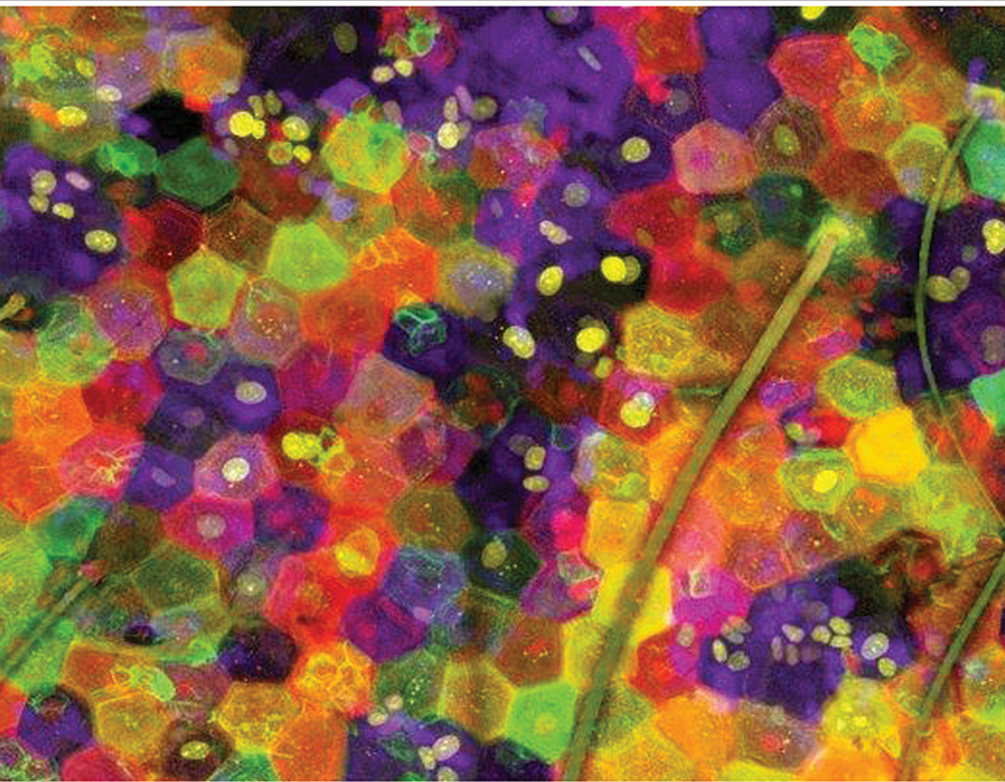


# FITZPATRICK'S DERMATOLOGY

## 9TH EDITION



### VOLUME 1

Sewon Kang  
Masayuki Amagai  
Anna L. Bruckner  
Alexander H. Enk  
David J. Margolis  
Amy J. McMichael  
Jeffrey S. Orringer

**Mc  
Graw  
Hill**  
Education



# **Fitzpatrick's Dermatology**

**SEWON KANG, MD, MPH**

Noxell Professor and Chair  
Department of Dermatology  
Johns Hopkins School of Medicine  
Dermatologist-in-Chief  
Johns Hopkins Hospital  
Baltimore, Maryland

**MASAYUKI AMAGAI, MD, PhD**

Professor and Chair  
Department of Dermatology  
Keio University School of Medicine  
Tokyo, Japan

**ANNA L. BRUCKNER, MD, MSCS**

Associate Professor of Dermatology and Pediatrics  
University of Colorado School of Medicine  
Section Head, Pediatric Dermatology  
Children's Hospital Colorado  
Aurora, Colorado

**ALEXANDER H. ENK, MD**

Professor and Chair  
Department of Dermatology  
University of Heidelberg  
Heidelberg, Germany

**DAVID J. MARGOLIS, MD, PhD**

Professor of Dermatology and Epidemiology  
Department of Dermatology  
Department of Biostatistics and Epidemiology  
University of Pennsylvania Perelman School of Medicine  
Philadelphia, Pennsylvania

**AMY J. McMICHAEL, MD**

Professor and Chair  
Department of Dermatology  
Wake Forest University School of Medicine  
Winston-Salem, North Carolina

**JEFFREY S. ORRINGER, MD**

Professor and Chief  
Division of Cosmetic Dermatology  
Department of Dermatology  
University of Michigan  
Ann Arbor, Michigan

# Fitzpatrick's Dermatology

## Ninth Edition

### EDITORS

SEWON KANG, MD, MPH

MASAYUKI AMAGAI, MD, PhD

ANNA L. BRUCKNER, MD, MSCS

ALEXANDER H. ENK, MD

DAVID J. MARGOLIS, MD, PhD

AMY J. McMICHAEL, MD

JEFFREY S. ORRINGER, MD

### VOLUME I



New York Chicago San Francisco Athens London Madrid Mexico City  
Milan New Delhi Singapore Sydney Toronto

Copyright © 2019 by McGraw-Hill Education. All rights reserved. Except as permitted under the United States Copyright Act of 1976, no part of this publication may be reproduced or distributed in any form or by any means, or stored in a database or retrieval system, without the prior written permission of the publisher, with the exception that the program listings may be entered, stored, and executed in a computer system, but they may not be reproduced for publication.

ISBN: 978-0-07-183783-5  
MHID: 0-07-183783-3

The material in this eBook also appears in the print version of this title: ISBN: 978-0-07-183779-8,  
MHID: 0-07-183779-5.

eBook conversion by codeMantra  
Version 1.0

All trademarks are trademarks of their respective owners. Rather than put a trademark symbol after every occurrence of a trademarked name, we use names in an editorial fashion only, and to the benefit of the trademark owner, with no intention of infringement of the trademark. Where such designations appear in this book, they have been printed with initial caps.

McGraw-Hill Education eBooks are available at special quantity discounts to use as premiums and sales promotions or for use in corporate training programs. To contact a representative, please visit the Contact Us page at [www.mhprofessional.com](http://www.mhprofessional.com).

All trademarks or copyrights mentioned herein are the possession of their respective owners and McGraw-Hill Education makes no claim of ownership by the mention of products that contain these marks.

#### Notice

Medicine is an ever-changing science. As new research and clinical experience broaden our knowledge, changes in treatment and drug therapy are required. The author and the publisher of this work have checked with sources believed to be reliable in their efforts to provide information that is complete and generally in accord with the standards accepted at the time of publication. However, in view of the possibility of human error or changes in medical sciences, neither the author nor the publisher nor any other party who has been involved in the preparation or publication of this work warrants that the information contained herein is in every respect accurate or complete, and they disclaim all responsibility for any errors or omissions or for the results obtained from use of the information contained in this work. Readers are encouraged to confirm the information contained herein with other sources. For example and in particular, readers are advised to check the product information sheet included in the package of each drug they plan to administer to be certain that the information contained in this work is accurate and that changes have not been made in the recommended dose or in the contraindications for administration. This recommendation is of particular importance in connection with new or infrequently used drugs.

#### TERMS OF USE

This is a copyrighted work and McGraw-Hill Education and its licensors reserve all rights in and to the work. Use of this work is subject to these terms. Except as permitted under the Copyright Act of 1976 and the right to store and retrieve one copy of the work, you may not decompile, disassemble, reverse engineer, reproduce, modify, create derivative works based upon, transmit, distribute, disseminate, sell, publish or sublicense the work or any part of it without McGraw-Hill Education's prior consent. You may use the work for your own noncommercial and personal use; any other use of the work is strictly prohibited. Your right to use the work may be terminated if you fail to comply with these terms.

THE WORK IS PROVIDED "AS IS." MCGRAW-HILL EDUCATION AND ITS LICENSORS MAKE NO GUARANTEES OR WARRANTIES AS TO THE ACCURACY, ADEQUACY OR COMPLETENESS OF OR RESULTS TO BE OBTAINED FROM USING THE WORK, INCLUDING ANY INFORMATION THAT CAN BE ACCESSED THROUGH THE WORK VIA HYPERLINK OR OTHERWISE, AND EXPRESSLY DISCLAIM ANY WARRANTY, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. McGraw-Hill Education and its licensors do not warrant or guarantee that the functions contained in the work will meet your requirements or that its operation will be uninterrupted or error free. Neither McGraw-Hill Education nor its licensors shall be liable to you or anyone else for any inaccuracy, error or omission, regardless of cause, in the work or for any damages resulting therefrom. McGraw-Hill Education has no responsibility for the content of any information accessed through the work. Under no circumstances shall McGraw-Hill Education and/or its licensors be liable for any indirect, incidental, special, punitive, consequential or similar damages that result from the use of or inability to use the work, even if any of them has been advised of the possibility of such damages. This limitation of liability shall apply to any claim or cause whatsoever whether such claim or cause arises in contract, tort or otherwise.

# CONTENTS

Contributors .....	xiii
Preface .....	xxix
Acknowledgments .....	xxxii

## Volume One

### PART 1 FOUNDATIONS OF CLINICAL DERMATOLOGY

<b>1</b> Fundamentals of Clinical Dermatology: Morphology and Special Clinical Considerations .....	1
<i>Erin H. Amerson, Susan Burgin, &amp; Kanade Shinkai</i>	
<b>2</b> Pathology of Skin Lesions .....	18
<i>Rosalie Elenitsas &amp; Emily Y. Chu</i>	
<b>3</b> Epidemiology and Public Health in Dermatology .....	40
<i>Junko Takeshita &amp; David J. Margolis</i>	

### PART 2 STRUCTURE AND FUNCTION OF SKIN

<b>4</b> Developmental Biology of the Skin .....	49
<i>Luis Garza</i>	
<b>5</b> Growth and Differentiation of the Epidermis .....	62
<i>Terry Lechler</i>	
<b>6</b> Skin Glands: Sebaceous, Eccrine, and Apocrine Glands .....	70
<i>Christos C. Zouboulis</i>	
<b>7</b> Biology of Hair Follicles .....	89
<i>George Cotsarelis &amp; Vladimir Botchkarev</i>	
<b>8</b> Nail .....	106
<i>Krzysztof Kobielski</i>	
<b>9</b> Cutaneous Vasculature .....	116
<i>Peter Petzelbauer, Robert Loewe, &amp; Jordan S. Pober</i>	

