Chen, Xiao-Jing Yan, Guang-Biao Zhou, and  
   Zhu Chen

12 Cancer stem cells  159  
   Yadwinder S. Deol, Jill Granger, and Max S. Wick

13 Cancer and cell death  167  
   John C. Reed

14 Cancer cell immortality: targeting telomerase  179  
   Ilgen Mender, Zelilha Gunnur Dikmen, Woodring E.  
   Wright, and Jerry W. Shay

15 Cancer metabolism  187  
   Natalya N. Pavlova and Craig B. Thompson

16 Modeling therapy of late or early-stage metastatic  
   disease in mice  199  
   Robert S. Kerbel, Marta Pazc-Ribes, Shan Man, Ping Xu,  
   Eric Guerin, William Cruz-Munoz, and John M. L. Ebos

17 Tumor angiogenesis  207  
   John V. Heymach, Amado Zurita-Saavedra, Scott Kopetz,  
   Tina Cascone, and Monique Nilsson

**Part 3: QUANTITATIVE ONCOLOGY**

18 Cancer bioinformatics  233  
   John N. Weinstein

19 Systems biology and genomics  247  
   Saima Hassan, Laura M. Heiser, and Joe W. Gray

20 Statistical innovations in cancer research  255  
   J. Jack Lee and Donald A. Berry

21 Biomarker-based clinical trial design in the era of  
   genomic medicine  271  
   Richard Simon and Martine Piccart-Gebhart

22 Clinical informatics  277  
   Edward P. Ambinder

**Part 4: CARCINOGENESIS**

23 Chemical carcinogenesis  287  
   Lorne J. Hofseth, Ainsley Weston, and Curtis C. Harris

24 Endocrine and genetic bases of hormone-related  
   cancers  307  
   Leslie Bernstein, Xia Pu, and Jian Gu

25 Ionizing radiation  321  
   David J. Grdina

26 Ultraviolet radiation carcinogenesis  327  
   James E. Cleaver, Susana Ortiz-Urda, Rudhika Gulhar,  
   Sarah T. Arron, Lionel Brookes 3rd, and David L. Mitchell
27 Inflammation and cancer 333
   Jelena Todoric, Atsushi Umemura, Koji Taniguchi, and Michael Karin
28 RNA tumor viruses 341
   Robert C. Gallo and Marvin S. Reitz
29 Herpesviruses 353
   Jeffrey I. Cohen
30 Papillomaviruses and cervical neoplasia 361
   Michael F. Herfs, Martin C. Chang, and Christopher P. Crum
31 Hepatitis viruses and hepatoma 367
   Hongyang Wang, Guangwen Cao, Jing Fu, and Guishuai Lv
32 Parasites 373
   Mervat Z. El Azzouni and Radwa G. Diab

Part 5: EPIDEMIOLOGY, PREVENTION AND DETECTION

33 The burden of cancer worldwide: current and future perspectives 383
   Jacques Ferlay, Christopher P. Wild, and Freddie Bray
34 Cancer epidemiology 399
   Xifeng Wu, Xia Pu, Stephanie C. Melkonian, and Margaret R. Spitz
35 Behavioral approaches to cancer prevention 407
   Errol J. Philip and Jamie S. Ostroff
36 Diet and nutrition in the etiology and prevention of cancer 415
   Steven K. Clinton, Elizabeth M. Grainger, and Edward L. Giovannucci
37 Chemoprevention of cancer 433
   William N. William Jr., Waun Ki Hong, and Scott M. Lippman
38 Cancer screening and early detection 439
   Otis W. Brawley

Part 6: CLINICAL DISCIPLINES

39 Nexgen pathology: predicting clinical course and targeting disease causation 459
   Carlos Cordon-Cardo and Adolfo Firpo-Betancourt
40 Molecular diagnostics in cancer 469
   Roshni D. Kalachand, Bryan T. Hennessy, Robert C. Bast Jr., and Gordon B. Mills
41 Principles of imaging 481
   Lawrence H. Schwartz
42 Interventional radiology for the cancer patient 483
   Judy U. Ahrar, Michael J. Wallace, and Rony Arritscher
43 Principles of surgical oncology 491
   Mark Bloomston, Kenneth K. Tanabe, Raphael E. Pollock, and Donald L. Morton (deceased)
44 Principles of radiation oncology 503
   Philip P. Connell and Ralph R. Weichselbaum
45 Principles of medical oncology 511
   William N. Hait, James F. Holland, Emil Frei III (deceased), Donald W. Kufe, Robert C. Bast Jr., and Waun Ki Hong
46 Palliative care and pain management 521
   Cardinale B. Smith
47 Principles of psycho-oncology 531
   Jimmie C. Holland and Talia W. Wiesel
48 Principles of cancer rehabilitation medicine 537
   Michael D. Stubblefield, David C. Thomas, and Kristjan T. Ragnarsson
49 Integrative oncology in cancer care 543
   Gabriel Lopez, Richard T. Lee, Alejandro Chaoul, M. Kay Garcia, and Lorenzo Cohen
50 Health services research 549
   Michaela A. Dinan, Bradford R. Hirsch, and Amy Abernethy

Part 7: INDIVIDUALIZED TREATMENT

51 Personalized medicine in oncology drug development 561
   Nicholas C. Dracopoli, Iqbal Grewal, Chris H. Takimoto, and Peter F. Lebowitz
52 Preclinical and early clinical development of chemotherapeutic drugs, mechanism-based agents and biologics 573
   Axel-R. Hanauske and Daniel D. Von Hoff
53 Tumor growth kinetics 589
   Elizabeth Comen, Teresa A. Gilewski, and Larry Norton
54 Principles of dose, schedule, and combination therapy 601
   William N. Hait and Joseph P. Eder
55 Pharmacology 613
   Manish R. Sharma and Mark J. Ratain
56 Folate antagonists 625
   Peter D. Cole, Lisa Figueiredo, and Joseph R. Bertino
57 Pyrimidine and purine antimetabolites 637
   Robert B. Diasio
58 Alkylating agents and platinum antitumor compounds 649
   Zahid H. Siddik
59 DNA topoisomerase targeting drugs 665
   Anish Thomas, Susan Bates, William D. Figg Sr, and Yves Pommier
60 Agents targeting microtubules and mitotic processes 679
   Eric K. Rowinsky
61 Endocrine therapy for hormone receptor-positive breast cancer 713
Aman U. Buzdar, Shaheenah Dawood, Harold A. Harvey, and Virgil Craig Jordan

62 Drug resistance and its clinical circumvention 733
Jeffrey A. Moscow, Kenneth H. Cowan, and Branimir I. Sikic

Part 9: BIOLOGICAL AND GENE THERAPY
63 Cytokines, interferons, and hematopoietic growth factors 743
Suhendan Ekmecioglu and Elizabeth A. Grimm

64 Monoclonal serotherapy 757
Robert C. Bast Jr., Michael R. Zalutsky, and Arthur E. Frankel

65 Vaccines and immunostimulants 777
Jeffrey Schlam, James L. Gulley, and James W. Hodge

66 Cell-based cancer immunotherapy 793
Krina K. Patel, Judy S. Moyes, and Laurence J. Cooper

67 Cancer immunotherapy 801
Padmanee Sharma, Sumit K. Subudhi, Karl Peggs, Sangeeta Goswami, Jianjun Gao, Sergio Quezada, and James P. Allison

68 Cancer gene therapy 817
Haruko Tashiro and Malcolm Brenner

69 Cancer nanotechnology 825
Yanlan Liu, Denny Liu, Jinjun Shi, and Robert S. Langer

70 Hematopoietic cell transplantation 831
Roy Jones, Elizabeth Shpall, and Richard Champlin

Part 10: SPECIAL POPULATIONS
71 Principles of pediatric oncology 845
Teena Bhatia and William L. Carroll

72 Cancer and pregnancy 865
Jennifer K. Litton

73 Cancer and aging 875
Arti Hurria, Hyman B. Muss, and Harvey J. Cohen

74 Disparities in cancer care 883
Otis W. Brawley

75 Neoplasms in acquired immunodeficiency syndrome 891
Jeremy S. Abramson and David T. Scadden

76 Cancer survivorship: new challenge in cancer medicine 909
Julia H. Rowland

Part 11: DISEASE SITES
77 Primary and metastatic neoplasms of the brain in adults 919
Lisa M. DeAngelis

78 Neoplasms of the eye 935
Jasmine H. Francis, Amy C. Scheffer, and David H. Abramson

79 Neoplasms of the endocrine glands: pituitary neoplasms 949
Chirag D. Gandhi, Margaret Pain, and Kalman D. Post

80 Neoplasms of the thyroid 959
Steven I. Sherman, Maria E. Cabanillas, and Stephen Y. Lai

81 Neoplasms of the adrenal cortex 967
Tito Fojo

82 Tumors of the diffuse neuroendocrine and gastroenteropancreatic system 971
Evan Vosburgh

83 Neoplasms of the head and neck 981
Renata Ferrarotto, Merrill S. Kies, Adam S. Garden, and Michael E. Kappelfman

84 Cancer of the lung 1011

85 Malignant pleural mesothelioma 1037
Daniel R. Gomez, Anne S. Tsao, Haining Yang, and Harvey I. Pass

86 Thymomas and thymic tumors 1051
Ronan J. Kelly and Alberto M. Marchevsky

87 Tumors of the heart and great vessels 1063
Anthony F. Yu, Sai-Ching Lim Yeung, Carmen P. Escalante, Sarina van der Zee, A. P. Chahinian, and Valentin Fuster

88 Primary germ cell tumors of the thorax 1069
John D. Hainsworth and F. Anthony Greco

89 Neoplasms of the esophagus 1075
Max W. Sung, Virginia R. Litle, Steven J. Chmura, Stephen G. Swisher, David C. Rice, Jaffer A. Ajani, Ritsuko K. Komaki, and Mark K. Ferguson

90 Carcinoma of the stomach 1091
Carl Schmidt, Mariela Blum Murphy, James C. Yao, and Christopher H. Crane

91 Primary neoplasms of the liver 1103
Junichi Shindoh, Kristoffer W. Brudvik, and Jean-Nicolas Vauthey

92 Gallbladder and bile duct cancer 1115
Ahmed O. Kaseb, Marc Uemura, Melanie B. Thomas, and Steven A. Carley

93 Neoplasms of the exocrine pancreas 1129
Robert A. Wolff, Christopher H. Crane, Donghui Li, Douglas B. Evans, Anirban Maitra, and Susan Tsai

94 Neoplasms of the small intestine, vermiform appendix, and peritoneum, and carcinoma of the colon and rectum 1151
Georgia M. Beasley, Zhifci Sun, Daniel P. Nussbaum, and Douglas S. Tyler

95 Neoplasms of the anus 1177
Bruce D. Minsky and Jose G. Guillem
96 Renal cell carcinoma 1187
Earle F. Burgess, Stephen B. Riggs, Brian I. Rini, and Derek Raghavan

97 Urothelial cancer 1195
Derek Raghavan, Richard Cote, Earle F. Burgess, Stephen B. Riggs, and Michael Haake

98 Neoplasms of the prostate 1205
Christopher J. Logothetis, Jeri Kim, John W. Davis, Brian F. Chapin, Deborah Kuban, Eleni Efstathiou, and Ana Aparicio