<b>10</b> The Immunological Structure of the Skin .....	130
<i>Georg Stingl &amp; Marie-Charlotte Brüggen</i>	
<b>11</b> Cellular Components of the Cutaneous Immune System .....	143
<i>Johann E. Gudjonsson &amp; Robert L. Modlin</i>	
<b>12</b> Soluble Mediators of the Cutaneous Immune System .....	159
<i>Allen W. Ho &amp; Thomas S. Kupper</i>	
<b>13</b> Basic Principles of Immunologic Diseases in Skin (Pathophysiology of Immunologic/Inflammatory Skin Diseases) .....	192
<i>Keisuke Nagao &amp; Mark C. Udey</i>	
<b>14</b> Skin Barrier .....	206
<i>Akiharu Kubo &amp; Masayuki Amagai</i>	
<b>15</b> Epidermal and Dermal Adhesion .....	232
<i>Leena Bruckner-Tuderman &amp; Aimee S. Payne</i>	
<b>16</b> Microbiome of the Skin .....	253
<i>Heidi H. Kong</i>	
<b>17</b> Cutaneous Photobiology .....	265
<i>Thomas M. Rütger</i>	
<b>18</b> Genetics in Relation to the Skin .....	289
<i>Etienne C. E. Wang, John A. McGrath, &amp; Angela M. Christiano</i>	
<b>19</b> Carcinogenesis and Skin .....	310
<i>Kenneth Y. Tsai &amp; Andrzej A. Dlugosz</i>	
<b>20</b> Pigmentation and Melanocyte Biology .....	328
<i>Stephen M. Ostrowski &amp; David E. Fisher</i>	
<b>21</b> Neurobiology of the Skin .....	351
<i>Sonja Ständer, Manuel P. Pereira, &amp; Thomas A. Luger</i>	

### PART 3 DERMATITIS

<b>22</b> Atopic Dermatitis .....	363
<i>Eric L. Simpson, Donald Y. M. Leung, Lawrence F. Eichenfield, &amp; Mark Boguniewicz</i>	

- 23** Nummular Eczema, Lichen Simplex Chronicus, and Prurigo Nodularis. . . . . 385  
*Jonathan I. Silverberg*
- 24** Allergic Contact Dermatitis. . . . . 395  
*Jake E. Turrentine, Michael P. Sheehan, & Ponciano D. Cruz, Jr.*
- 25** Irritant Dermatitis. . . . . 414  
*Susan T. Nedorost*
- 26** Seborrheic Dermatitis. . . . . 428  
*Dae Hun Suh*
- 27** Occupational Skin Diseases. . . . . 438  
*Andy Chern, Casey M. Chern, & Boris D. Lushniak*

#### PART 4 PSORIASIFORM DISORDERS

- 28** Psoriasis. . . . . 457  
*Johann E. Gudjonsson & James T. Elder*
- 29** Pityriasis Rubra Pilaris. . . . . 498  
*Knut Schäkel*
- 30** Parapsoriasis and Pityriasis Lichenoides. . . . . 505  
*Stefan M. Schieke & Gary S. Wood*
- 31** Pityriasis Rosea. . . . . 518  
*Matthew Clark & Johann E. Gudjonsson*

#### PART 5 LICHENOID AND GRANULOMATOUS DISORDERS

- 32** Lichen Planus. . . . . 527  
*Aaron R. Mangold & Mark R. Pittelkow*
- 33** Lichen Nitidus and Lichen Striatus. . . . . 554  
*Aaron R. Mangold & Mark R. Pittelkow*
- 34** Granuloma Annulare. . . . . 564  
*Julie S. Prendiville*
- 35** Sarcoidosis. . . . . 572  
*Richard Marchell*

#### PART 6 NEUTROPHILIC, EOSINOPHILIC, AND MAST CELL DISORDERS

- 36** Sweet Syndrome. . . . . 587  
*Philip R. Cohen & Razelle Kurzrock*
- 37** Pyoderma Gangrenosum. . . . . 605  
*Natanel Jourabchi & Gerald S. Lazarus*

- 38** Subcorneal Pustular Dermatitis (Sneddon-Wilkinson Disease). . . . . 617  
*Franz Trautinger & Herbert Hönigsmann*
- 39** Autoinflammatory Disorders. . . . . 621  
*Takashi K. Satoh & Lars E. French*
- 40** Eosinophilic Diseases. . . . . 649  
*Hideyuki Ujiie & Hiroshi Shimizu*
- 41** Urticaria and Angioedema. . . . . 684  
*Michihiro Hide, Shunsuke Takahagi, & Takaaki Hiragun*
- 42** Mastocytosis. . . . . 710  
*Michael D. Tharp*

#### PART 7 REACTIVE ERYTHEMAS

- 43** Erythema Multiforme. . . . . 723  
*Jean-Claude Roujeau & Maja Mockenhaupt*
- 44** Epidermal Necrolysis (Stevens-Johnson Syndrome and Toxic Epidermal Necrolysis). . . . . 733  
*Maja Mockenhaupt & Jean-Claude Roujeau*
- 45** Cutaneous Reactions to Drugs. . . . . 749  
*Kara Heelan, Cathryn Sibbald, & Neil H. Shear*
- 46** Erythema Annulare Centrifugum and Other Figurate Erythemas. . . . . 765  
*Christine S. Ahn & William W. Huang*

#### PART 8 DISORDERS OF CORNIFICATION

- 47** The Ichthyoses. . . . . 775  
*Keith A. Choate & Leonard M. Milstone*
- 48** Inherited Palmoplantar Keratodermas. . . . . 816  
*Liat Samuelov & Eli Sprecher*
- 49** Keratosis Pilaris and Other Follicular Keratotic Disorders. . . . . 867  
*Anna L. Bruckner*
- 50** Acantholytic Disorders of the Skin. . . . . 877  
*Alain Hovnanian*
- 51** Porokeratosis. . . . . 901  
*Cathal O'Connor, Grainne M. O'Regan, & Alan D. Irvine*

#### PART 9 VESICULOBULLOUS DISORDERS

- 52** Pemphigus. . . . . 909  
*Aimee S. Payne & John R. Stanley*



- 53 Paraneoplastic Pemphigus . . . . . 934  
*Grant J. Anhalt & Daniel Mimouni*
- 54 Bullous Pemphigoid . . . . . 944  
*Donna A. Culton, Zhi Liu, & Luis A. Diaz*
- 55 Mucous Membrane Pemphigoid . . . . . 960  
*Kim B. Yancey*
- 56 Epidermolysis Bullosa Acquisita . . . . . 971  
*David T. Woodley & Mei Chen*
- 57 Intercellular Immunoglobulin (Ig)  
A Dermatitis (IgA Pemphigus) . . . . . 981  
*Takashi Hashimoto*
- 58 Linear Immunoglobulin A Dermatitis and  
Chronic Bullous Disease of Childhood . . . . . 992  
*Matilda W. Nicholas, Caroline L. Rao,  
& Russell P. Hall III*
- 59 Dermatitis Herpetiformis . . . . . 1002  
*Stephen I. Katz*
- 60 Inherited Epidermolysis Bullosa . . . . . 1011  
*M. Peter Marinkovich*

## PART 10 AUTOIMMUNE CONNECTIVE TISSUE AND RHEUMATOLOGIC DISORDERS

- 61 Lupus Erythematosus . . . . . 1037  
*Clayton J. Sontheimer, Melissa I. Costner,  
& Richard D. Sontheimer*
- 62 Dermatomyositis . . . . . 1061  
*Matthew Lewis & David Fiorentino*
- 63 Systemic Sclerosis . . . . . 1086  
*Pia Moynzadeh, Christopher P. Denton,  
Carol M. Black, & Thomas Krieg*
- 64 Morphea and Lichen Sclerosus . . . . . 1106  
*Nika Cyrus & Heidi T. Jacobe*
- 65 Psoriatic Arthritis and Reactive Arthritis . . . . . 1127  
*Ana-Maria Orbai & John A. Flynn*
- 66 Rheumatoid Arthritis, Juvenile Idiopathic  
Arthritis, Adult-Onset Still Disease, and  
Rheumatic Fever . . . . . 1146  
*Warren W. Piette*
- 67 Scleredema and Scleromyxedema . . . . . 1163  
*Roger H. Weenig & Mark R. Pittelkow*
- 68 Sjögren Syndrome . . . . . 1170  
*Akiko Tanikawa*

- 69 Relapsing Polychondritis . . . . . 1186  
*Camille Francès*

## PART 11 DERMAL CONNECTIVE TISSUE DISORDERS

- 70 Anetoderma and Other Atrophic Disorders  
of the Skin . . . . . 1193  
*Catherine Maari & Julie Powell*
- 71 Acquired Perforating Disorders . . . . . 1203  
*Garrett T. Desman & Raymond L. Barnhill*
- 72 Genetic Disorders Affecting Dermal  
Connective Tissue . . . . . 1212  
*Jonathan A. Dyer*

## PART 12 SUBCUTANEOUS TISSUE DISORDERS

- 73 Panniculitis . . . . . 1251  
*Eden Pappo Lake, Sophie M. Worobec,  
& Iris K. Aronson*
- 74 Lipodystrophy . . . . . 1295  
*Abhimanyu Garg*

## PART 13 MELANOCYTIC DISORDERS

- 75 Albinism and Other Genetic Disorders  
of Pigmentation . . . . . 1309  
*Masahiro Hayashi & Tamio Suzuki*
- 76 Vitiligo . . . . . 1330  
*Khaled Ezzedine & John E. Harris*
- 77 Hypermelanoses . . . . . 1351  
*Michelle Rodrigues & Amit G. Pandya*

## PART 14 ACNEIFORM DISORDERS

- 78 Acne Vulgaris . . . . . 1391  
*Carolyn Goh, Carol Cheng, George Agak,  
Andrea L. Zaenglein, Emmy M. Graber,  
Diane M. Thiboutot, & Jenny Kim*
- 79 Rosacea . . . . . 1419  
*Martin Steinhoff & Jörg Buddenkotte*
- 80 Acne Variants and Acneiform Eruptions . . . . . 1448  
*Andrea L. Zaenglein, Emmy M. Graber,  
& Diane M. Thiboutot*

## PART 15 DISORDERS OF ECCRINE AND APOCRINE SWEAT GLANDS

- 81 Hyperhidrosis and Anhidrosis .....1459  
*Anastasia O. Kurta & Dee Anna Glaser*
- 82 Bromhidrosis and Chromhidrosis .....1469  
*Christos C. Zouboulis*
- 83 Fox-Fordyce Disease .....1475  
*Powell Perng & Inbal Sander*
- 84 Hidradenitis Suppurativa .....1480  
*Ginette A. Okoye*

## PART 16 DISORDERS OF THE HAIR AND NAILS

- 85 Androgenetic Alopecia .....1495  
*Ulrike Blume-Peytavi & Varvara Kanti*
- 86 Telogen Effluvium .....1507  
*Manabu Ohyama*
- 87 Alopecia Areata .....1517  
*Nina Otberg & Jerry Shapiro*
- 88 Cicatricial Alopecias .....1524  
*Nina Otberg & Jerry Shapiro*
- 89 Hair Shaft Disorders .....1537  
*Leslie Castelo-Soccio & Deepa Patel*
- 90 Hirsutism and Hypertrichosis .....1555  
*Thusanth Thuraisingam & Amy J. McMichael*
- 91 Nail Disorders .....1568  
*Eckart Haneke*

## PART 17 DISORDERS DUE TO THE ENVIRONMENT

- 92 Polymorphic Light Eruption .....1611  
*Alexandra Gruber-Wackernagel & Peter Wolf*
- 93 Actinic Prurigo .....1628  
*Travis Vandergriff*
- 94 Hydroa Vacciniforme .....1634  
*Travis Vandergriff*
- 95 Actinic Dermatitis .....1639  
*Robert S. Dawe*

- 96 Solar Urticaria .....1650  
*Marcus Maurer, Joachim W. Fluhr, & Karsten Weller*
- 97 Phototoxicity and Photoallergy .....1657  
*Henry W. Lim*
- 98 Cold Injuries .....1666  
*Ashley N. Millard, Clayton B. Green, & Erik J. Stratman*
- 99 Burns .....1679  
*Benjamin Levi & Stewart Wang*

## PART 18 PSYCHOSOCIAL SKIN DISEASE

- 100 Delusional, Obsessive-Compulsive, and Factitious Skin Diseases .....1693  
*Mio Nakamura, Josie Howard, & John Y. M. Koo*
- 101 Drug Abuse .....1705  
*Nicholas Frank, Cara Hennings, & Jami L. Miller*
- 102 Physical Abuse .....1717  
*Kelly M. MacArthur & Annie Grossberg*

## PART 19 SKIN CHANGES ACROSS THE SPAN OF LIFE

- 103 Neonatal Dermatology .....1727  
*Raegan Hunt, Mary Wu Chang, & Kara N. Shah*
- 104 Pediatric and Adolescent Dermatology .....1750  
*Mary Wu Chang*
- 105 Skin Changes and Diseases in Pregnancy .....1765  
*Lauren E. Wiznia & Miriam Keltz Pomeranz*
- 106 Skin Aging .....1779  
*Michelle L. Kerns, Anna L. Chien, & Sewon Kang*
- 107 Caring for LGBT Persons in Dermatology .....1792  
*Howa Yeung, Matthew D. Mansh, Suephy C. Chen, & Kenneth A. Katz*

## PART 20 NEOPLASIA

- 108 Benign Epithelial Tumors, Hamartomas, and Hyperplasias .....1799  
*Jonathan D. Cuda, Sophia Rangwala, & Janis M. Taube*
- 109 Appendage Tumors of the Skin .....1820  
*Ruth K. Foreman & Lyn McDivitt Duncan*
- 110 Epithelial Precancerous Lesions .....1857  
*Markus V. Heppt, Gabriel Schlager, & Carola Berking*

<b>111</b>	Basal Cell Carcinoma and Basal Cell Nevus Syndrome . . . . .	1884
	<i>Jean Y. Tang, Ervin H. Epstein, Jr., &amp; Anthony E. Oro</i>	
<b>112</b>	Squamous Cell Carcinoma and Keratoacanthoma . . . . .	1901
	<i>Anke S. Lonsdorf &amp; Eva N. Hadaschik</i>	
<b>113</b>	Merkel Cell Carcinoma . . . . .	1920
	<i>Aubriana McEvoy &amp; Paul Nghiem</i>	
<b>114</b>	Page's Disease . . . . .	1934
	<i>Conroy Chow, Isaac M. Neuhaus, &amp; Roy C. Grekin</i>	
<b>115</b>	Melanocytic Nevi . . . . .	1944
	<i>Jonathan D. Cuda, Robert F. Moore, &amp; Klaus J. Busam</i>	
<b>116</b>	Melanoma . . . . .	1982
	<i>Jessica C. Hassel &amp; Alexander H. Enk</i>	
<b>117</b>	Histiocytosis . . . . .	2018
	<i>Astrid Schmieder, Sergij Goerd, &amp; Jochen Utikal</i>	
<b>118</b>	Vascular Tumors . . . . .	2042
	<i>Kelly M. MacArthur &amp; Katherine Püttgen</i>	
<b>119</b>	Cutaneous Lymphoma . . . . .	2072
	<i>Martine Bagot &amp; Rudolf Stadler</i>	
<b>120</b>	Cutaneous Pseudolymphoma . . . . .	2108
	<i>Werner Kempf, Rudolf Stadler, &amp; Martine Bagot</i>	
<b>121</b>	Neoplasias and Hyperplasias of Muscular and Neural Origin . . . . .	2130
	<i>Hansgeorg Müller &amp; Heinz Kutzner</i>	
<b>122</b>	Lipogenic Neoplasms . . . . .	2172
	<i>Thomas Mentzel &amp; Thomas Brenn</i>	

## Volume Two

### PART 21 METABOLIC, GENETIC, AND SYSTEMIC DISEASES

<b>123</b>	Cutaneous Changes in Nutritional Disease . . . . .	2199
	<i>Albert C. Yan</i>	
<b>124</b>	The Porphyrias . . . . .	2234
	<i>Eric W. Gou &amp; Karl E. Anderson</i>	
<b>125</b>	Amyloidosis . . . . .	2258
	<i>Peter D. Gorevic &amp; Robert G. Phelps</i>	
<b>126</b>	Xanthomas and Lipoprotein Disorders . . . . .	2273
	<i>Vasanth Sathiyakumar, Steven R. Jones, &amp; Seth S. Martin</i>	

<b>127</b>	Fabry Disease . . . . .	2292
	<i>Atul B. Mehta &amp; Catherine H. Ortel</i>	
<b>128</b>	Calcium and Other Mineral Deposition Disorders . . . . .	2307
	<i>Janet A. Fairley &amp; Adam B. Aronson</i>	
<b>129</b>	Graft-Versus-Host Disease . . . . .	2320
	<i>Kathryn J. Martires &amp; Edward W. Cowen</i>	
<b>130</b>	Hereditary Disorders of Genome Instability and DNA Repair . . . . .	2342
	<i>John J. DiGiovanna, Thomas M. Rünger, &amp; Kenneth H. Kraemer</i>	
<b>131</b>	Ectodermal Dysplasias . . . . .	2372
	<i>Elizabeth L. Nieman &amp; Dorothy Katherine Grange</i>	
<b>132</b>	Genetic Immunodeficiency Diseases . . . . .	2394
	<i>Ramsay L. Fuleihan &amp; Amy S. Paller</i>	
<b>133</b>	Skin Manifestations of Internal Organ Disorders . . . . .	2425
	<i>Amy K. Forrestel &amp; Robert G. Micheletti</i>	
<b>134</b>	Cutaneous Paraneoplastic Syndromes . . . . .	2441
	<i>Manasmon Chairatchaneeboon &amp; Ellen J. Kim</i>	
<b>135</b>	The Neurofibromatoses . . . . .	2465
	<i>Robert Listernick &amp; Joel Charrow</i>	
<b>136</b>	Tuberous Sclerosis Complex . . . . .	2480
	<i>Thomas N. Darling</i>	
<b>137</b>	Diabetes and Other Endocrine Diseases . . . . .	2493
	<i>April Schachtel &amp; Andrea Kalus</i>	

### PART 22 VASCULAR DISEASES

<b>138</b>	Cutaneous Necrotizing Venulitis . . . . .	2527
	<i>Nicholas A. Soter</i>	
<b>139</b>	Systemic Necrotizing Arteritis . . . . .	2539
	<i>Peter A. Merkel &amp; Paul A. Monach</i>	
<b>140</b>	Erythema Elevatum Diutinum . . . . .	2562
	<i>Theodore J. Alkousakis &amp; Whitney A. High</i>	
<b>141</b>	Adamantiades–Behçet Disease . . . . .	2567
	<i>Christos C. Zouboulis</i>	
<b>142</b>	Kawasaki Disease . . . . .	2580
	<i>Anne H. Rowley</i>	
<b>143</b>	Pigmented Purpuric Dermatoses . . . . .	2590
	<i>Alexandra Haden &amp; David H. Peng</i>	
<b>144</b>	Cryoglobulinemia and Cryofibrinogenemia . . . . .	2599
	<i>Julio C. Sartori-Valinotti &amp; Mark D. P. Davis</i>	

- 145** Raynaud Phenomenon . . . . .2613  
*Drew Kurtzman & Ruth Ann Vleugels*
- 146** Malignant Atrophic Papulosis  
(Degos Disease) . . . . .2630  
*Dan Lipsker*
- 147** Vascular Malformations . . . . .2636  
*Laurence M. Boon, Fanny Ballieux,  
& Miikka Vikkula*
- 148** Cutaneous Changes in Arterial, Venous, and  
Lymphatic Dysfunction . . . . .2669  
*Sabrina A. Newman*
- 149** Wound Healing . . . . .2700  
*Afsaneh Alavi & Robert S. Kirsner*

### PART 23 BACTERIAL DISEASES

- 150** Superficial Cutaneous Infections and  
Pyodermas . . . . .2719  
*Lloyd S. Miller*
- 151** Cellulitis and Erysipelas . . . . .2746  
*David R. Pearson & David J. Margolis*
- 152** Gram-Positive Infections Associated with  
Toxin Production . . . . .2757  
*Jeffrey B. Travers*
- 153** Necrotizing Fasciitis, Necrotizing Cellulitis,  
and Myonecrosis . . . . .2770  
*Avery LaChance & Daniela Kroshinsky*
- 154** Gram-Negative Coccal and  
Bacillary Infections . . . . .2782  
*Breanne Mordorski & Adam J. Friedman*
- 155** The Skin in Infective Endocarditis, Sepsis,  
Septic Shock, and Disseminated  
Intravascular Coagulation . . . . .2815  
*Joseph C. English III & Misha Rosenbach*
- 156** Miscellaneous Bacterial Infections with  
Cutaneous Manifestations . . . . .2827  
*Scott A. Norton & Michael A. Cardis*
- 157** Tuberculosis and Infections with Atypical  
Mycobacteria . . . . .2858  
*Aisha Sethi*
- 158** Actinomycosis, Nocardiosis, and  
Actinomycetoma . . . . .2876  
*Francisco G. Bravo, Roberto Arenas,  
& Daniel Asz Sigall*
- 159** Leprosy . . . . .2892  
*Claudio Guedes Salgado, Arivaldo Cardoso de Brito,  
Ubirajara Imbiriba Salgado, & John Stewart Spencer*