99 Tumors of the penis and the urethra 1237
James F. Holland, Raymond S. Lance, Donald F. Lynch Jr.

100 Testis cancer 1243
Christian Kollmannsberger, Craig R. Nichols, Siamak Daneshmand, Eric K. Hansen, Christopher L. Corless, Bruce J. Roth, and Lawrence Einhorn

101 Neoplasms of the vulva and vagina 1269
Summer B. Dewdney and Jacob Rotmensch

102 Neoplasms of the cervix 1281
Anuja Jhingran and Ana M. Rodriguez

103 Endometrial cancer 1305
Jamal Rahaman, Karen Lu, and Carmel J. Cohen

104 Epithelial ovarian, fallopian tube, and peritoneal cancer 1317

105 Nonepithelial ovarian malignancies 1339

106 Molar pregnancy and gestational trophoblastic neoplasia 1353
Donald P. Goldstein, Ross S. Berkowitz, and Neil S. Horowitz

107 Gynecologic sarcomas 1361
Jamal Rahaman and Carmel J. Cohen

108 Neoplasms of the breast 1369
Hope S. Rugo, Melanie Majure, Anthony Dragun, Meredith Buxton, and Laura Esserman

109 Malignant melanoma 1441

110 Other skin cancers 1461
William G. Stebbins, Eric A. Milican, and Victor A. Neel

111 Bone tumors 1475
Timothy A. Damron

112 Soft tissue sarcomas 1499
Robert G. Maki, Chandrajit P. Raut, and Brian O'Sullivan

113 The myelodysplastic syndrome 1529
Lewis R. Silverman

114 Acute myeloid leukemia in adults: mast cell leukemia and other mast cell neoplasms 1545
Richard M. Stone and Charles A. Schiffer

115 Chronic myeloid leukemia 1571
Jorge Cortes, Richard T. Silver, and Hagop M. Kantarjian

116 Acute lymphoblastic leukemia 1581
Nitin Jain, Stefan Faderl, Hagop M. Kantarjian, and Susan O'Brien

117 Chronic lymphocytic leukemia 1595
Kanti R. Rai and Jacqueline C. Barrientos

118 Hodgkin lymphoma 1605
Carol S. Portlock, Anita Kumar, and James Armitage

119 Non-Hodgkin’s lymphoma 1615
Arnold S. Freedman and Ann S. LaCasce

120 Mycosis fungoides and Sézary syndrome 1629
Richard T. Hoppe, Youn H. Kim, and Ranjana H. Advani

121 Plasma cell tumors 1635
Noopur Raje, Teru Hideshima, Andrew J. Yee, and Kenneth C. Anderson

122 Myeloproliferative neoplasms: essential thrombocytopenia, primary myelofibrosis, and polycythemia vera 1659
Ayalew Tefferi

Part 12: MANAGEMENT OF CANCER COMPLICATIONS

123 Neoplasms of unknown primary site 1673
John D. Hainsworth and F. Anthony Greco

124 Anorexia and cachexia 1685
Takao Ohnuma

125 Antiemetic therapy 1693
Patrick M. Forde and David S. Ettinger

126 Neurologic complications of cancer 1701
Lisa M. DeAngelis

127 Dermatologic complications of cancer chemotherapy 1717
Anisha B. Patel and Madeleine M. Duvic

128 Skeletal complications 1727
Michael A. Vina, Ilya Lofin, and Jeffrey I. Mechanick

129 Hematologic complications and blood bank support 1737
Richard M. Kaufman and Kenneth C. Anderson

130 Coagulopathic complications of cancer patients 1745
Maria T. De Sancho and Jacob H. Rand

131 Urologic complications 1755
Rachel A. Sanford, Ala Abudayyeh, Christopher J. Logothetis, and Nizar M. Tunnir

132 Cardiac complications 1763
Michael S. Ewer, Steven M. Ewer, and Thomas Suter
<table>
<thead>
<tr>
<th>Page</th>
<th>Title</th>
<th>Author(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>134</td>
<td>Gastrointestinal and hepatic complications in cancer patients</td>
<td>Robert S. Bresalier, H. Franklin Herlong, and Boris Blechacz</td>
</tr>
<tr>
<td>135</td>
<td>Oral complications of cancer and their treatment</td>
<td>Stephen T. Sonis and Anna Yuan</td>
</tr>
<tr>
<td>136</td>
<td>Gonadal complications</td>
<td>Vignesh Narayanan and Catherine E. Klein</td>
</tr>
<tr>
<td>137</td>
<td>Sexual dysfunction</td>
<td>Leslie R. Schover</td>
</tr>
<tr>
<td>138</td>
<td>Endocrine complications and paraneoplastic syndromes</td>
<td>Sai-Ching Jim Yeung and Robert F. Gagel</td>
</tr>
<tr>
<td>139</td>
<td>Infections in patients with cancer</td>
<td>Lior Nesher and Kenneth V. I. Rolston</td>
</tr>
<tr>
<td>140</td>
<td>Oncologic emergencies</td>
<td>Sai-Ching Jim Yeung and Carmen P. Escalante</td>
</tr>
</tbody>
</table>

Part 13: THE FUTURE OF ONCOLOGY

<table>
<thead>
<tr>
<th>Page</th>
<th>Title</th>
<th>Author(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>141</td>
<td>A vision for twenty-first century healthcare</td>
<td>Leroy Hood, Kristin Brogaard, and Nathan D. Price</td>
</tr>
<tr>
<td></td>
<td>Index</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Index</td>
<td></td>
</tr>
</tbody>
</table>
List of contributors

Stuart A. Aaronson, MD
Aron Professor
Department of Oncological Sciences
Icahn School of Medicine at Mount Sinai
New York, NY
USA

Amy Abernethy, MD, PhD
Professor of Medicine, Division of Medical Oncology
Director, Center for Learning Health Care
Duke University Medical Center & Duke Clinical Research Institute
Durham, NC
USA

David H. Abramson, MD
Chief
Ophthalmic Oncology Service, Department of Surgery
Memorial Sloan Kettering Cancer Center
New York, NY
USA

Jeremy S. Abramson, MD, MMSc
Assistant Professor, Medicine, Harvard Medical School
Dana-Farber Cancer Institute
Boston, MA
USA

Ala Abudayyeh, MD
Assistant Professor, Division of Internal Medicine
Section of Nephrology
The University of Texas MD Anderson Cancer Center
Houston, TX
USA

Mario Acunzo, PhD
Research Scientist
James Comprehensive Cancer Center
The Ohio State University
Columbus, OH
USA

Roberto Adachi, MD
Associate Professor
Department of Pulmonary Medicine
The University of Texas MD Anderson Cancer Center
Houston, TX
USA

Ranjana H. Advani, MD
The Saul A. Rosenberg, MD, Professor of Lymphoma
Department of Medicine/Medical Oncology
Stanford University
Stanford, CA
USA

Judy U. Ahrar, MD
Associate Professor
Department of Interventional Radiology, Division of Diagnostic Imaging
The University of Texas MD Anderson Cancer Center
Houston, TX
USA

Jaffer A. Ajani, MD
Professor
Department of Gastrointestinal (GI) Medical Oncology
Division of Cancer Medicine
The University of Texas MD Anderson Cancer Center
Houston, TX
USA

James P. Allison, PhD
Professor and Chair
Department of Immunology
The University of Texas MD Anderson Cancer Center
Houston, TX
USA

Edward P. Ambinder, MD
Tisch Cancer Institute
Clinical Professor of Medicine
Icahn School of Medicine at Mount Sinai
New York, NY
USA

Kenneth C. Anderson, MD
Professor of Medicine
Medical Oncology
Dana-Farber Cancer Institute/Harvard Medical School
Boston, MA
USA

Ana Aparicio, MD
Associate Professor
Genitourinary Medical Oncology
The University of Texas MD Anderson Cancer Center
Houston, TX
USA

James Armitage, MD
Professor, Internal Medicine
Division of Hematology & Oncology
UNMC Oncology-Hematology Division
Omaha, NE
USA

Sarah T. Arron, MD, PhD
Associate Professor
Department of Dermatology
University of California
San Francisco, CA
USA

Rony Avritscher, MD
Associate Professor
Department of Interventional Radiology
The University of Texas MD Anderson Cancer Center
Houston, TX
USA

Diwakar D. Balachandran, MD
Associate Professor
Department of Pulmonary Medicine
The University of Texas MD Anderson Cancer Center
Houston, TX
USA

Jacqueline C. Barrientos, MD
Assistant Professor
Medicine
Hofstra Northwell School of Medicine
New Hyde Park, NY
USA

Lara Bashoura, MD
Associate Professor
Department of Pulmonary Medicine
The University of Texas MD Anderson Cancer Center
Houston, TX
USA

Robert C. Bast Jr., MD
Vice President for Translational Research
The University of Texas MD Anderson Cancer Center
Houston, TX
USA

Susan Bates, MD
Professor of Medicine
Division of Hematology/Oncology
Columbia University Medical Center
New York, NY
USA