### PART 24 FUNGAL DISEASES

- 160** Superficial Fungal Infection . . . . .2925  
*Lauren N. Craddock & Stefan M. Schieke*
- 161** Yeast Infections . . . . .2952  
*Iris Ahronowitz & Kieron Leslie*
- 162** Deep Fungal Infections . . . . .2965  
*Roderick J. Hay*

### PART 25 VIRAL DISEASES

- 163** Exanthematous Viral Diseases . . . . .2989  
*Vikash S. Oza & Erin F. D. Mathes*
- 164** Herpes Simplex . . . . .3021  
*Jeffrey I. Cohen*
- 165** Varicella and Herpes Zoster . . . . .3035  
*Myron J. Levin, Kenneth E. Schmader,  
& Michael N. Oxman*
- 166** Poxvirus Infections . . . . .3065  
*Ellen S. Haddock & Sheila Fallon Friedlander*
- 167** Human Papillomavirus Infections . . . . .3095  
*Jane C. Sterling*
- 168** Cutaneous Manifestations of HIV  
and Human T-Lymphotropic Virus . . . . .3107  
*Adam D. Lipworth, Esther E. Freeman,  
& Arturo P. Saavedra*
- 169** Mosquito-Borne Viral Diseases . . . . .3135  
*Edwin J. Asturias & J. David Beckham*

### PART 26 SEXUALLY TRANSMITTED DISEASES

- 170** Syphilis . . . . .3145  
*Susan A. Tuddenham & Jonathan M. Zenilman*
- 171** Endemic (Nonvenereal) Treponematoses . . . . .3173  
*Francisco G. Bravo, Carolina Talhari,  
& Khaled Ezzedine*
- 172** Chancroid . . . . .3186  
*Stephan Lautenschlager & Norbert H. Brockmeyer*
- 173** Lymphogranuloma Venereum . . . . .3193  
*Norbert H. Brockmeyer & Stephan Lautenschlager*
- 174** Granuloma Inguinale . . . . .3202  
*Melissa B. Hoffman & Rita O. Pichardo*

- 175 Gonorrhea, Mycoplasma, and Vaginosis . . . . .3207  
*Lindsay C. Strowd, Sean McGregor, & Rita O. Pichardo*

## PART 27 INFESTATIONS, BITES, AND STINGS

- 176 Leishmaniasis and Other Protozoan Infections . . . . .3223  
*Esther von Stebut*
- 177 Helminthic Infections . . . . .3251  
*Kathryn N. Suh & Jay S. Keystone*
- 178 Scabies, Other Mites, and Pediculosis . . . . .3274  
*Chikoti M. Wheat, Craig N. Burkhart, Craig G. Burkhart, & Bernard A. Cohen*
- 179 Lyme Borreliosis . . . . .3287  
*Roger Clark & Linden Hu*
- 180 The Rickettsioses, Ehrlichioses, and Anaplasmoses . . . . .3306  
*Maryam Liaqat, Analisa V. Halpern, Justin J. Green, & Warren R. Heymann*
- 181 Arthropod Bites and Stings . . . . .3324  
*Robert A. Schwartz & Christopher J. Steen*
- 182 Bites and Stings of Terrestrial and Aquatic Life . . . . .3338  
*Camila K. Janniger, Robert A. Schwartz, Jennifer S. Daly, & Mark Jordan Scharf*

## PART 28 TOPICAL AND SYSTEMIC TREATMENTS

- 183 Principles of Topical Therapy . . . . .3363  
*Mohammed D. Saleem, Howard I. Maibach, & Steven R. Feldman*
- 184 Glucocorticoids . . . . .3382  
*Avrom Caplan, Nicole Fett, & Victoria Werth*
- 185 Retinoids . . . . .3395  
*Anna L. Chien, Anders Vahlquist, Jean-Hilaire Saurat, John J. Voorhees, & Sewon Kang*
- 186 Systemic and Topical Antibiotics . . . . .3407  
*Sean C. Condon, Carlos M. Isada, & Kenneth J. Tomecki*
- 187 Dapsone . . . . .3423  
*Chee Leok Goh & Jiun Yit Pan*
- 188 Antifungals . . . . .3436  
*Mahmoud Ghannoum, Iman Salem, & Luisa Christensen*

- 189 Antihistamines . . . . .3451  
*Michael D. Tharp*
- 190 Cytotoxic and Antimetabolic Agents . . . . .3463  
*Jeremy S. Honaker & Neil J. Korman*
- 191 Antiviral Drugs . . . . .3493  
*Zeena Y. Nawas, Quynh-Giao Nguyen, Khaled S. Sanber, & Stephen K. Tyring*
- 192 Immunosuppressive and Immunomodulatory Drugs . . . . .3517  
*Drew Kurtzman, Ruth Ann Vleugels, & Jeffrey Callen*
- 193 Immunobiologics: Targeted Therapy Against Cytokines, Cytokine Receptors, and Growth Factors in Dermatology . . . . .3531  
*Andrew Johnston, Yoshikazu Takada, & Sam T. Hwang*
- 194 Molecular Targeted Therapies . . . . .3558  
*David Michael Miller, Bobby Y. Reddy, & Hensin Tsao*
- 195 Antiangiogenic Agents . . . . .3590  
*Adilson da Costa, Michael Y. Bonner, & Jack L. Arbiser*
- 196 Other Topical Medications . . . . .3610  
*Shawn G. Kwatra & Manisha Loss*
- 197 Photoprotection . . . . .3623  
*Jin Ho Chung*

## PART 29 PHYSICAL TREATMENTS

- 198 Phototherapy . . . . .3635  
*Tarannum Jaleel, Brian P. Pollack, & Craig A. Elmets*
- 199 Photochemotherapy and Photodynamic Therapy . . . . .3664  
*Herbert Hönigsmann, Rolf-Markus Szeimies, & Robert Knobler*
- 200 Radiotherapy . . . . .3687  
*Roy H. Decker & Lynn D. Wilson*

## PART 30 DERMATOLOGIC SURGERY

- 201 Cutaneous Surgical Anatomy . . . . .3697  
*Arif Aslam & Sumaira Z. Aasi*
- 202 Perioperative Considerations in Dermatologic Surgery . . . . .3706  
*Noah Smith, Kelly B. Cha, & Christopher Bichakjian*
- 203 Excisional Surgery and Repair, Flaps, and Grafts . . . . .3726  
*Adele Haimovic, Jessica M. Sheehan, & Thomas E. Rohrer*

<p><b>204</b> Mohs Micrographic Surgery .....3761 <i>Sean R. Christensen &amp; David J. Leffell</i></p> <p><b>205</b> Nail Surgery .....3774 <i>Robert Baran &amp; Olivier Cogrel</i></p> <p><b>206</b> Cryosurgery and Electrosurgery.....3791 <i>Justin J. Vujevich &amp; Leonard H. Goldberg</i></p>	<p><b>211</b> Noninvasive Body Contouring.....3857 <i>Murad Alam</i></p> <p><b>212</b> Treatment of Varicose Veins and Telangiectatic Lower-Extremity Vessels.....3871 <i>Daniel P. Friedmann, Vineet Mishra, &amp; Jeffrey T. S. Hsu</i></p> <p><b>213</b> Chemical Peels and Dermabrasion.....3895 <i>Gary Monheit &amp; Bailey Tayebi</i></p> <p><b>214</b> Liposuction Using Tumescent Local Anesthesia .....3906 <i>C. William Hanke, Cheryl J. Gustafson, William G. Stebbins, &amp; Aimee L. Leonard</i></p> <p><b>215</b> Soft-Tissue Augmentation .....3911 <i>Lisa M. Donofrio &amp; Dana L. Ellis</i></p> <p><b>216</b> Botulinum Toxin .....3921 <i>Richard G. Glogau</i></p> <p><b>217</b> Hair Transplantation.....3931 <i>Robin H. Unger &amp; Walter P. Unger</i></p> <p><b>Index</b> ..... 3951</p>
---	--

**PART 31 COSMETIC DERMATOLOGY**

<p><b>207</b> Cosmeceuticals and Skin Care in Dermatology .....3803 <i>Leslie Baumann</i></p> <p><b>208</b> Fundamentals of Laser and Light-Based Treatments .....3820 <i>Omer Ibrahim &amp; Jeffrey S. Dover</i></p> <p><b>209</b> Laser Skin Resurfacing: Cosmetic and Medical Applications .....3834 <i>Bridget E. McIlwee &amp; Tina S. Alster</i></p> <p><b>210</b> Nonablative Laser and Light-Based Therapy: Cosmetic and Medical Indications .....3846 <i>Jeffrey S. Orringer</i></p>
---

Videos can be accessed via the following link: [mhprofessional.com/fitzderm9videos](http://mhprofessional.com/fitzderm9videos)

Chapter Number: Title	Video Number: Title
<b>Chapter 159: Leprosy</b>	Video 159-1: Sensitivity Test Monofilament
	Video 159-2: Drop Foot
	Video 159-3: Walking Impairment
<b>Chapter 205: Nail Surgery</b>	Video 205-1: Lateral Longitudinal Biopsy
	Video 205-2: Biopsy of the Distal Matrix
	Video 205-3: Tangential Shave Excision
	Video 205-4: Biopsy of Onychopapilloma

# CONTRIBUTORS

**Sumaira Z. Aasi, MD**

Clinical Professor, Dermatology, Clinical Professor (By Courtesy), Surgery–Plastic and Reconstructive Surgery, Dermatology–North Campus, Stanford University, Redwood City, California [201]

**George Agak, PhD**

Research Scientist, Dermatology / Medicine, David Geffen School of Medicine at UCLA, Los Angeles, California [78]

**Christine S. Ahn, MD**

Resident Physician, Wake Forest School of Medicine, Winston Salem, North Carolina [46]

**Iris Ahronowitz, MD**

Assistant Professor of Clinical Dermatology, Keck School of Medicine, University of Southern California, Los Angeles, California [161]

**Murad Alam, MD, MSCI, MBA**

Professor of Dermatology, Otolaryngology, and Surgery, Vice-Chair, Department of Dermatology, Chief, Section of Cutaneous and Aesthetic Surgery, Director, Micrographic Surgery and Dermatologic Oncology Fellowship, Northwestern University, Chicago, Illinois [211]

**Afsaneh Alavi, MSc, MD, FRCPC**

Assistant Professor of Dermatology, Women's College Hospital, University of Toronto, Toronto, Ontario, Canada [149]

**Theodore J. Alkousakis, MD**

Assistant Clinical Professor, University of Colorado School of Medicine, Medical Director, Adult Dermatology, Aurora, Colorado [140]

**Tina S. Alster, MD**

Director, Washington Institute of Dermatologic Laser Surgery, Clinical Professor of Dermatology, Georgetown University Medical Center, Washington, DC [209]

**Masayuki Amagai, MD, PhD**

Professor and Chair, Department of Dermatology, Keio University School of Medicine, Tokyo, Japan [14]

**Erin H. Amerson, MD**

Associate Professor, University of California, San Francisco, Department of Dermatology, San Francisco, California [1]

**Karl E. Anderson, MD, FACP**

Departments of Preventive Medicine and Community Health, and Internal Medicine (Division of Gastroenterology and Hepatology), University of Texas Medical Branch, Galveston, Texas [124]

**Grant J. Anhalt, MD**

Professor of Dermatology and Pathology, Department of Dermatology, Johns Hopkins Hospital, Baltimore, Maryland [53]

**Jack L. Arbiser, MD, PhD**

Emory University School of Medicine, Department of Dermatology, Atlanta Veterans Affairs Medical Center, Atlanta, Georgia [195]

**Roberto Arenas, MD**

Mycology Section, Dr. Manuel Gea Gonzalez General Hospital, Mexico City, Mexico [158]

**Adam B. Aronson, MD**

Resident Physician, Dermatology, University of Iowa Carver College of Medicine, Iowa City, Iowa [128]

**Iris K. Aronson, MD**

University of Illinois at Chicago, Chicago, Illinois [73]

**Arif Aslam, MBChB, MRCP (UK), MRCGP, MRCP (Dermatology)**

Consultant Dermatologist and Mohs Surgeon, St Helens and Knowsley Teachings Hospitals NHS Trust, St Helens, United Kingdom [201]

**Edwin J. Asturias, MD**

The Jules Amer Chair in Community Pediatrics, Children's Hospital Colorado, Associate Professor of Pediatrics and Epidemiology, Division of Pediatric Infectious Diseases, University of Colorado School of Medicine, Center for Global Health, Colorado School of Public Health, Aurora, Colorado [169]

**Martine Bagot, MD, PhD**

Department of Dermatology, Hôpital Saint-Louis, Paris, France [119, 120]

**Fanny Ballieux, MD**

Resident, Center for Vascular Anomalies, Division of Plastic Surgery, Cliniques Universitaires St Luc and University of Louvain, Brussels, Belgium [147]

**Robert Baran, MD**

Honorary Professor, Nail Disease Center, Cannes, France [205]

**Raymond L. Barnhill, MD**

Professor, Department of Pathology, Institut Curie, and University of Paris Descartes Faculty of Medicine, Paris, France, Department of Pathology, Paris, France [71]

**Leslie Baumann, MD**

Board Certified Dermatologist, Baumann Cosmetic and Research Institute, Miami, Florida [207]

**J. David Beckham, MD**

Associate Professor, Director of the Infectious Disease Fellowship Training Program, Division of Adult Infectious Diseases, University of Colorado School of Medicine, Denver, Colorado [169]

**Carola Berking, MD**

Department of Dermatology, University Hospital Munich, Ludwig-Maximilian University (LMU), Munich, Germany [110]

**Christopher Bichakjian, MD**

Department of Dermatology,  
University of Michigan Health  
System, Ann Arbor, Michigan [202]

**Carol M. Black, MD, FRCP**

Centre for Rheumatology and  
Connective Tissue Diseases, UCL  
Medical School, Royal Free Hospital,  
London, United Kingdom [63]

**Ulrike Blume-Peytavi, MD**

Department of Dermatology and  
Allergy, Charité-Universitätsmedizin,  
Berlin, Germany [85]

**Mark Boguniewicz, MD**

Professor, Division of Allergy  
and Immunology, Department of  
Pediatrics, National Jewish Health  
and University of Colorado School  
of Medicine, Denver, Colorado [22]

**Michael Y. Bonner, BA**

Emory University School  
of Medicine, Department of  
Dermatology, Atlanta, Georgia [195]

**Laurence M. Boon, MD, PhD**

Coordinator of the Center for  
vascular Anomalies, Division  
of Plastic Surgery, Cliniques  
Universitaires St Luc and Human  
Molecular Genetics, de Duve  
Institute, University of Louvain,  
Brussels, Belgium [147]

**Vladimir Botchkarev, MD,  
PhD, FRSB**

Professor and Deputy Director,  
Centre for Skin Sciences, University  
of Bradford, United Kingdom,  
Adjunct Professor, Department of  
Dermatology, Boston University  
School of Medicine, Boston,  
Massachusetts [7]

**Francisco G. Bravo, MD**

Associate Professor of Dermatology  
and Pathology, Universidad  
Peruana Cayetano Heredia, Lima,  
Peru [158, 171]

**Thomas Brenn, MD, PhD**

Consultant Dermatopathologist  
and Honorary Senior Lecturer,  
Department of Pathology NHS  
Lothian University Hospitals Trust  
and the University of Edinburgh,  
Edinburgh, United Kingdom [122]

**Norbert H. Brockmeyer**

Walk In Ruhr (WIR) Center for  
Sexual Health and Medicine,  
Department of Dermatology,  
Venerology and Allergology,  
Ruhr-Universität Bochum, Bochum,  
Germany [172, 173]

**Anna L. Bruckner, MD, MSCS**

Associate Professor of Dermatology  
and Pediatrics, University of  
Colorado School of Medicine,  
Section Head, Pediatric  
Dermatology, Children's Hospital  
Colorado, Aurora, Colorado [49]

**Leena Bruckner-Tuderman,  
MD, PhD**

Professor and Chair of Dermatology,  
Medical Center-University of  
Freiburg, Freiburg, Germany [15]

**Marie-Charlotte Brüngen,  
MD, PhD**

Department of Dermatology,  
University Hospital Zurich, Zurich,  
Switzerland [10]

**Jörg Buddenkotte, MD, PhD**

Academic Research Scientist,  
Department of Dermatology and  
Venereology, Hamad Medical  
Corporation, Doha, Qatar [79]

**Susan Burgin, MD**

Assistant Professor, Beth Israel  
Deaconess Medical Center,  
Harvard Medical School,  
Department of Dermatology, Boston,  
Massachusetts [1]

**Craig G. Burkhart, MD**

Sylvania, Ohio [178]

**Craig N. Burkhart, MD**

The University of North Carolina  
at Chapel Hill, Chapel Hill, North  
Carolina [178]

**Klaus J. Busam, MD**

Professor of Pathology and  
Laboratory Medicine, Weill Medical  
College of Cornell University,  
Department of Dermatopathology  
and Pathology, Memorial Sloan  
Kettering Cancer Center, New York,  
New York [115]

**Jeffrey Callen, MD**

Professor of Medicine  
(Dermatology), University  
of Louisville, Chief, Division  
of Dermatology, Louisville,  
Kentucky [192]

**Avrom Caplan, MD**

Department of Dermatology,  
Hospital of the University of  
Pennsylvania, Philadelphia,  
Pennsylvania [184]

**Michael A. Cardis, MD**

Department of Dermatology,  
Washington Hospital Center/  
Georgetown University,  
Washington, DC [156]

**Arival Cardoso de Brito,  
MD, PhD**

Full Professor, Dermatology, Pará  
Federal University, Belém, Pará,  
Brazil [159]

**Leslie Castelo-Soccio,  
MD, PhD**

Assistant Professor of Pediatrics  
and Dermatology, The Children's  
Hospital of Philadelphia and  
University of Pennsylvania Perlmans  
School of Medicine, Philadelphia,  
Pennsylvania [89]

**Kelly B. Cha, MD, PhD**

Department of Dermatology,  
University of Michigan Health  
System, Ann Arbor, Michigan [202]

**Manasmon  
Chairatchaneeboon, MD**

Clinical Instructor in Dermatology,  
Department of Dermatology,  
Faculty of Medicine Siriraj Hospital,  
Mahidol University, Bangkok,  
Thailand [134]

**Mary Wu Chang, MD**

Clinical Professor of Dermatology  
and Pediatrics, University of  
Connecticut School of Medicine,  
Farmington, Connecticut [103, 104]

**Joel Charrow, MD**

Professor of Pediatrics, Feinberg  
School of Medicine, Northwestern  
University, Ann and Robert H.  
Lurie Children's Hospital of  
Chicago, Division of Genetics, Birth  
Defects and Metabolism, Chicago,  
Illinois [135]

**Mei Chen, PhD**

Director, USC Laboratories for  
Investigative Dermatology, The  
Keck School of Medicine, University  
of Southern California, Los Angeles,  
California [56]

**Suephy C. Chen, MD, MS**

Vice Chair and Associate Professor  
of Dermatology, Emory University  
School of Medicine, Atlanta,  
Georgia [107]

**Carol Cheng, MD**

Assistant Clinical Professor of  
Dermatology/Medicine, David  
Geffen School of Medicine at UCLA,  
Los Angeles, California [78]



**Andy Chern, MD, MPH**

Captain, Medical Corps, United States Army, Associate Program Director, Occupational and Environmental Medicine Residency Program, Uniformed Services University of the Health Sciences, F. Edward Hébert School of Medicine, Department of Preventive Medicine and Biostatistics, Bethesda, Maryland [27]

**Casey M. Chern, MD**

Captain, Medical Corps, United States Army, Dermatology Resident, National Capital Consortium Dermatology Residency Program, Walter Reed National Military Medical Center, Bethesda, Maryland [27]

**Anna L. Chien, MD**

Assistant Professor, Department of Dermatology, Johns Hopkins School of Medicine, Baltimore, Maryland [106, 185]

**Keith A. Choate, MD, PhD**

Professor of Dermatology, Genetics and Pathology, Yale University School of Medicine, New Haven, Connecticut [47]