Stephen B. Baylin, MD
Deputy Director
The Sidney Kimmel Comprehensive Cancer Center
Johns Hopkins University
Baltimore, MD
USA
<table>
<thead>
<tr>
<th>Name</th>
<th>Title, Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Georgia M. Beasley, MD</td>
<td>Duke University Medical Center</td>
</tr>
<tr>
<td></td>
<td>Durham, NC</td>
</tr>
<tr>
<td></td>
<td>USA</td>
</tr>
<tr>
<td>Jonathan S. Berek, MD, MMS, FASCO</td>
<td>Laurie Kraus Jacob Professor, Stanford Distinguished Careers Institute Director,</td>
</tr>
<tr>
<td></td>
<td>Special Programs, Stanford Cancer Institute Director, Stanford Women's Cancer</td>
</tr>
<tr>
<td></td>
<td>Center Director, Stanford Health Care Communication Program</td>
</tr>
<tr>
<td></td>
<td>Stanford University School of Medicine Stanford, CA</td>
</tr>
<tr>
<td></td>
<td>USA</td>
</tr>
<tr>
<td>Ross S. Berkowitz, MD</td>
<td>William H. Baker Professor of Gynecology Director of Division of Gynecologic Oncology</td>
</tr>
<tr>
<td></td>
<td>at Brigham and Women's Hospital and Dana Farber Cancer Institute Director of New</td>
</tr>
<tr>
<td></td>
<td>England Trophoblastic Disease Center</td>
</tr>
<tr>
<td></td>
<td>Harvard Medical School Boston, MA</td>
</tr>
<tr>
<td></td>
<td>USA</td>
</tr>
<tr>
<td>Leslie Bernstein, PhD</td>
<td>Professor and Director Division of Cancer Etiology, Department of Population</td>
</tr>
<tr>
<td></td>
<td>Sciences Beckman Research Institute and the City of Hope Comprehensive Cancer Center</td>
</tr>
<tr>
<td></td>
<td>Duarte, CA</td>
</tr>
<tr>
<td></td>
<td>USA</td>
</tr>
<tr>
<td>Donald A. Berry, PhD</td>
<td>Professor Department of Biostatistics The University of Texas MD Anderson Cancer</td>
</tr>
<tr>
<td></td>
<td>Center Houston, TX</td>
</tr>
<tr>
<td></td>
<td>USA</td>
</tr>
<tr>
<td>Joseph R. Bertino, MD</td>
<td>Professor Medicine and Pharmacology Robert Wood Johnson Medical School Rutgers,</td>
</tr>
<tr>
<td></td>
<td>The State University of New Jersey New Brunswick, NJ</td>
</tr>
<tr>
<td></td>
<td>USA</td>
</tr>
<tr>
<td>Teena Bhatla, MD</td>
<td>Assistant Professor Division of Pediatric Hematology-Oncology New York University</td>
</tr>
<tr>
<td></td>
<td>Medical Center The Stephen D. Hassenfeld Children's Center for Cancer and Blood</td>
</tr>
<tr>
<td></td>
<td>Disorders New York, NY</td>
</tr>
<tr>
<td></td>
<td>USA</td>
</tr>
<tr>
<td>Boris Blechacz, MD, PhD</td>
<td>Assistant Professor Department of Gastroenterology, Hepat, &amp; Nutr Division of</td>
</tr>
<tr>
<td></td>
<td>Internal Medicine The University of Texas MD Anderson Cancer Center Houston, TX</td>
</tr>
<tr>
<td></td>
<td>USA</td>
</tr>
<tr>
<td>Mark Bloomston, MD, FACS</td>
<td>Professor Division of Surgical Oncology Department of Surgery The Ohio State</td>
</tr>
<tr>
<td></td>
<td>University Wexner Medical Center Columbus, OH USA</td>
</tr>
<tr>
<td>Otis W. Brawley, MD, MACP</td>
<td>Chief Medical Officer American Cancer Society, Inc. Atlanta, GA</td>
</tr>
<tr>
<td>Freddie Bray, PhD</td>
<td>Head Section of Cancer Surveillance International Agency for Research on Cancer</td>
</tr>
<tr>
<td></td>
<td>Lyon France</td>
</tr>
<tr>
<td>Malcolm Brenner, MB, PhD</td>
<td>Professor Center for Gene Therapy Baylor College of Medicine Houston, TX USA</td>
</tr>
<tr>
<td>Robert S. Bresalier, MD</td>
<td>Professor Gastroenterology, Hepatology &amp; Nutrition Division of Internal Medicine</td>
</tr>
<tr>
<td></td>
<td>The University of Texas MD Anderson Cancer Center Houston, TX USA</td>
</tr>
<tr>
<td>Kristin Brogaard, PhD</td>
<td>Project Manager Institute for Systems Biology Seattle, WA</td>
</tr>
<tr>
<td>Lionel Brookes, 3rd, PhD</td>
<td>Postdoctoral student Department of Dermatology University of California San</td>
</tr>
<tr>
<td></td>
<td>Francisco, CA USA</td>
</tr>
<tr>
<td>Kristoffer W. Brudvik, MD, PhD</td>
<td>Postdoctoral Fellow Department of Surgical Oncology The University of Texas MD</td>
</tr>
<tr>
<td></td>
<td>Anderson Cancer Center Houston, TX USA</td>
</tr>
<tr>
<td>Alan H. Bryce, MD</td>
<td>Assistant Professor of Medicine Department of Hematology/Oncology Mayo Clinic</td>
</tr>
<tr>
<td></td>
<td>Arizona Scottsdale, AZ</td>
</tr>
<tr>
<td></td>
<td>USA</td>
</tr>
<tr>
<td>Earle F. Burgess, MD</td>
<td>Attending Physician, Medical Oncology Levine Cancer Institute, Carolinas HealthCare</td>
</tr>
<tr>
<td></td>
<td>System Charlotte, NC</td>
</tr>
<tr>
<td>Meredith Buxton, PhD</td>
<td>Assistant Professor Department of Surgery UCSF School of Medicine San Francisco,</td>
</tr>
<tr>
<td></td>
<td>CA USA</td>
</tr>
<tr>
<td>Aman U. Buzdar, MD, FACP</td>
<td>Professor of Medicine and Internist Department of Breast Medical Oncology, Division</td>
</tr>
<tr>
<td></td>
<td>of Cancer Medicine The University of Texas MD Anderson Cancer Center Houston, TX</td>
</tr>
<tr>
<td></td>
<td>USA</td>
</tr>
<tr>
<td>Maria E. Cabanillas, MD</td>
<td>Associate Professor Department of Endocrine Neoplasia and Hormonal Disorders The</td>
</tr>
<tr>
<td></td>
<td>University of Texas MD Anderson Cancer Center Houston, TX USA</td>
</tr>
<tr>
<td>Guangwen Cao, MD, PhD</td>
<td>Professor Department of Epidemiology Second Military Medical University Shanghai</td>
</tr>
<tr>
<td></td>
<td>China</td>
</tr>
<tr>
<td>William L. Carroll, MD</td>
<td>Julie and Edward J. Minskoff Professor of Pediatrics and Pathology Chief, Division</td>
</tr>
<tr>
<td></td>
<td>of Pediatric Hematology-Oncology at NYU Langone Medical Center Stephen D.</td>
</tr>
<tr>
<td></td>
<td>Hassenfeld Children's Center for Cancer and Blood Disorders New York, NY</td>
</tr>
<tr>
<td></td>
<td>USA</td>
</tr>
<tr>
<td>Tina Cascone, MD, PhD</td>
<td>Fellow, Cancer Medicine The University of Texas MD Anderson Cancer Center Houston,</td>
</tr>
<tr>
<td></td>
<td>TX USA</td>
</tr>
<tr>
<td>A. P. Chahinian, MD</td>
<td>Professor Department of Medicine Mount Sinai School of Medicine New York, NY</td>
</tr>
<tr>
<td></td>
<td>USA</td>
</tr>
<tr>
<td>Richard Champlin, MD</td>
<td>Chair, Professor of Medicine Department of Stem Cell Transplantation and Cellular</td>
</tr>
<tr>
<td></td>
<td>Therapy The University of Texas MD Anderson Cancer Center Houston, TX USA</td>
</tr>
</tbody>
</table>
List of contributors

Martin C. Chang, MD, PhD, FCAP, FRCP
Assistant Professor
Lab Med and Pathobiology
Mount Sinai Hospital
Toronto, ON
Canada

Joe Y. Chang, MD, PhD
Director, Stereotactic Radiotherapy Program
Department of Radiation Oncology
The University of Texas MD Anderson Cancer Center
Houston, TX
USA

Alejandro Chaoul, PhD
Assistant Professor
Department of Palliative, Rehabilitation & Integrative Medicine
The University of Texas MD Anderson Cancer Center
Houston, TX
USA

Brian F. Chapin, MD
Assistant Professor
Department of Urology, Division of Surgery
The University of Texas MD Anderson Cancer Center
Houston, TX
USA

Sai-Juan Chen, MD, PhD
Professor of Hematology
State Key Laboratory of Medical Genomics
Shanghai Institute of Hematology
Rui-Jin Hospital affiliated to Shanghai Jiao Tong University School of Medicine
Shanghai
China

Zhu Chen, PhD
Vice-Chairman, 12th Standing Committee of the National People’s Congress
President, Chinese Medical Association
Beijing
China

Anne Chiang, MD, PhD
Assistant Professor
Department of Medicine, Section of Medical Oncology
Yale School of Medicine, Yale Cancer Center, and Smilow Cancer Hospital
New Haven, CT
USA

Steven J. Chmura, MD, PhD
Associate Professor of Radiation and Cellular Oncology
The University of Chicago Pritzker School of Medicine
Chicago, IL
USA

James E. Cleaver, PhD
Professor Emeritus
Department of Dermatology
University of California
San Francisco, CA
USA

Steven K. Clinton, MD, PhD
Professor
Department of Internal Medicine
College of Medicine
The Ohio State University Comprehensive Cancer Center
Arthur G. James Cancer Hospital and Richard J. Solove Research Institute (OSUCCC – James)
Columbus, OH
USA

Jeffrey I. Cohen, MD
Chief, Laboratory of Infectious Diseases
National Institute of Allergy and Infectious Diseases
National Institutes of Health
Bethesda, MD
USA

Carmel J. Cohen, MD
Professor, Division of GYN Oncology
Department of Obstetrics and Gynecology
Ruttenberg Cancer Center, Icahn School of Medicine at Mount Sinai Medical Center
New York, NY
USA

Harvey J. Cohen, MD
Division Chief of Geriatrics, Director of the Center for the Study of Aging and Human Development
Duke University Medical Center
Durham, NC
USA

Lorenzo Cohen, PhD
Professor and Director
Integrative Medicine Program
Department of Palliative, Rehabilitation and Integrative Medicine
The University of Texas MD Anderson Cancer Center
Houston, TX
USA

Peter D. Cole, MD
Associate Professor
Pediatrics
Albert Einstein College of Medicine
The Children’s Hospital at Montefiore
Bronx, NY
USA

Elizabeth Comen, MD
Medical Oncologist
Breast Medicine Service
Memorial Sloan Kettering Cancer Center
New York, NY
USA

Philip P. Connell, MD
Associate Professor
Department of Radiation and Cellular Oncology
University of Chicago Hospital
Chicago, IL
USA

Laurence J. Cooper, MD, PhD
Visiting Scientist
Pediatrics Research
The University of Texas MD Anderson Cancer Center
Houston, TX
USA

Carlos Cordon-Cardo, MD, PhD
Professor and Chair
Department of Pathology
Icahn School of Medicine at Mount Sinai
New York, NY
USA

Christopher L. Corless, MD, PhD
Medical Director of the Cancer Pathology Share Resource
Oregon Health & Science University
Portland, OR
USA

Jorge Cortes, MD
Professor of Medicine
Chair CML and AML Section
Department of Leukemia
The University of Texas MD Anderson Cancer Center
Houston, TX
USA

David Cosgrove, MB, BCh
Assistant Professor, Department of Oncology
Johns Hopkins University
Baltimore, MD
USA

Richard Cote, MD, FRCP
Professor & Joseph R. Coulter Jr. Chair, Department of Pathology
Professor, Department of Biochemistry and Molecular Biology
Chief of Pathology
Jackson Memorial Hospital
University of Miami Miller School of Medicine
Miami, FL
USA

Kenneth H. Cowan, MD, PhD
Director, Fred and Pamela Buffett Cancer Center
University of Nebraska Medical Center
Omaha, NE
USA

Christopher H. Crane, MD
Professor with Tenure
Department of Radiation Oncology
The University of Texas MD Anderson Cancer Center
Houston, TX
USA

Carlo M. Croce, MD
Distinguished University Professor
The John W. Wolfe Chair in Human Cancer Genetics
Professor and Chair
Department of Molecular Virology, Immunology and Medical Genetics
The Wexner Medical Center
The Ohio State University
Columbus, OH
USA

Christopher P. Crum, MD, FRCP
Professor of Pathology, Harvard Medical School
Department of Pathology
Brigham and Women’s Hospital
Boston, MA
USA
List of contributors

William Cruz-Munoz, PhD
Postdoctoral Fellow
Biological Sciences Platform
Sunnybrook Research Institute
Toronto, ON
Canada

Steven A. Curley, MD, FACS
Professor of Surgery and Chief
Division of Surgical Oncology
Baylor College of Medicine
Houston, TX
USA

Timothy A. Damron, MD, FACS
Professor of Orthopedic Surgery
Upstate University Hospital
Syracuse, NY
USA

Siamak Daneshmand, MD
Associate Professor of Urology (Clinical Scholar)
Director of Urologic Oncology, USC Institute of Urology
Los Angeles, CA
USA