**Conroy Chow, MD**

Assistant Professor, Department of Dermatology, Loma Linda University, Loma Linda, California [114]

**Luisa Christensen, MD**

Center for Medical Mycology, University Hospitals Cleveland Medical Center, Case Western Reserve University, Cleveland, Ohio [188]

**Sean R. Christensen, MD, PhD**

Assistant Professor of Dermatology, Section of Dermatologic Surgery, Yale University School of Medicine, New Haven, Connecticut [204]

**Angela M. Christiano, PhD**

Department of Dermatology, Department of Genetics and Development, Columbia University, New York, New York [18]

**Emily Y. Chu, MD, PhD**

Assistant Professor of Dermatology, Hospital of the University of Pennsylvania, Perelman School of Medicine, Philadelphia, Pennsylvania [2]

**Jin Ho Chung, MD, PhD**

Professor and Chairman, Department of Dermatology, Seoul National University College of Medicine, Seoul, Korea [197]

**Matthew Clark, MD**

Dermatology Resident, University of Michigan Department of Dermatology, Ann Arbor, Michigan [31]

**Roger Clark, DO**

Assistant Professor of Medicine, Tufts Medical Center, Brigham and Women's Faulkner Hospital, Boston, Massachusetts [179]

**Olivier Cogrel, MD**

Dermatologic Surgery and Laser Unit, Dermatology Department, CHU Bordeaux, Hôpital Saint-André, Bordeaux, France [205]

**Bernard A. Cohen, MD**

Johns Hopkins Hospital Baltimore, Maryland [178]

**Jeffrey I. Cohen, MD**

Chief, Laboratory of Infectious Diseases, National Institute of Allergy and Infectious Diseases, National Institutes of Health, Bethesda, Maryland [164]

**Philip R. Cohen, MD**

Professor of Dermatology, University of California San Diego School of Medicine, San Diego, California [36]

**Sean C. Condon, MD**

Department of Dermatology, Cleveland Clinic, Cleveland, Ohio [186]

**Melissa I. Costner, MD**

Associate Clinical Professor, Dermatology, UT Southwestern Medical School, North Dallas Dermatology Associates, Dallas, Texas [61]

**George Cotsarelis, MD**

Milton B. Hartzell Professor and Chair, Department of Dermatology, Perelman School of Medicine University of Pennsylvania, Director, Program on Epithelial Regeneration and Stem Cells, University of Pennsylvania Institute for Regenerative Medicine, Philadelphia, Pennsylvania [7]

**Edward W. Cowen, MD**

Head, Dermatology Consultation Service, Dermatology Branch, Center for Cancer Research, National Cancer Institute, National Institutes of Health, Bethesda, Maryland [129]

**Lauren N. Craddock, MD**

Department of Dermatology, University of Wisconsin-Madison, Madison, Wisconsin [160]

**Ponciano D. Cruz, Jr., MD**

Distinguished Professor, Paul Bergstresser Endowed Chair in Dermatology, Department of Dermatology, The University of Texas, Chief of Dermatology, North Texas Veterans Affairs Medical Center, Dallas, Texas [24]

**Jonathan D. Cuda, MD**

Assistant Professor of Dermatology, Johns Hopkins School of Medicine, Baltimore, Maryland [108, 115]

**Donna A. Culton, MD, PhD**

Department of Dermatology, University of North Carolina at Chapel Hill, Chapel Hill, North Carolina [54]

**Nika Cyrus, MD**

Department of Dermatology, Parkland Health and Hospital System, Dallas, Texas [64]

**Adilson da Costa, MD**

Emory University School of Medicine, Department of Dermatology, Atlanta, Georgia [195]

**Jennifer S. Daly, MD**

Clinical Chief, Infectious Diseases and Immunology, Professor of Medicine, Microbiology and Physiological Systems, University of Massachusetts Medical School, Worcester, Massachusetts [182]

**Thomas N. Darling, MD, PhD**

Professor and Chair of Dermatology, Uniformed Services University of the Health Sciences, Bethesda, Maryland [136]

**Mark D. P. Davis, MD**

Professor of Dermatology, Mayo Clinic College of Medicine, Department of Dermatology, Rochester, Minnesota [144]

**Robert S. Dawe, MBChB, MD(Glasg), FRCP(Edin)**  
Consultant Dermatologist and Honorary Reader in Dermatology, Department of Dermatology and Photobiology Unit, NHS Tayside and University of Dundee, Dundee, Scotland [95]

**Roy H. Decker, MD, PhD**  
Associate Professor, Vice Chair and Director of Clinical Research, Department of Therapeutic Radiology, Yale School of Medicine, New Haven, Connecticut [200]

**Christopher P. Denton, PhD, FRCP**  
Centre for Rheumatology and Connective Tissue Diseases, UCL Medical School, Royal Free Hospital, London, United Kingdom [63]

**Garrett T. Desman, MD**  
Assistant Professor of Pathology and Dermatology, Icahn School of Medicine at Mount Sinai, New York, New York [71]

**Luis A. Diaz, MD**  
Department of Dermatology, University of North Carolina at Chapel Hill, Chapel Hill, North Carolina [54]

**John J. DiGiovanna, MD**  
Senior Research Physician, DNA Repair Section, Dermatology Branch, Center for Cancer Research, National Cancer Institute, National Institutes of Health, Bethesda, Maryland [130]

**Andrzej A. Dlugosz, MD**  
Poth Professor of Cutaneous Oncology, Departments of Dermatology and Cell and Developmental Biology, University of Michigan Medical School, Ann Arbor, Michigan [19]

**Lisa M. Donofrio, MD**  
Associate Clinical Professor, Department of Dermatology, Yale School of Medicine, Yale University, New Haven, Connecticut [215]

**Jeffrey S. Dover, MD, FRCPC**  
SkinCare Physicians, Chestnut Hill, Massachusetts [208]

**Lyn McDivitt Duncan, MD**  
Professor of Pathology, Harvard Medical School, Chief, Dermatopathology Unit, Department of Pathology, Massachusetts General Hospital, Boston, Massachusetts [109]

**Jonathan A. Dyer, MD**  
Associate Professor of Dermatology and Child Health, Departments of Dermatology and Child Health, University of Missouri, Columbia, Missouri [72]

**Lawrence F. Eichenfield, MD**  
Chief, Pediatric and Adolescent Dermatology, Professor of Dermatology and Pediatrics, Vice Chair, Department of Dermatology, University of California, San Diego School of Medicine, San Diego, California [22]

**James T. Elder, MD, PhD**  
Kirk D. Wuepper Professor of Molecular Genetic Dermatology, Department of Dermatology, University of Michigan, Ann Arbor, Ann Arbor, Michigan [28]

**Rosalie Elenitsas, MD**  
Professor of Dermatology, Director of Dermatopathology, Hospital of the University of Pennsylvania, Perelman School of Medicine, Philadelphia, Pennsylvania [2]

**Dana L. Ellis, MD**  
Clinical Instructor, Department of Dermatology, Yale School of Medicine, Yale University, New Haven, Connecticut [215]

**Craig A. Elmets, MD**  
Professor and Emeritus Chair, Department of Dermatology, University of Alabama at Birmingham, The Birmingham VA Medical Center, Birmingham, Alabama [198]

**Joseph C. English III, MD**  
Professor of Dermatology, University of Pittsburgh, Department of Dermatology, UPMC North Hills Dermatology, Wexford, Pennsylvania [155]

**Alexander H. Enk, MD**  
Professor and Chair, Department of Dermatology, University of Heidelberg, Heidelberg, Germany [116]

**Ervin H. Epstein, Jr., MD**  
Children's Hospital of Oakland Research Institute, UCSF, Oakland, California [111]

**Khaled Ezzedine, MD, PhD**  
Professor, Department of Dermatology, Hôpital Henri Mondor, EA EpiDermE (Epidémiologie en Dermatologie et Evaluation des Thérapeutiques), UPEC-Université Paris-Est Créteil, Créteil, France [76, 171]

**Janet A. Fairley, MD**  
John S. Strauss Professor and Chair, Department of Dermatology, University of Iowa Carver College of Medicine, Iowa City, Iowa [128]

**Steven R. Feldman, MD, PhD**  
Department of Dermatology, Wake Forest University School of Medicine, Winston-Salem, North Carolina [183]

**Nicole Fett, MD, MSCE**  
Associate Professor of Dermatology, Department of Dermatology, Oregon Health and Science University, Portland, Oregon [184]

**David Fiorentino, MD, PhD**  
Professor in the Department of Dermatology and the Department of Immunology and Rheumatology at Stanford University School of Medicine, Redwood City, California [62]

**David E. Fisher, MD, PhD**  
Edward Wigglesworth Professor and Chairman, Department of Dermatology, Harvard Medical School, Director, Melanoma Program MGH Cancer Center, Director, Cutaneous Biology Research Center, Massachusetts General Hospital, Boston, Massachusetts [20]

**Joachim W. Fluhr, MD**  
Oberarzt, Charité-Universitätsmedizin Berlin, Klinik für Dermatologie, Venerologie und Allergologie, Berlin, Germany [96]

**John A. Flynn, MD, MBA, MED**  
Professor and Associate Dean of Medicine, Johns Hopkins University, Baltimore, Maryland [65]

**Ruth K. Foreman, MD, PhD**  
Instructor of Pathology, Harvard Medical School, Dermatopathology Unit, Department of Pathology, Massachusetts General Hospital, Boston, Massachusetts [109]

**Amy K. Forrestel, MD**

University of Pennsylvania,  
Department of Dermatology,  
Philadelphia, Pennsylvania [133]

**Camille Francès, MD**

AP-HP, Hôpital Tenon, Université  
Paris VI, Service de Dermatologie-  
Allergologie, Paris, France [69]

**Nicholas Frank, MD**

Dermatology Resident, Vanderbilt  
University Medical Center,  
Department of Internal Medicine,  
Division of Dermatology, Nashville,  
Tennessee [101]

**Esther E. Freeman, MD, PhD**

Assistant Professor of Dermatology,  
Harvard University Medical  
School, Director, Global Health  
Dermatology, Massachusetts  
General Hospital, Department  
of Dermatology, Boston,  
Massachusetts [168]

**Lars E. French, MD**

Professor and Chairman,  
Department of Dermatology,  
University of Zurich, Zurich,  
Switzerland [39]

**Sheila Fallon Friedlander, MD**

Professor of Dermatology and  
Pediatrics, University of California,  
San Diego School of Medicine, Rady  
Children's Hospital, San Diego,  
San Diego, California [166]

**Adam J. Friedman, MD**

Associate Professor of Dermatology,  
Director of Translational Research,  
Residency Program Director,  
Department of Dermatology, George  
Washington School of Medicine  
and Health Sciences, Washington,  
DC [154]

**Daniel P. Friedmann, MD**

Westlake Dermatology Clinical  
Research Center, Westlake  
Dermatology and Cosmetic Surgery,  
Austin, Texas [212]

**Ramsay L. Fuleihan, MD**

Professor of Pediatrics,  
Northwestern University Feinberg  
School of Medicine, Chicago,  
Illinois [132]

**Abhimanyu Garg, MD**

Professor of Internal Medicine,  
Chief, Division of Nutrition and  
Metabolic Diseases, Department of  
Internal Medicine and the Center  
for Human Nutrition, Distinguished  
Chair in Human Nutrition Research,  
Dallas, Texas [74]

**Luis Garza, MD, PhD**

Associate Professor, Department  
of Dermatology, Johns Hopkins  
School of Medicine, Baltimore,  
Maryland [4]

**Mahmoud Ghannoum,  
PhD, EMBA**

Center for Medical Mycology,  
University Hospitals Cleveland  
Medical Center, Case Western  
Reserve University, Cleveland,  
Ohio [188]

**Dee Anna Glaser, MD**

Interim Chair and Professor,  
Director Cosmetic and Laser  
Surgery, Director of Clinical  
Research, Department of  
Dermatology, Saint Louis University  
School of Medicine, St. Louis,  
Missouri [81]

**Richard G. Glogau, MD**

Clinical Professor of Dermatology,  
University of California,  
San Francisco, San Francisco,  
California [216]

**Sergij Goerdt, MD**

Professor of Dermatology, Chair  
of Dermatology, Department  
of Dermatology, Venereology  
and Allergology, University  
Medical Center and Medical  
Faculty Mannheim, University  
of Heidelberg, Mannheim,  
Germany [117]

**Carolyn Goh, MD**

Assistant Clinical Professor of  
Dermatology/Medicine, David  
Geffen School of Medicine at UCLA,  
Los Angeles, California [78]

**Chee Leok Goh, MD, MBBS,  
M. Med (Int. Med), MRCP (UK),  
FRCP (Edin), Hon FACD, FAMS  
(Dermatology)**

Clinical Professor, National Skin  
Centre, Singapore [187]

**Leonard H. Goldberg, MD**

DermSurgery Associates, Houston,  
Texas [206]

**Peter D. Gorevic, MD**

Professor of Medicine, Division  
of Rheumatology, Icahn School of  
Medicine at Mount Sinai, New York,  
New York [125]

**Eric W. Gou, MD**

Department of Internal Medicine,  
Division of Gastroenterology  
and Hepatology, University of  
Texas Medical Branch, Galveston,  
Texas [124]

**Emmy M. Graber, MD, MBA**

Dermatologist, The Dermatology  
Institute of Boston, Boston,  
Massachusetts [78, 80]

**Dorothy Katherine Grange, MD**

Professor of Pediatrics, Division of  
Genetics and Genomic Medicine,  
Department of Pediatrics,  
Washington University School of  
Medicine, St. Louis, Missouri [131]

**Clayton B. Green MD, PhD**

The Marshfield Clinic, Marshfield,  
Wisconsin [98]

**Justin J. Green, MD**

Division of Dermatology, Cooper  
Medical School of Rowan  
University, Camden,  
New Jersey [180]

**Roy C. Grekin, MD**

Professor of Dermatology, Director,  
Dermatologic Surgery and Laser  
Center, University of California,  
San Francisco, San Francisco,  
California [114]

**Annie Grossberg, MD**

Associate Director, Dermatology  
Residency Program, Assistant  
Professor, Departments of  
Dermatology and Pediatrics, Johns  
Hopkins University, Baltimore,  
Maryland [102]

**Alexandra Gruber-  
Wackernagel, MD**

Medical University of Graz,  
Research Unit for Photodermatology,  
Department of Dermatology,  
Medical University of Graz, Graz,  
Austria [92]

**Johann E. Gudjonsson,  
MD, PhD**

Assistant Professor, Department of  
Dermatology, Frances and Kenneth  
Eisenberg Emerging Scholar of  
the Taubman Medical Research  
Institute, University of Michigan,  
Ann Arbor, Michigan [11, 28, 31]

**Cheryl J. Gustafson, MD**

St. Vincent Carmel Medical Center,  
Carmel, Indiana [214]

**Eva N. Hadaschik, MD**

Department of Dermatology,  
University Hospital Heidelberg,  
Heidelberg, Germany [112]

**Ellen S. Haddock, AB, MBA**

University of California, San  
Diego School of Medicine, La Jolla,  
California [166]

**Alexandra Haden, MD**

Assistant Professor of Clinical Dermatology, Department of Dermatology, University of Southern California, Los Angeles, California [143]

**Adele Haimovic, MD**

SkinCare Physicians, Chestnut Hill, Massachusetts [203]

**Russell P. Hall III, MD**

J. Lamar Callaway Professor, Department of Dermatology, Duke University Medical Center, Durham, North Carolina [58]

**Analisa V. Halpern, MD**

Division of Dermatology, Cooper Medical School of Rowan University, Camden, New Jersey [180]

**Eckart Haneke, MD, PhD**

Clinical Professor (em) of Dermatology, Department of Dermatology, Inselspital, University of Berne, Bern, Switzerland [91]

**C. William Hanke, MD, MPH, FACP**

St. Vincent Carmel Medical Center, Carmel, Indiana [214]

**John E. Harris, MD, PhD**

Associate Professor, University of Massachusetts Medical School, Worcester, Massachusetts [76]

**Takashi Hashimoto, MD**

Professor and Director, Kurume University Institute of Cutaneous Cell Biology, Kurume, Fukuoka, Japan [57]

**Jessica C. Hassel, MD**

Section Head, DermatoOncology, Department of Dermatology and National Center for Tumor Diseases, University Hospital Heidelberg, Heidelberg, Germany [116]

**Roderick J. Hay, DM, FRCP, FRCPATH, FMedSci**

Professor, Department of Dermatology, Kings College Hospital, Denmark Hill, London, United Kingdom [162]

**Masahiro Hayashi, MD, PhD**

Associate Professor of Dermatology, Yamagata University Faculty of Medicine, Yamagata, Japan [75]

**Kara Heelan, MB BCH, BAO**

Dermatology Department, University College London Hospitals, London, United Kingdom [45]

**Cara Hennings, MD**

University of Tennessee/Erlanger Medical Center, Chattanooga, Tennessee [101]

**Markus V. Heppt, MD**

Department of Dermatology, University Hospital Munich, Ludwig-Maximilian University, Munich, Germany [110]

**Warren R. Heymann, MD**

Division of Dermatology, Cooper Medical School of Rowan University, Camden, New Jersey [180]

**Michihiro Hide, MD, PhD**

Department of Dermatology, Institute of Biomedical and Health Sciences, Hiroshima University, Hiroshima, Japan [41]

**Whitney A. High, MD, JD, MEng**

Associate Professor of Dermatology and Pathology, University of Colorado School of Medicine, Director of Dermatopathology (Dermatology), Aurora, Colorado [140]

**Takaaki Hiragun, MD, PhD**

Department of Dermatology, Institute of Biomedical and Health Sciences, Hiroshima University, Hiroshima, Japan [41]

**Allen W. Ho, MD, PhD**

Resident Physician, Department of Dermatology, Harvard Medical School, Boston, Massachusetts [12]

**Melissa B. Hoffman, MD**

Resident, Dermatology, Wake Forest School of Medicine, Winston Salem, North Carolina [174]

**Jeremy S. Honaker, CNP, PhD**

Assistant Professor, Department of Dermatology, Case Western Reserve University, Cleveland, Ohio [190]

**Herbert Hönigsmann, MD**

Professor of Dermatology, Emeritus Chairman, Department of Dermatology, Medical University of Vienna, Vienna, Austria [38, 199]

**Alain Hovnanian, MD, PhD**

Professor of Genetics, Department of Genetics, Imagine Institute for Genetic Diseases, Necker Hospital for Sick Children, University Paris Descartes-Sorbonne Paris Cité, Paris, France [50]

**Josie Howard, MD**

Clinical Faculty, Departments of Psychiatry and Dermatology, University of California, San Francisco, San Francisco, California [100]

**Jeffrey T. S. Hsu, MD**

Clinical Assistant Professor, Department of Dermatology, University of Illinois College of Medicine at Chicago, Co-Director of Dermatologic, Laser and Cosmetic Surgery, The Dermatology Institute of DuPage Medical Group, Naperville, Illinois [212]

**Linden Hu, MD**

Professor of Microbiology and Medicine, Tufts University School of Medicine, Boston, Massachusetts [179]

**William W. Huang, MD, MPH**

Associate Professor of Dermatology, Residency Program Director, Wake Forest School of Medicine, Winston Salem, North Carolina [46]

**Raegan Hunt, MD, PhD**

Assistant Professor of Dermatology and Pediatrics, Texas Children's Hospital, Baylor College of Medicine, Houston, Texas [103]

**Sam T. Hwang, MD, PhD**

Department of Dermatology, University of California Davis School of Medicine, Sacramento, California [193]

**Omer Ibrahim, MD**

SkinCare Physicians, Chestnut Hill, Massachusetts [208]

**Alan D. Irvine, MD, DSc**

Paediatric Dermatology and National Children's Research Centre, Our Lady's Children's Hospital Crumlin, Dublin, Clinical Medicine, Trinity College, Dublin, Ireland [51]

**Carlos M. Isada, MD**

Department of Infectious Disease, Cleveland Clinic, Cleveland, Ohio [186]

**Heidi T. Jacobe, MD, MSCS**

Associate Professor, Department of Dermatology, UT Southwestern Medical Center, Dallas, Texas [64]

**Tarannum Jaleel, MD**

Instructor, Department of Dermatology, Duke Medical Center, Durham, North Carolina [198]

**Camila K. Janniger, MD**

Clinical Professor, Dermatology, Rutgers New Jersey Medical School, Englewood, New Jersey [182]

**Andrew Johnston, PhD**

Department of Dermatology, University of Michigan School of Medicine, Ann Arbor, Michigan [193]

**Steven R. Jones, MD**

Ciccarone Center for the Prevention of Heart Disease, Division of Cardiology, Department of Medicine, Johns Hopkins Hospital, Baltimore Maryland [126]