John W. Davis, MD, FACS
Associate Professor, Department of Urology
Division of Urology
The University of Texas MD Anderson Cancer Center
Houston, TX
USA

Shaheenah Dawood, MD, MBBch, FACP, FRCP, MPH, CPH
Head of Medical Oncology
Dubai Hospital
Dubai
United Arab Emirates

Lisa M. DeAngelis, MD, FAAN
Neuro-Oncologist
Chair, Department of Neurology
Lillian Rojtman Berkman Chair in Honor of Jerome B. Posner
Memorial Sloan Kettering Cancer Center
New York, NY
USA

Yadwinder S. Deol, PhD
Postdoctoral Research Fellow
University of Michigan Comprehensive Cancer Center
Ann Arbor, MI
USA

Maria T. De Sancho, MD, MSc
Associate Professor of Clinical Medicine
Non-Malignant Hematology Program at Weill Cornell Medicine's Center for Blood Disorders
New York, NY
USA

Summer B. Dewdney, MD
Assistant Professor
Division of Gynecologic Oncology
Rush University Medical Center
Chicago, IL
USA

Radwa G. Diab, MD, MBBCH, PhD
Lecturer of Medical Parasitology
Faculty of Medicine, Alexandria University
Alexandria
Egypt

Robert B. Diasio, MD
Director, Mayo Clinic Cancer Center
William J. and Charles H. Mayo Professor
Departments of Molecular Pharmacology & Experimental Therapeutics and Oncology
Rochester, MN
USA

Burton F. Dickey, MD
Professor
Department of Pulmonary Medicine
The University of Texas MD Anderson Cancer Center
Houston, TX
USA

Zeliha Gunnur Dikmen, MD, PhD
Faculty of Medicine
Department of Biochemistry
Hacettepe University
Ankara
Turkey

Michaela A. Dinan, PhD
Medical Instructor, Division of Medical Oncology
Duke University Medical Center
Durham, NC
USA

Nicholas C. Dracopoli, PhD
Vice President and Head of Oncology Biomarkers
Janssen Research & Development, LLC.
Raritan, NJ
USA

Anthony Dragun, MD
Assistant Professor
Department of Radiation Oncology
James Graham Brown Cancer Center
Louisville, KY
USA

Madeleine M. Duvic, MD
Professor, Dermatology
The University of Texas MD Anderson Cancer Center
Houston, TX
USA

George A. Eapen, MD
Professor
Department of Pulmonary Medicine
The University of Texas MD Anderson Cancer Center
Houston, TX
USA

John M. L. Ebos, PhD
Assistant Professor of Oncology
Department of Cancer Genetics
Department of Medicine
Department of Pharmacology and Therapeutics (Graduate Program)
Roswell Park Cancer Institute
Buffalo, NY
USA

Joseph P. Eder, MD
Professor of Medicine (Medical Oncology)
Yale-New Haven Hospital
New Haven, CT
USA

Eleni Efstathiou, MD, PhD
Associate Professor, Department of Genitourinary Medical Oncology, Division of Cancer Medicine
The University of Texas MD Anderson Cancer Center
Houston, TX
USA

Suhendan Ekmekcioglu, PhD
Professor
Melanoma Medical Oncology – Research
The University of Texas MD Anderson Cancer Center
Houston, TX
USA

Mervat Z. El Azzouni, MD, PhD
Professor of Medical Parasitology
Faculty of Medicine
Alexandria University
Alexandria
Egypt

Lawrence Einhorn, MD
Professor of Medicine, Division of Hematology-Oncology/Department of Urology
Indiana University School of Medicine
Melvin and Bren Simon, Cancer Center, IN
USA

Carmen P. Escalante, MD
Professor and Chairman
Department of General Internal Medicine, Ambulatory Treatment and Emergency Care
The University of Texas MD Anderson Cancer Center
Houston, TX
USA

Laura Esserman, MD, MBA
Professor, Departments of Surgery and Radiology; and Affiliate Faculty, Institute for Health Policy Studies
University of California
San Francisco, CA
USA

David S. Ettinger, MD, FACP, FCCP
Alex Grass Professor of Oncology
The Sidney Kimmel Comprehensive Cancer Center at Johns Hopkins
Baltimore, MD
USA

Douglas B. Evans, MD
Ausman Family Foundation Professor of Surgery
Chairman, Department of Surgery
Medical College of Wisconsin
Milwaukee, WI
USA

Scott E. Evans, MD
Associate Professor
Department of Pulmonary Medicine
The University of Texas MD Anderson Cancer Center
Houston, TX
USA
Steven M. Ewer, MD  
Division Cardiovascular Medicine  
University of Wisconsin School of Medicine of Public Health  
Madison, WI, USA  

Michael S. Ewer, MD, MPH, JD, LLM, MBA  
Special Assistant to the Vice President of Medical Affairs  
The University of Texas MD Anderson Cancer Center  
Houston, TX, USA  

Stefan Faderl, MD  
Chief  
John Theurer Cancer Center’s Leukemia Division  
Hackensack, NJ, USA  

Saadia A. Faiz, MD  
Associate Professor  
Department of Pulmonary Medicine  
The University of Texas MD Anderson Cancer Center  
Houston, TX, USA  

Mark K. Ferguson, MD  
Professor of Surgery  
Department of Surgical Oncology  
University of Chicago Medical Center  
Chicago, IL, USA  

Jacques Ferlay, MSc, ME  
Informatics Officer  
Section of Cancer Surveillance  
International Agency for Research on Cancer  
Lyon, France  

Renata Ferrarotto, MD  
Assistant Professor of Medicine  
Department of Thoracic-Head and Neck Medical Oncology  
The University of Texas MD Anderson Cancer Center  
Houston, TX, USA  

William D. Figg Sr, Pharm D  
Deputy Chief  
Genitourinary Malignancies Branch Center for Cancer Research, National Cancer Institute, National Institutes of Health  
Bethesda, MD, USA  

Lisa Figueiredo, MD  
Assistant Professor  
Pediatrics  
Albert Einstein College of Medicine  
The Children’s Hospital at Montefiore  
Bronx, NY, USA  

Tito Fojo, MD, PhD  
Professor of Medicine  
Division of Hematology/Oncology  
Columbia University Medical Center  
New York, NY, USA  

Patrick M. Forde, MD, MBBCCh  
Assistant Professor of Oncology  
Sidney Kimmel Comprehensive Cancer Center  
Johns Hopkins  
Baltimore, MD, USA  

Adolfo Firpo-Betancourt, MD, MPA  
Professor of Pathology  
The Mount Sinai Hospital  
New York, NY, USA  

Jasmine H. Francis, MD  
Assistant Attending  
Ophthalmic Oncology Service, Department of Surgery  
Memorial Sloan-Kettering Cancer Center  
New York, NY, USA  

Arthur E. Frankel, MD  
Professor in the Department of Internal Medicine  
UT Southwestern Medical Center  
Dallas, TX, USA  

Milo Frattini, MD, PhD  
Head  
Laboratory of Molecular Pathology  
Institute of Pathology  
Locarno, Switzerland  

Arnold S. Freedman, MD  
Professor of Medicine  
Harvard Medical School  
Dana Farber Cancer Institute  
Boston, MA, USA  

Jing Fu, MD, PhD  
Research Assistant  
International Lab on Signaling Transduction  
Eastern Hepatobiliary Surgery Hospital  
Shanghai, China  

Valentin Fuster, MD, PhD  
Professor, Icahn School of Medicine  
Physician-in-Chief  
Mount Sinai Hospital  
New York, NY, USA  

Robert F. Gagel, MD  
Head, Division of Internal Medicine  
The University of Texas MD Anderson Cancer Center  
Houston, TX, USA  

Robert C. Gallo, MD  
Homer & Martha Gudelsky Distinguished Professor in Medicine & Director, Institute of Human Virology  
University of Maryland School of Medicine  
Baltimore, MD, USA  

Jianjun Gao, MD, PhD  
Assistant Professor, Department of Genitourinary Medical Oncology, Division of Cancer Medicine  
The University of Texas MD Anderson Cancer Center  
Houston, TX, USA  

M. Kay Garcia, DrPH, MSN, LAc  
Associate Professor  
Department of Palliative, Rehabilitation and Integrative Medicine  
The University of Texas MD Anderson Cancer Center  
Houston, TX, USA  

Adam S. Garden, MD  
Professor, Department of Radiation Oncology  
The University of Texas MD Anderson Cancer Center  
Houston, TX, USA  

Chirag D. Gandhi, MD, FACS, FAANS  
Associate Professor of Neurosurgery, Neurology, and Radiology  
Program Director, Neurointerventional Fellowship  
Associate Program Director, Neurosurgical Residency  
Rutgers University – New Jersey Medical School  
Chief and Division Director, Neurological Surgery  
Newark Beth Israel Medical Center  
Newark, NJ, USA  

Teresa A. Gilewski, MD  
Professor of Clinical Medicine  
Weill Cornell Medical College  
Memorial Sloan-Kettering Cancer Center  
New York, NY, USA  

Emil Frei III, MD (deceased)  
Director and Physician-in-Chief  
Dana Farber Cancer Institute  
Boston, MA, USA
Edward L. Giovannucci, MD, ScD
Professor of Nutrition and Epidemiology
Department of Nutrition & Department of Epidemiology
Harvard T.H. Chan School of Public Health
Boston, MA
USA

Donald P. Goldstein, MD
Founder and Director Emeritus
Brigham and Women’s Hospital
Boston, MA
USA

Daniel R. Gomez, MD
Assistant Professor
Radiation Oncology Department
The University of Texas MD Anderson Cancer Center
Houston, TX
USA

Edward L. Giovannucci, MD, ScD
Professor of Nutrition and Epidemiology
Department of Nutrition & Department of Epidemiology
Harvard T.H. Chan School of Public Health
Boston, MA
USA

Donald P. Goldstein, MD
Founder and Director Emeritus
Brigham and Women’s Hospital
Boston, MA
USA

Daniel R. Gomez, MD
Assistant Professor
Radiation Oncology Department
The University of Texas MD Anderson Cancer Center
Houston, TX
USA

Elizabeth A. Grimm, PhD
Assistant Professor
Department of Pulmonary Medicine
The University of Texas MD Anderson Cancer Center
Houston, TX
USA

Sangeeta Goswami, MD, PhD
Internal Medicine Resident
University of Pittsburgh Medical Center
Pittsburgh, PA
USA

Elizabeth M. Grainger, PhD, RD
Professor, Department of Emergency Medicine
Division of Internal Medicine
The University of Texas MD Anderson Cancer Center
Houston, TX
USA

Jill Granger, BSc, MSc
Research Supervisor
Cancer Stem Cell Laboratory
Department of Internal Medicine - Hematology/Oncology
University of Michigan
Ann Arbor, MI
USA

Joe W. Gray, PhD
Professor and Gordon Moore Endowed Chair, Department of Biomedical Engineering
Director, OHSU Center for Spatial Systems Biomedicine
Associate Director for Biophysical Oncology, Knight Cancer Institute
Oregon Health & Science University
Portland, OR
USA

David J. Grdina, PhD
Professor of Radiation and Cellular Oncology
Department of Radiation and Cellular Oncology
The University of Chicago
Chicago, IL
USA

F. Anthony Greco, MD
Director, Sarah Cannon Cancer Center
Senior Investigator
Department of Oncology
Sarah Cannon Research Institute and Tennessee Oncology, PLLC
Nashville, TN
USA

Iqbal Grewal, PhD, DSc, FRCPath
Vice President, Head of Immuno-Oncology in the Oncology Therapeutic Area
Janssen Research & Development, LLC
Raritan, NJ
USA

Elizabeth A. Grimm, PhD
Assistant Professor
Department of Pulmonary Medicine
The University of Texas MD Anderson Cancer Center
Houston, TX
USA

Horiana B. Grosu, MD
Assistant Professor
Department of Pulmonary Medicine
The University of Texas MD Anderson Cancer Center
Houston, TX
USA

Luca Grumolato, PhD
Associate Professor
INSERM U982-Department of Biology
University of Rouen Normandie
Mont Saint Aignan
France

Michael Haake, MD
Medical Director
Department of Radiation Oncology
Levine Cancer Institute at Carolinas Medical Center and Senior Physician
Southeast Radiation Oncology
Charlotte, NC
USA

John D. Hainsworth, MD
Senior Investigator
Department of Oncology
Sarah Cannon Research Institute and Tennessee Oncology, PLLC
Nashville, TN
USA

William N. Hait, MD, PhD
Global Head, Research and Development
Janssen Pharmaceutical Companies of Johnson and Johnson
Raritan, NJ
USA

Douglas Hanahan, PhD
Director, Swiss Institute for Experimental Cancer Research
Professor, Department of Molecular Oncology
Swiss Federal Institute of Technology
Lausanne
Switzerland

Axel-R. Hanauske, MD, PhD, MBA
Senior Medical Fellow, Medical Oncology, Global Early Drug Development
Eli Lilly and Company
Indianapolis, IN
USA

Eric K. Hansen, MD
Radiation Oncologist
The Oregon Clinic
Portland, OR
USA

Curtis C. Harris, MD
Chief
Laboratory of Human Carcinogenesis
National Cancer Institute, National Institutes of Health
Bethesda, MD
USA

Radhika Gulhar, BA
Medical student
Department of Dermatology
University of California
San Francisco, CA
USA

Harold A. Harvey, MD
Director, Hematology/Oncology Fellowship Program
Penn State Hershey Cancer Institute
Hershey, PA
USA

James L. Gulley, MD, PhD, FACP
Chief
Genitourinary Malignancies Branch
Center for Cancer Research
National Cancer Institute
National Institutes of Health
Bethesda, MD
USA

Saima Hassan, MD, PhD, FRCSC
Postdoctoral Research Fellow
Department of Biomedical Engineering
Oregon Health & Science University
Portland, OR
USA
Laura M. Heiser, PhD
Assistant Professor
Department of Biomedical Engineering
Affiliated Faculty
OHSU Center for Spatial Systems Biomedicine
Oregon Health & Science University
Portland, OR
USA

William P. D. Hendricks, PhD
Assistant Professor
Integrated Cancer Genomics Division
Translational Genomics Research Institute
Phoenix, AZ
USA

Bryan T. Hennessy, MD
Senior Lecturer
RCSI and Consultant Medical Oncologist
Beaumont Hospital
Our Lady of Lourdes Hospital
Dublin
Ireland

Roy S. Herbst, MD, PhD
Professor (Ensign Professor of Medicine)
Department of Medicine, Section of Medical Oncology
Yale School of Medicine, Yale Cancer Center, and Smilow Cancer Hospital
New Haven, CT
USA

Michael F. Herfs, PhD
Principal Investigator
GIGA-Cancer
Laboratory of Experimental Pathology
Department of Pathology
University of Liege
Liege
Belgium

H. Franklin Herlong, MD
Professor of Medicine
Department of Gastroenterology, Hepatology and Nutrition
The University of Texas MD Anderson Cancer Center
Houston, TX
USA

James G. Herman, MD
Professor of Medicine
Co-Leader, UPCI Lung Cancer Program
University of Pittsburgh Cancer Institute
Pittsburgh, PA
USA

John V. Heymach, MD, PhD
Chair, Department of Thoracic Head and Neck
The University of Texas MD Anderson Cancer Center
Houston, TX
USA

Teru Hideshima, MD, PhD
Institute Scientist
Department of Medical Oncology
Dana-Farber Cancer Institute
Principal Associate in Medicine
Harvard Medical School
Boston, MA
USA

Bradford R. Hirsch, MD, MBA
Department of Medicine
Adjunct Assistant Professor
Duke University Medical Center
Durham, NC
USA

James W. Hodge, PhD, MBA
Senior Investigator
Laboratory of Tumor Immunology and Biology
Center for Cancer Research
National Cancer Institute
National Institutes of Health
Bethesda, MD
USA

Lorne J. Hofseth, PhD
Professor and Graduate Director, College of Pharmacy
University of South Carolina
Professor, Drug Discovery & Biomedical Sciences
South Carolina College of Pharmacy
Columbia, SC
USA

James F. Holland, MD, ScD (hc)
Distinguished Professor of Neoplastic Diseases
Director Emeritus of Derald H. Ruttenberg Cancer Center
Icahn School of Medicine at Mount Sinai
New York, NY
USA

Jimmie C. Holland, MD
Wayne E. Chapman Chair in Psychiatric Oncology
Memorial Sloan-Kettering Cancer Center
New York, NY
USA

Waun Ki Hong, MD, DMSc (Hon)
Professor of Thoracic/Head and Neck Medical Oncology
American Cancer Society
Professor, Samsung Distinguished University Chair in Cancer Medicine Emeritus
The University of Texas MD Anderson Cancer Center
Houston, TX
USA

Leroy Hood, MD, PhD
Providence Health & Services
Institute for Systems Biology
Seattle, WA
USA

Richard T. Hoppe, MD
The Henry S. Kaplan-Harry Lebow Professor in Cancer Biology
Department of Radiation Oncology
Stanford University
Stanford, CA
USA

Neil S. Horowitz, MD
Assistant Professor
Obstetrics and Gynecology
Brigham and Women’s Hospital
Boston, MA
USA

Arti Hurria, MD
Professor, Department of Medical Oncology and Therapeutics Research
City of Hope
Duarte, CA
USA

Ilya Iofin, MD
Assistant Professor of Orthopedics
Mount Sinai Hospital
New York, NY
USA

Nitin Jain, MD, MSPH
Associate Professor, Physical Medicine and Rehabilitation and Orthopaedics, Director of PM&R Research and Co-Director of Orthopaedic Sports Medicine Research
Vanderbilt Stallworth Rehabilitation Hospital
Nashville, TN
USA

Anuja Jhingran, MD
Professor
Department of Pulmonary Medicine
The University of Texas MD Anderson Cancer Center
Houston, TX
USA

Roy Jones, MD, PhD
Professor, Cancer Medicine, Department of Stem Cell Transplantation & Cellular Therapy
The University of Texas MD Anderson Cancer Center
Houston, TX
USA

Virgil Craig Jordan, OBE, PhD, DSc, FMedSci
Professor of Breast Medical Oncology and Professor of Molecular and Cellular Oncology
The University of Texas MD Anderson Cancer Center
Houston, TX
USA

Roshni D. Kalachand, MBBCh, MD
Specialist Registrar in Medical Oncology
Beaumont Hospital and Royal College of Surgeons
Dublin
Ireland

Hagop M. Kantarjian, MD
Professor and Chairman, Department of Leukemia
The University of Texas MD Anderson Cancer Center
Houston, TX
USA

Michael Karin, PhD
Distinguished Professor of Pharmacology
Pharmacology
University of California, San Diego
La Jolla, CA
USA
Ahmed O. Kaseb, MD  
Associate Professor, Department of Gastrointestinal (GI) Medical Oncology, Division of Cancer Medicine  
The University of Texas MD Anderson Cancer Center  
Houston, TX  
USA

Richard M. Kaufman, MD  
Assistant Professor of Pathology  
Harvard Medical School  
Medical Director, Adult Transfusion Service  
Brigham and Women’s Hospital  
Boston, MA  
USA

Ronan J. Kelly, MD  
Director of the Gastroesophageal Cancer Therapeutics Program  
Johns Hopkins University School of Medicine  
Baltimore, MD  
USA

Robert S. Kerbel, PhD  
Senior Scientist, Biological Sciences Platform  
Sunnybrook Research Institute  
Professor, Department of Medical Biophysics  
University of Toronto  
Toronto, ON  
Canada

Merrill S. Kies, MD  
Professor of Medicine  
Department of Thoracic–Head and Neck Medical Oncology  
The University of Texas MD Anderson Cancer Center  
Houston, TX  
USA

Youn H. Kim, MD  
The Joanne and Peter Haas, Jr., Professor for Cutaneous Lymphoma Research  
Department of Dermatology  
Stanford University  
Stanford, CA  
USA

Jeri Kim, MD  
Associate Professor, Department of Genitourinary Medical Oncology, Division of Cancer Medicine  
The University of Texas MD Anderson Cancer Center  
Houston, TX  
USA

Catherine E. Klein, MD  
Professor of Medicine  
Division of Medical Oncology  
University of Colorado  
Aurora, CO  
USA

Justin M. Ko, MD, MBA, FAAD  
Clinical Associate Professor, Dermatology  
Stanford Medical  
Redwood City, CA  
USA

Christian Kollmannsberger, MD, FRCP  
Clinical Associate Professor of Medicine  
Division of Medical Oncology  
University of British Columbia  
BCCA Vancouver Cancer Centre  
Vancouver, BC  
Canada

Ritsuko K. Komaki, MD  
Professor  
Department of Radiation Oncology  
The University of Texas MD Anderson Cancer Center  
Houston, TX  
USA

Scott Kopetz, MD, PhD  
Associate Professor, GI Medical Oncology  
The University of Texas MD Anderson Cancer Center  
Houston, TX  
USA

Michael Kroll, MD  
Professor  
Department of Pulmonary Medicine  
The University of Texas MD Anderson Cancer Center  
Houston, TX  
USA

Deborah Kuban, MD, FACP, FASTRO  
Professor, Department of Radiation Oncology  
The University of Texas MD Anderson Cancer Center  
Houston, TX  
USA

Donald W. Kufe, MD  
Distinguished Physician, Dana-Farber Cancer Institute  
Professor of Medicine, Harvard Medical School  
Leader, Translational Pharmacology and Early Therapeutic Trials Program  
Dana-Farber/Harvard Cancer Center  
Boston, MA  
USA

Anita Kumar, MD  
Assistant Attending, Lymphoma Service  
Department of Medicine  
Memorial Sloan-Kettering Cancer Center and  
Instructor of Clinical Medicine  
Weill Cornell Medical College  
New York, NY  
USA

Michael E. Kupferman, MD  
Associate Professor  
Department of Head and Neck Surgery  
The University of Texas MD Anderson Cancer Center  
Houston, TX  
USA

Ann S. LaCasce, MD  
Assistant Professor of Medicine  
Harvard Medical School  
Boston, MA  
USA

Stephen Y. Lai, MD, PhD  
Associate Professor  
Department of Head and Neck Surgery  
The University of Texas MD Anderson Cancer Center  
Houston, TX  
USA

Raymond S. Lance, MD  
Urologist  
Deaconess Medical Center-Spokane  
Spokane, WA  
USA

Robert S. Langer, ScD  
David H. Koch Institute Professor  
Department of Chemical Engineering  
Massachusetts Institute of Technology  
Cambridge, MA  
USA

Peter F. Lebowitz, MD, PhD  
Global Therapeutic Area Head, Oncology  
Janssen Research & Development, LLC.  
Raritan, NJ  
USA

Michelle M. Le Beau, PhD  
Arthur and Marian Edelstein Professor of Medicine  
Director, University of Chicago Comprehensive Cancer Center  
Chicago, IL  
USA

J. Jack Lee, PhD, MS, DDS  
Associate Vice Provost, Quantitative Research  
The University of Texas MD Anderson Cancer Center  
Houston, TX  
USA

Richard T. Lee, MD  
Assistant Professor  
Department of Medicine  
University Hospitals and Case Western Reserve University  
Cleveland, OH  
USA

Donghui Li, PhD  
Professor of Medicine  
Department of Gastrointestinal Medical Oncology  
The University of Texas MD Anderson Cancer Center  
Houston, TX  
USA

Scott M. Lippman, MD  
Professor  
Moores Cancer Center  
University of California San Diego  
La Jolla, CA  
USA
Virginia R. Little, MD  
Associate Professor of Surgery  
Boston University School of Medicine  
Boston, MA  
USA

Jennifer K. Litton, MD  
Associate Professor  
Breast Medical Oncology  
The University of Texas MD Anderson Cancer Center  
Houston, TX  
USA

Danny Liu  
Research Assistant  
Brigham and Women’s Hospital  
Harvard Medical School  
Boston, MA  
USA

Yanlan Liu, PhD  
Post-doctoral Researcher  
Brigham and Women’s Hospital  
Harvard Medical School  
Boston, MA  
USA

Christopher J. Logothetis, MD  
Chairman & Professor  
Genitourinary Medical Oncology  
The University of Texas MD Anderson Cancer Center  
Houston, TX  
USA

Gabriel Lopez, MD  
Assistant Professor  
Department of Palliative, Rehabilitation and Integrative Medicine  
The University of Texas MD Anderson Cancer Center  
Houston, TX  
USA

Charles Lu, MD, SM  
Professor, Department of Thoracic/Head and Neck Medical Oncology, Division of Cancer Medicine  
The University of Texas MD Anderson Cancer Center  
Houston, TX  
USA

Karen Lu, MD  
Chair, Department of Gynecologic Oncology and Reproductive Medicine, Division of Surgery  
The University of Texas MD Anderson Cancer Center  
Houston, TX  
USA

Guishuai Lv, MD  
Research Assistant  
International Lab on Signaling Transduction  
Eastern Hepatobiliary Surgery Hospital  
Shanghai  
China

Donald F. Lynch, Jr., MD  
Urologist  
Eastern Virginia Medical School  
Norfolk, VA  
USA

Anirban Maitra, MD  
Professor of Pathology  
Department of Pathology  
The University of Texas MD Anderson Cancer Center  
Houston, TX  
USA

Melanie Majure, MD  
H5 Clinical Instructor  
UCSF School of Medicine  
San Francisco, CA  
USA

Robert G. Maki, MD, PhD, FACP  
Professor of Medicine, Pediatrics, and Orthopaedics  
Mount Sinai Medical School  
New York, NY  
USA

Shan Man, BSc  
Senior Technician/Lab Manager  
Biological Sciences Platform  
Sunnybrook Research Institute  
Toronto, ON  
Canada

Alberto M. Marchevsky, MD  
Director, Pulmonary and Mediastinal Pathology  
Cedars-Sinai Medical Center  
West Hollywood, CA  
USA

Kim A. Margolin, MD  
Director, Multi-disciplinary Melanoma Program  
City of Hope Department of Medical Oncology and Comprehensive Cancer Center  
Duarte, California  
USA

Megan E. McNerney, MD, PhD  
Assistant Professor of Pathology  
Department of Pathology  
University of Chicago  
Chicago, IL  
USA

Jeffrey I. Mechanick, MD  
Clinical Professor of Medicine  
Division of Endocrinology, Diabetes, and Bone Disease  
Icahn School of Medicine at Mount Sinai  
New York, NY  
USA

Stephanie C. Melkonian, PhD  
Postdoctoral Research Fellow  
Department of Epidemiology  
The University of Texas MD Anderson Cancer Center  
Houston, TX  
USA

Ilgen Mender, PhD  
Postdoctoral Researcher  
Department of Cell Biology  
The University of Texas Southwestern Medical Center  
Dallas, TX  
USA  
Department of Biochemistry  
Faculty of Medicine, Hacettepe University  
Ankara  
Turkey

Matthew Meyerson, MD, PhD  
Professor  
Department of Pathology  
Dana-Farber Cancer Institute  
Boston, MA  
USA

Eric A. Millican, MD  
Fellow, Procedural Dermatology  
Vanderbilt University  
Nashville, TN  
USA

Gordon B. Mills, MD, PhD  
Professor  
Department of Systems Biology  
The University of Texas MD Anderson Cancer Center  
Houston, TX  
USA

Bruce D. Minsky, MD  
Professor of Radiation Oncology  
Frank T. McGraw Memorial Chair  
Department of Radiation Oncology  
The University of Texas MD Anderson Cancer Center  
Houston, TX  
USA

David L. Mitchell, PhD  
Professor  
Department of Carcinogenesis  
Science Park–Research Division  
Department of Carcinogenesis  
The University of Texas MD Anderson Cancer Center  
Smithville, TX  
USA

Francesca Molinari, PhD  
Scientific collaborator  
Laboratory of Molecular Pathology  
Institute of Pathology  
Locarno  
Switzerland

Daniel Morgensztern, MD  
Associate Professor  
Department of Medicine, Division of Medical Oncology  
Washington University School of Medicine  
St. Louis  
Missouri, MO  
USA

Rodolfo C. Morice, MD  
Professor  
Department of Pulmonary Medicine  
The University of Texas MD Anderson Cancer Center  
Houston, TX  
USA
Donald L. Morton, MD, FACS (deceased)
Chief of the Melanoma Program and Co-Director of the Surgical Oncology Fellowship Program
John Wayne Cancer Institute (JWCI)
Santa Monica, CA
USA

Jeffrey A. Moscow, MD
Pediatric Hematologist-Oncologist
Senior Investigator, National Cancer Institute
Bethesda, MD
USA

Judy S. Moyes, MA (Cantab), MB, BChir, FRCP, FRCPC
Technical Writer
The University of Texas MD Anderson Cancer Center
Houston, TX
USA

Mariela Blum Murphy, MD
Assistant Professor
Department of Gastrointestinal Medical Oncology
The University of Texas MD Anderson Cancer Center
Houston, TX
USA

Muhammed Murtaza, MBBS, PhD
Assistant Professor
Co-Director, Center for Noninvasive Diagnostics
Translational Genomics Research Institute
Phoenix, AZ
USA

Hyman B. Muss, MD
Mary Jones Hudson Distinguished Professorship in Geriatric Oncology
School of Medicine
UNC-Chapel Hill
Chapel Hill, NC
USA

Serge Patrick Nana-Sinkam, MD
Associate Professor
Division of Pulmonary, Allergy, Critical Care and Sleep Medicine
Department of Molecular Virology, Immunology & Medical Genetics
James Comprehensive Cancer Center
The Ohio State University
Columbus, OH
USA

Vignesh Narayanan, MD
Fellow, Hematology-Oncology
University of Colorado
Aurora, CO
USA

Victor A. Neel, MD, PhD
Assistant Professor, Department of Dermatology
Harvard Medical School
Boston, MA
USA

Lior Nesher, MD
Infectious Disease Institute
Soreq University Medical Center
Senior lecturer, Faculty of Health Sciences
Ben-Gurion University of the Negev
Beersheba
Israel

Craig R. Nichols, MD
Director, Testicular Cancer Commons
Co-Director, Testicular Cancer Multidisciplinary Clinic
Virginia Mason Medical Center
Seattle, WA
USA

Monique Nilsson, PhD
Senior Research Scientist, Department of Thoracic Head and Neck
The University of Texas MD Anderson Cancer Center
Houston, TX
USA

Larry Norton, MD
Deputy Physician-in-Chief for Breast Cancer Programs
Memorial Sloan Kettering Cancer Center
New York, NY
USA

Daniel P. Nussbaum, MD
Resident, General Surgery
Department of Pharmacology and Cancer Biology
Duke University Medical Center
Durham, NC
USA

Amir Onn, MD
Head, Institute of Pulmonary Medicine
Sheba Medical Center
Ramat Gan
Israel

Susana Ortiz-Urda, MD, PhD, MBA
Assistant Professor
Department of Dermatology
University of California
San Francisco, CA
USA

Brian O’Sullivan, MD, FRCPI, FRCP
Professor, Department of Radiation Oncology
University of Toronto
Head, Radiation Oncology Sarcoma Site Group
Princess Margaret Cancer Centre
Toronto, ON
Canada

Jamie S. Ostroff, PhD
Chief, Behavioral Sciences Service
Director, Tobacco Treatment Program
Memorial Sloan Kettering Cancer Center
New York, NY
USA

Marta Paez-Ribes, PhD
Research Associate
Department of Pathology
University of Cambridge
Cambridge
UK

Margaret Pain, MD
Neurosurgical Resident
Icahn School of Medicine at Mount Sinai
New York, NY
USA

Ben Ho Park, MD, PhD
Professor, Department of Oncology, Johns Hopkins University
Professor of Oncology, Breast and Ovarian Cancer Program
Associate Director, Hematology/Oncology Fellowship Training Program
Associate Director for Research Training and Education
The Sidney Kimmel Comprehensive Cancer Center at Johns Hopkins
Baltimore, MD
USA

Harvey I. Pass, MD
Stephen E. Banner Professor of Thoracic Oncology
Professor of Surgery and Cardiothoracic Surgery
Director, General Thoracic Division
Chief, Thoracic Oncology
NYU Langone Medical Center
New York, NY
USA

Anisha B. Patel, MD
Assistant Professor of Dermatology
The University of Texas MD Anderson Cancer Center
Houston, TX
USA

Krina K. Patel, MD
Assistant Professor
Stem Cell Transplantation and Cellular Therapy
The University of Texas MD Anderson Cancer Center
Houston, TX
USA

Anisha B. Patel, MD
Assistant Professor of Dermatology
The University of Texas MD Anderson Cancer Center
Houston, TX
USA

Krina K. Patel, MD
Assistant Professor
Stem Cell Transplantation and Cellular Therapy
The University of Texas MD Anderson Cancer Center
Houston, TX
USA

Natalya N. Pavlova, PhD
Postdoctoral Research Fellow
Cancer Biology and Genetics Program
Memorial Sloan Kettering Cancer Center
New York, NY
USA

Karl Peggs, MD, MA, MRCP, FRCPath
Senior Lecturer in Stem Cell Transplantation and Immunotherapy
University College Hospital London
London
UK
List of contributors

Errol J. Philip, PhD
Chief Clinical Research Fellow in the Department of Psychiatry and Behavioral Sciences
Memorial Sloan Kettering Cancer Center
New York, NY
USA

Martine Piccart-Gebhart, MD, PhD
Professor of Oncology
Université Libre de Bruxelles (ULB)
Head of the Medicine Department
Jules Bordet Institute
Brussels
Belgium

Marco A. Pierotti, PhD
Scientific Directorate
Fondazione Istituto Ricerche Pediatriche Città della Speranza
Padova
Italy

Raphael E. Pollock, MD, PhD, FACS
Professor and Director, Division of Surgical Oncology
Surgeon in Chief, James Comprehensive Cancer Center
The Ohio State University Wexner Medical Center
Columbus, OH
USA

Yves Pommier, MD, PhD
Chief
Developmental Therapeutics Branch, National Cancer Institute, National Institutes of Health
Bethesda, MD
USA

Carol S. Portlock, MD
Attending Physician
Lymphoma Service, Department of Medicine
Memorial Sloan-Kettering Cancer Center and Memorial Sloan Kettering Cancer Center
New York, NY
USA

Kalmon D. Post, MD, FACS, FAANS
Chairman Emeritus Department Neurosurgery
Professor Neurosurgery & Medicine
Icahn School of Medicine at Mount Sinai
Program Director Department Neurosurgery
Mount Sinai Health System
New York, NY
USA

Selvaraj E. Pravinkumar, MD, FRCP
Associate Professor
Department of Critical Care
The University of Texas MD Anderson Cancer Center
Houston, TX
USA

Nathan D. Price, PhD
Professor and Associate Director
Institute for Systems Biology
Seattle, WA
USA

Xia Pu, PhD
Instructor
Department of Epidemiology
The University of Texas MD Anderson Cancer Center
Houston, TX
USA

Sergio Quezada, PhD
Professorial Research Fellow
UCL Cancer Institute
London
UK

Derek Raghavan, MD, PhD, FACP, FRACP, FASCO
President, Levine Cancer Institute & Professor-Medicine, UNC School of Medicine, Charlotte Campus, Carolinas HealthCare System
Charlotte, NC
USA

Kristján T. Ragnarsson, MD
Professor and Chairman
Department of Rehabilitation Medicine
Icahn School of Medicine at Mount Sinai
New York, NY
USA

Jamal Rahaman, MD
Associate Clinical Professor
The Mount Sinai Hospital
New York, NY
USA

Kanti R. Rai, MD
Professor of Medicine and Professor of Molecular Medicine
Joel Finkelstein Cancer Foundation
Hofstra Northwell School of Medicine
New Hyde Park, NY
USA

Noopur Raje, MD
Director, Center for Multiple Myeloma
Rita Kelley Chair in Oncology
Massachusetts General Hospital Cancer Center
Associate Professor of Medicine
Harvard Medical School
Boston, MA
USA

Pilar Ramos, PhD
Postdoctoral Fellow
Integrated Cancer Genomics Division, Translational Genomics Research Institute
Phoenix, AZ
USA

Jacob H. Rand, MD
Hematologist
Montefiore Medical Center
Bronx, NY
USA

Mark J. Ratain, MD
Leon O. Jacobson Professor of Medicine
Department of Medicine and Committee on Clinical Pharmacology and Pharmacogenomics
University of Chicago
Chicago, IL
USA

Chandrajit P. Raut, MD, MSc, FACS
Associate Surgeon, General and Gastrointestinal Surgery
Brigham and Women’s Hospital
Harvard Medical School
Boston, MA
USA

John C. Reed, MD, PhD
Pharmaceutical Research & Early Development
Roche Innovation Center
Basel
Switzerland

Marvin S. Reitz, PhD
Adjunct Professor
School of Medicine
Institute of Human Virology
Baltimore, MD
USA

David C. Rice, MB, BCh, BAO, FRCSI
Professor
Department of Thoracic and Cardiovascular Surgery
Division of Surgery
The University of Texas MD Anderson Cancer Center
Houston, TX
USA

Stephen B. Riggs, MD
Attending Surgeon, Department of Urology and Levine Cancer Institute
Carolinas HealthCare System
Charlotte, NC
USA

Brian I. Rini, MD, FACP
Professor of Medicine
Department of Solid Tumor Oncology
Cleveland Clinic Taussig Cancer Institute
Cleveland, OH
USA
Ana M. Rodriguez, MD, MPH, FACOG
Assistant Professor
Department of Obstetrics & Gynecology
University of Texas Medical Branch
Galveston, TX
USA

Kenneth V. I. Rolston, MD, FACP
Adjunct Professor, Department of Medicine / Infectious Diseases Section
The University of Texas MD Anderson Cancer Center
Houston, TX
USA

Bruce J. Roth, MD
Professor of Medicine
Division of Oncology, Section of Medical Oncology
Washington University School of Medicine
Missouri, MO
USA

Jacob Rotmensh, MD
Oncologist
Department of Gynecologic Oncology
Rush University Medical Center
Chicago, IL
USA

Eric K. Rowinsky, MD
Adjunct Professor, Department of Medicine
NYU School of Medicine
New York, NY
USA

Julia H. Rowland, PhD
Director, Office of Cancer Survivorship
Division of Cancer Control and Population Sciences, National Cancer Institute, NIH-DHHS
Bethesda, MD
USA

Hope S. Rugo, MD
Clinical Professor, Department of Medicine (Hematology/Oncology)
University of California San Francisco School of Medicine
San Francisco, CA
USA

Rachel A. Sanford, MD
Fellow, Division of Cancer Medicine Fellowship Program
The University of Texas MD Anderson Cancer Center
Houston, TX
USA

David T. Scadden, MD
Massachusetts General Hospital
Director, MGH Center for Regenerative Medicine
Boston, MA
USA

Amy C. Schefler, MD, FACS
Attending
Retina Consultants of Houston
Houston, TX
USA

Charles A. Schiffer, MD
Professor of Medicine and Oncology
Joseph Dresser Chair for Hematologic Malignancies
Department of Oncology
Karmanos Cancer Center
Wayne State University School of Medicine
Detroit, MI
USA

Jeffery Schlom, PhD
Chief
Laboratory of Tumor Immunology and Biology
National Cancer Institute
Bethesda, MD
USA

Carl Schmidt, MD
Associate Professor
Department of Surgery
The Ohio State University Wexner Medical Center
Columbus, OH
USA

Leslie R. Schover, PhD
Professor of Behavioral Science
The University of Texas MD Anderson Cancer Center
Houston, TX
USA

Lawrence H. Schwartz, MD
James Picker Professor of Radiology
Department of Radiology
University of Columbia
Columbia, OH
USA

Aleksandar Sekulic, MD, PhD
Associate Professor of Dermatology
Vice Chair, Department of Dermatology
Chair, Cutaneous Oncology Disease Group
Mayo Clinic Arizona
Scottsdale, AZ
USA

Boris Sepesi, MD
Assistant Professor
Thoracic and Cardiovascular Surgery
The University of Texas MD Anderson Cancer Center
Houston, TX
USA

Vickie R. Shannon, MD
Professor
Department of Pulmonary Medicine
The University of Texas MD Anderson Cancer Center
Houston, TX
USA

Padmanee Sharma, MD, PhD
Professor, Department of Genitourinary Medical Oncology, Division of Cancer Medicine
The University of Texas MD Anderson Cancer Center
Houston, TX
USA

Manish R. Sharma, MD
Assistant Professor of Medicine
Department of Medicine and Committee on Clinical Pharmacology and Pharmacogenomics
University of Chicago
Chicago, IL
USA

Jerry W. Shay, PhD
Professor, Department of Cell Biology
UT Southwestern Medical Center
Dallas, TX
USA
Professor
Center for Excellence in Genomics Medicine Research
King Abdullah University
Jeddah
Saudi Arabia

Steven I. Sherman, MD
Associate Vice Provost, Clinical Research
Chair and Naguib Samaan Distinguished Professor in Endocrinology
Department of Endocrine Neoplasia and Hormonal Disorders
The University of Texas MD Anderson Cancer Center
Houston, TX
USA

Jinjun Shi, PhD
Assistant Professor of Anaesthesia
Department of Anaesthesia
Brigham and Women’s Hospital
Harvard Medical School
Boston, MA
USA

Junichi Shindoh, MD, PhD
Associate Professor
Department of Hepatobiliary and Pancreatic Surgery
The University of Tokyo
Tokyo
Japan

Elizabeth Shpall, MD
Professor, Department of Stem Cell Transplantation and Cellular Therapy
The University of Texas MD Anderson Cancer Center
Houston, TX
USA

Zahid H. Siddik, PhD
Professor of Medicine (Pharmacology)
The University of Texas MD Anderson Cancer Center
Houston, TX
USA

Branimir I. Sikic, MD
Professor of Medicine (Oncology)
Stanford Medicine
Stanford, CA
USA

Richard T. Silver, MD
Professor of Medicine, Division of Hematology-Oncology
Department of Medicine
Weill Cornell Medical College
New York, NY
USA
Lewis R. Silverman, MD
Associate Professor
Department of Medicine, Hematology and Medical Oncology
Mount Sinai Hospital
New York, NY
USA

Richard Simon, DSc
Associate Director
Division of Cancer Treatment and Diagnosis
National Cancer Institute
Bethesda, MD
USA

Cardinale B. Smith, MD, MSCR
Assistant Professor of Medicine
Associate Program Director of Research, Internal Medicine Residency
Division of Hematology/Medical Oncology and Brookdale Department of Geriatrics and Palliative Medicine
Icahn School of Medicine at Mount Sinai
New York, NY
USA

Vernon K. Sondak, MD
Chief of the Division of Cutaneous Oncology and Director of Surgical Education
H. Lee Moffitt Cancer Center and Research Institute
Tampa, FL
USA

Stephen T. Sonis, DMD, DMSc
Clinical Professor of Oral Medicine and Diagnostic Sciences
Harvard School of Dental Medicine
Brigham and Women's Hospital
Boston, MA
USA

Gabriella Sozzi, PhD
Head
Tumor Genomics Unit
Department of Experimental Oncology and Molecular Medicine
Fondazione IRCCS Istituto Nazionale dei Tumori
Milan, Italy

Margaret R. Spitz, MD, MPH
Professor
Dan L. Duncan Cancer Center
Baylor College of Medicine
Houston, TX
USA

William G. Stebbins, MD
Assistant Professor of Dermatology
Vanderbilt University
Nashville, TN
USA

Richard M. Stone, MD
Chief of Staff
Program Director, Adult Leukemia
Professor of Medicine
Harvard Medical School Center/Program
Boston, MA
USA

Michael D. Stubblefield, MD
National Medical Director for Cancer Rehabilitation
Select Medical
Medical Director for Cancer Rehabilitation
Kessler Institute for Rehabilitation
West Orange, NJ
USA

Sumit K. Subudhi, MD, PhD
Assistant Professor
Department of Genitourinary Medical Oncology
Division of Cancer Medicine
The University of Texas MD Anderson Cancer Center
Houston, TX
USA

Zhifei Sun, MD
Research Assistant
Department of Leukemia
University of Texas Medical Center
Dallas, TX
USA

Max W. Sung, MD
Associate Professor of Medicine, Hematology and Medical Oncology
The Mount Sinai Hospital
New York, NY
USA

Thomas Suter, MD
Professor of Medicine
Department of Cardiology
University Hospital Bern
Basel
Switzerland

Susan M. Swetter, MD
Professor of Dermatology
Palo Alto Veterans Affairs Health Care System and the Stanford University Medical Center
Stanford, CA
USA

Stephen G. Swisher, MD, FACS
Division Head, Division of Surgery
The University of Texas MD Anderson Cancer Center
Houston, TX
USA

Chris H. Takimoto, MD, PhD, FACP
Vice President, Translational Medicine Early Development
Janssen Research & Development, LLC.
Raritan, NJ
USA

Kenneth K. Tanabe, MD, FACS
Associate Professor
Director, Mesothelioma Program
Director, Thoracic Chemo-Radiation Program
The University of Texas MD Anderson Cancer Center
Department of Thoracic-Head & Neck Medical Oncology
Houston, TX
USA

Koji Taniguchi, MD, PhD
Assistant Project Scientist
Pharmacology
University of California, San Diego
La Jolla, CA
USA

Nizar M. Tannir, MD, FACP
Professor and Deputy Chairman
Department of Genitourinary Medical Oncology
The University of Texas MD Anderson Cancer Center
Houston, TX
USA

Haruko Tashiro, MD, PhD
Post-doctoral fellow
Baylor College of Medicine
Houston, TX
USA

Ayalew Tefferi, MD
Professor of Medicine and Hematology
Department of Internal Medicine Mayo Clinic
Rochester, MN
USA

Anish Thomas, MBBS, MD
Staff Clinician
Thoracic and Gastrointestinal Oncology Branch, Center for Cancer Research
National Cancer Institute
National Institutes of Health
Bethesda, MD
USA

Melanie B. Thomas, MD, MS
Associate Center Director for Experimental Therapeutics
Gibbs Cancer Center & Research Institute – Spartanburg
Spartanburg, SC
USA

David C. Thomas, MD, MHPE
Professor of Medicine, Medical Education and Rehabilitation Medicine
Vice Chair for Education
Samuel Bronfman Department of Medicine
Icahn School of Medicine at Mount Sinai
New York, NY
USA

Craig B. Thompson, MD
President and CEO-Member
Cancer Biology and Genetics Program
Memorial Sloan Kettering Cancer Center
New York, NY
USA

Jelena Todoric, MD, PhD
Postdoctoral Researcher
Pharmacology
University of California, San Diego
La Jolla, CA
USA
Jeffrey M. Trent, PhD
Professor
Integrated Cancer Genomics Division
Translational Genomics Research Institute
Phoenix, AZ
USA

Susan Tsai, MD
Assistant Professor of Surgery
Department of Surgery
Medical College of Wisconsin
Milwaukee, WI
USA

Anne S. Tsao, MD
Associate Professor
Department of Thoracic-Head & Neck Medical Oncology
The University of Texas MD Anderson Cancer Center
Houston, TX
USA

David A. Tuveson, MD, PhD
Professor
Cold Spring Harbor Laboratory
Cold Spring Harbor, NY
USA

Douglas S. Tyler, MD
John Woods Harris Distinguished Chair in Surgery
University of Texas Medical Branch
Galveston, TX
USA

Marc Uemura, MD
Fellow in Hematology and Medical Oncology
Anderson Cancer Center
Houston, TX
USA

Atsushi Umemura, MD, PhD
Assistant Professor
Department of Molecular Gastroenterology and Hepatology, Graduate School of Medical Science
Kyoto Prefectural University of Medicine
Kyoto
Japan

David J. Vander Weele, MD, PhD
Section of Hematology-Oncology, Department of Medicine
Comprehensive Cancer Center
University of Chicago
Chicago, IL
USA

Ara A. Vaporiyan, MD
Professor and Chairman
Director of Clinical Education and Training
Department of Thoracic and Cardiovascular Surgery
M.G. & Lillie A. Johnson Chair for Cancer Treatment & Research
The University of Texas MD Anderson Cancer Center
Houston, TX
USA

Jean-Nicolas Vauthey, MD
Professor, Department Surgical Oncology
Chief, Hepato-Pancreato-Biliary Section
The University of Texas MD Anderson Cancer Center
Houston, TX
USA

Michael A. Via, MD
Assistant Professor of Medicine
Associate Fellowship Director
Director of Metabolic Support
Division of Endocrinology, Diabetes, and Bone Disease
Mount Sinai Beth Israel Medical Center
Icahn School of Medicine at Mount Sinai
New York, NY
USA

Srinivas R. Viswanathan, MD, PhD
Director
Department of Gynecologic Radiation Oncology
Dana-Farber Cancer Institute
Boston, MA
USA

Bert Vogelstein, MD
Professor, Department of Oncology
Johns Hopkins University
Baltimore, MD
USA

Daniel D. Von Hoff, MD, FACP
Director, AHSC Cancer Therapeutics Program
Department of Medicine
University of Arizona College of Medicine
Physician in Chief and Distinguished Professor
Translational Genomics Research Institute
Phoenix, AZ
USA

Evan Vosburgh, MD
Clinical Associate Professor of Medicine
Department of Medicine
Yale University School of Medicine
New Haven, CT
USA

Michael J. Wallace, MD
Professor
Department of Interventional Radiology
The University of Texas MD Anderson Cancer Center
Houston, TX
USA

Hongyang Wang, MD
Professor and Director
National Center for Liver Cancer
China
Eastern Hepatobiliary Surgery Hospital
Shanghai
China

Ralph R. Weichselbaum, MD
Daniel K. Ludwig Distinguished Service Professor of Radiation and Cellular Oncology
Chair, Department of Radiation and Cellular Oncology
University of Chicago
Hospital Director, Chicago Tumor Institute
Chicago, IL
USA

Robert A. Weinberg, PhD
Professor of Biology
Whitehead Institute
Massachusetts Institute of Technology
Cambridge, MA
USA

John N. Weinstein, MD, PhD
Professor and Chair, Department of Bioinformatics and Computational Biology, Division of Quantitative Sciences
The University of Texas MD Anderson Cancer Center
Houston, TX
USA

Ainsley Weston, PhD
Associate Director for Science
Division of Respiratory Disease Studies
Centers for Disease Control and Prevention (CDC)
Morgantown, WV
USA

Talia W. Wiesel, PhD
Assistant Professor
Psychiatry
Icahn School of Medicine at Mount Sinai
New York, NY
USA

Christopher P. Wild, PhD
Director, International Agency for Research on Cancer
Lyon
France

William N. William, Jr., MD
Associate Professor
Department of Thoracic / Head and Neck Medical Oncology
The University of Texas MD Anderson Cancer Center
Houston, TX
USA

Ignacio I. Wistuba, MD
Professor and Chair
Department of Translational Molecular Pathology
Anderson Clinical Faculty Chair for Cancer Treatment and Research
The University of Texas MD Anderson Cancer Center
Houston, TX
USA
Robert A. Wolff, MD
Professor of Medicine
Department of Gastrointestinal Medical Oncology
The University of Texas MD Anderson Cancer Center
Houston, TX
USA

Scott E. Woodman, MD, PhD
Assistant Professor
Department of Melanoma Medical Oncology, Division of Cancer Medicine
The University of Texas MD Anderson Cancer Center
Houston, TX
USA

Woodring E. Wright, MD, PhD
Department of Cell Biology
University of Texas Southwestern Medical Center
Dallas, TX
USA

Xifeng Wu, MD, PhD
Professor and Department Chair
Department of Epidemiology
The University of Texas MD Anderson Cancer Center
Houston, TX
USA

Ping Xu, PhD
Research Associate
Biological Sciences Platform
Sunnybrook Research Institute
Toronto, ON
Canada

Xiao-Jing Yan, MD
Physician and Research Fellow
Shanghai Institute of Hematology
Rui Jin Hospital
Shanghai Jiao Tong University School of Medicine
Shanghai
China

Haining Yang, PhD
Associate Professor
Cancer Biology Program
University of Hawaii Cancer Center
Honolulu, HI
USA

James C. Yao, MD
Professor with Tenure
Department of Gastrointestinal Medical Oncology
The University of Texas MD Anderson Cancer Center
Houston, TX
USA

Andrew J. Yee, MD
Instructor in Medicine
Massachusetts General Hospital Cancer Center
Harvard Medical School
Boston, MA
USA

Sai-Ching Jim Yeung, MD, PhD, FACP
Professor, Department of Emergency Medicine, Division of Internal Medicine
The University of Texas MD Anderson Cancer Center
Houston, TX
USA

Anthony F. Yu, MD
Cardiologist
Memorial Sloan Kettering Cancer Center
Department of Medicine, Cardiology Service
New York, NY
USA

Anna Yuan, DMD
Oral Medicine Fellow
Brigham and Women's Hospital
Boston, MA
USA

Jonathan S. Zager, MD
Professor
Moffitt Cancer Center
Tampa, FL
USA

Michael R. Zalutsky, PhD, MA
Professor of Radiology
Department of Research
Duke University School of Medicine
Durham, NC
USA

Sarina van der Zee, MD
Fellow, The Zena and Michael A. Wiener Cardiovascular Institute
The Mount Sinai Medical Center
New York, NY
USA

Guang-Biao Zhou, MD
Professor of Institute of Zoology
State Key Laboratory of Biomembrane and Membrane Biotechnology
Institute of Zoology
Chinese Academy of Sciences
Beijing
China

Amado Zurita-Saavedra, MD
Assistant Professor, Genitourinary Medical Oncology
The University of Texas MD Anderson Cancer Center
Houston, TX
USA
Our understanding of cancer at the molecular, cellular, and clinical levels continues to expand. Translation of molecular diagnostics and therapeutics to the clinic has begun to realize the promise of precision medicine with the development and approval of dozens of new targeted drugs, antibodies, and predictive biomarkers. Assimilating this knowledge poses an acute challenge for students, residents, fellows, and established practitioners of oncology. Laboratory-based investigators seeking to translate their discoveries to human application require an accurate overview of clinical oncology, informed by cancer biology. As new therapies and diagnostics may now be applicable across multiple disease sites, it is essential that Pharma and Biotech understand the new advances and the unmet needs across the entire field of oncology.

This 9th Edition of Cancer Medicine provides a comprehensive synthesis of clinical oncology and the principles underlying approaches to detection, diagnosis, and cancer management. Biological hallmarks of cancer and the clinical manifestations of neoplastic diseases are described. Oncologists must now be familiar with pathways and processes that explain the origin and pathogenesis of neoplasms. Transformational technologies are discussed in depth to provide oncologists with an understanding of technical procedures such as deep sequencing, methods for measuring epigenetic modification of DNA and histones, transcriptional profiling, ncRNAs, specific functions of RNAs, proteomics, and metabolomics. The heterogeneity within and between cancers and their metastases are described and implications for clinical management are discussed. Quantitative oncology is explained in understandable terms providing an introduction not only to biostatistics and novel trial design, but also to bioinformatics and systems biology.

This work includes concise guidelines for the use of both conventional and novel drugs. As in the past editions, there is an emphasis on multidisciplinary patient care including surgical and radiation oncology, psycho-oncology, and population science. This volume should be of value to oncologists of every discipline. Cancer Medicine, 9th Edition, includes electronic web-based access with links to relevant references that will be regularly updated.

The editors have chosen experts who have written authoritatively about the disciplines and diseases covered in their respective chapters. Given the global importance of oncology, editors have now been included from Europe and Asia. As the world of science and medicine chip away the unknowns of the cancer process and its prevention and therapy, we believe the contents of this work will provide a platform for understanding the current state of accomplishment and preparing the reader for a critical evaluation of discoveries still to come.

The Editors
2016