**Natanel Jourabchi, MD**

Resident Dermatology Physician, Johns Hopkins School of Medicine, Baltimore, Maryland [37]

**Andrea Kalus, MD**

Associate Professor, University of Washington School of Medicine, Division of Dermatology, Seattle, Washington [137]

**Sewon Kang, MD, MPH**

Noxell Professor & Chair, Department of Dermatology, Johns Hopkins School of Medicine, Dermatologist-in-Chief, Johns Hopkins Hospital, Baltimore, Maryland [106, 185]

**Varvara Kanti, MD**

Department of Dermatology and Allergy, Charité-Universitätsmedizin, Berlin, Germany [85]

**Kenneth A. Katz, MD, MSc, MSCE**

Department of Dermatology, Kaiser Permanente, San Francisco, California [107]

**Stephen I. Katz, MD, PhD**

National Institute of Arthritis and Musculoskeletal and Skin Diseases, Bethesda, Maryland [59]

**Werner Kempf, MD**

Kempf and Pfaltz, Histologische Diagnostik, Department of Dermatology, University Hospital Zurich, Zurich, Switzerland [120]

**Michelle L. Kerns, MD**

Research Fellow, Department of Dermatology, Johns Hopkins School of Medicine, Baltimore, Maryland [106]

**Jay S. Keystone, MD, MSc (CTM), FRCPC**

Professor of Medicine, University of Toronto, Tropical Disease Unit, Division of Infectious Diseases, Toronto General Hospital, Toronto, Ontario, Canada [177]

**Ellen J. Kim, MD**

Sandra J. Lazarus Associate Professor in Dermatology, Department of Dermatology, Perelman School of Medicine at the University of Pennsylvania, Perelman Center for Advanced Medicine, Philadelphia, Pennsylvania [134]

**Jenny Kim, MD, PhD**

Professor of Dermatology/Medicine/Nutrition, David Geffen School of Medicine at UCLA, Los Angeles, California [78]

**Robert S. Kirsner, MD, PhD**

Chairman and Harvey Blank Professor, Department of Dermatology and Cutaneous Surgery, Professor, Department of Public Health Sciences, University of Miami Miller School of Medicine, Miami, Florida [149]

**Robert Knobler, MD**

Associate Professor of Dermatology, Department of Dermatology, Medical University of Vienna, Vienna, Austria [199]

**Krzysztof Kobiela, MD, PhD**

Group Leader of Laboratory of Stem Cells, Development and Tissue Regeneration, Centre of New Technologies, University of Warsaw, Warsaw, Poland, Principal Investigator, Department of Developmental and Cell Biology, University of California, Irvine, Irvine, California [8]

**Heidi H. Kong, MD, MHSc**

Investigator, Dermatology Branch, Center for Cancer Research, National Cancer Institute, National Institutes of Health, Dermatology Branch Bethesda, Maryland [16]

**John Y. M. Koo, MD**

Professor, Psoriasis, Phototherapy, and Skin Treatment Center and Psychodermatology Clinic, Department of Dermatology, University of California San Francisco, San Francisco, California [100]

**Neil J. Korman, MD, PhD**

Professor, Department of Dermatology, Case Western Reserve University, Cleveland, Ohio [190]

**Kenneth H. Kraemer, MD**

Chief, DNA Repair Section, Dermatology Branch, Center for Cancer Research, National Cancer Institute, National Institutes of Health, Bethesda, Maryland [130]

**Thomas Krieg, MD, FRCP**

Department of Dermatology and Venerology, University of Cologne, Cologne, Germany [63]

**Daniela Kroshinsky, MD, MPH**

Associate Professor, Harvard Medical School, Director of Inpatient Dermatology, Director of Pediatric Dermatology, Massachusetts General Hospital/ MassGeneral Hospital for Children, Boston, Massachusetts [153]

**Akiharu Kubo, MD, PhD**

Department of Dermatology, Keio University School of Medicine, Tokyo, Japan [14]

**Thomas S. Kupper, MD**

Thomas B. Fitzpatrick Professor, Department of Dermatology, Brigham and Women's Hospital, Harvard Medical School, Boston, Massachusetts [12]

**Anastasia O. Kurta, DO**

Dermatology Resident, Department of Dermatology, Saint Louis University School of Medicine, St Louis, Missouri [81]

**Drew Kurtzman, MD**

Assistant Professor of Medicine (Dermatology), Director, Connective Tissue Disease Clinic, Director, Immunobullous Disease Clinic, The University of Arizona, Tucson, Arizona [145, 192]

**Razelle Kurzrock, MD**

Professor of Medicine and Chief, Division of Hematology and Oncology; Senior Deputy Center Director, Clinical Science; and Director, Center for Personalized Cancer Therapy and Clinical Trials Office, University of California, San Diego Moores Cancer Center, San Diego, California [36]

**Heinz Kutzner, MD**

Dermatopathology Friedrichshafen, Friedrichshafen, Germany [121]

**Shawn G. Kwatra, MD**

Department of Dermatology, Johns Hopkins School of Medicine, Baltimore, Maryland [196]

**Avery LaChance, MD, MPH**

Dermatology Resident, Harvard Combined Dermatology Residency Training Program, Massachusetts General Hospital, Boston, Massachusetts [153]

**Eden Pappo Lake, MD**

University of Illinois at Chicago, Chicago, Illinois [73]

**Stephan Lautenschlager, MD**

Associate Professor University of Zurich, Chairman Outpatient Clinic of Dermatology and Venereology, City Hospital Triemli, Zurich, Switzerland [172, 173]

**Gerald S. Lazarus, MD**

Professor of Dermatology and Medicine, Johns Hopkins School of Medicine, Baltimore, Maryland [37]

**Terry Lechler, PhD**

Associate Professor of Dermatology, Duke University Medical Center, Durham, North Carolina [5]

**David J. Leffell, MD**

David Paige Smith Professor of Dermatology and Professor of Surgery (Otolaryngology and Plastic), Section Chief of Dermatologic Surgery, Yale University School of Medicine, New Haven, Connecticut [204]

**Aimee L. Leonard, MD**

New England Dermatology and Laser Center, Springfield, Massachusetts [214]

**Kieron Leslie, MBBS, DTM&H, FRCP**

Professor of Clinical Dermatology, Dermatology Department, University of California, San Francisco, San Francisco, California [161]

**Donald Y. M. Leung, MD, PhD**

Department of Pediatrics, National Jewish Health, University of Colorado Denver, Denver, Colorado [22]

**Benjamin Levi, MD**

Director, Burn, Wound and Regenerative Medicine Laboratory, Assistant Professor of Surgery, Ann Arbor, Michigan [99]

**Myron J. Levin, MD**

Section of Pediatric Infectious Diseases, Department of Pediatrics, University of Colorado School of Medicine, Aurora, Colorado [165]

**Matthew Lewis, MD, MPH**

Clinical Assistant Professor in the Department of Dermatology at Stanford University School of Medicine, Redwood City, California [62]

**Maryam Liaqat, MD**

Division of Dermatology, Cooper Medical School of Rowan University, Camden, New Jersey [180]

**Henry W. Lim, MD**

Emeritus Chair, Department of Dermatology, Henry Ford Hospital, Senior Vice President for Academic Affairs, Henry Ford Health System, Detroit, Michigan [97]

**Dan Lipsker, MD, PhD**

Professor of Dermatology, Faculté de Médecine, Université de Strasbourg and Clinique Dermatologique, Hôpitaux Universitaires, Strasbourg, France [146]

**Adam D. Lipworth, MD**

Assistant Professor of Dermatology, Harvard University Medical School, Director, Program for Infectious Diseases of the Skin, Director of Clinical Care Redesign, Dermatology, Brigham and Women's Hospital, Boston, Massachusetts [168]

**Robert Listernick, MD**

Professor of Pediatrics, Feinberg School of Medicine, Northwestern University, Ann and Robert H. Lurie Children's Hospital of Chicago, Division of General Academic Pediatrics, Chicago, Illinois [135]

**Zhi Liu, PhD**

Department of Dermatology, University of North Carolina at Chapel Hill, Chapel Hill, North Carolina [54]

**Robert Loewe, MD**

Associate Professor, Department of Dermatology, Medical University Vienna, Vienna, Austria [9]

**Anke S. Lonsdorf, MD**

Department of Dermatology, University Hospital Heidelberg, Heidelberg, Germany [112]

**Manisha Loss, MD**

Department of Dermatology Johns Hopkins School of Medicine, Baltimore, Maryland [196]

**Thomas A. Luger, MD**

Center of Chronic Pruritus, Department of Dermatology, University of Münster, Münster, Germany [21]

**Boris D. Lushniak, MD, MPH**

Rear Admiral, United States Public Health Service (Retired), Professor and Chair, Preventive Medicine and Biostatistics, Uniformed Services University of the Health Sciences, F. Edward Hébert School of Medicine, Department of Preventive Medicine and Biostatistics, Bethesda, Maryland [27]

**Catherine Maari, MD, FRCPC**

Associate Clinical Professor, Division of Dermatology, Montreal University Health Center, University of Montreal, CHU Sainte-Justine, Montreal, Quebec, Canada [70]

**Kelly M. MacArthur, MD**

Chief Resident, Department of Dermatology, Johns Hopkins University, Baltimore, Maryland [102, 118]

**Howard I. Maibach, MD**

Department of Dermatology, University of California, San Francisco School of Medicine, San Francisco, California [183]

**Aaron R. Mangold, MD**

Assistant Professor of Dermatology, Mayo Clinic, Scottsdale, Arizona [32, 33]

**Matthew D. Mansh, MD**

Resident in Dermatology, University of Minnesota, Minneapolis, Minnesota [107]

**Richard Marchell, MD**

Associate Professor of Dermatology and Dermatologic Surgery, Residency Program Director, Medical University of South Carolina, Charleston, South Carolina [35]

**David J. Margolis, MD, PhD**

Professor of Dermatology and Epidemiology, Department of Dermatology, Department of Biostatistics and Epidemiology, University of Pennsylvania Perelman School of Medicine, Philadelphia, Pennsylvania [3, 151]

**M. Peter Marinkovich, MD**

Attending Physician, VA Palo Alto Health Care System, Associate Professor and Director, Blistering Disease Clinic, Department of Dermatology, Program in Epithelial Biology, Stanford University School of Medicine, Stanford, California [60]

**Seth S. Martin, MD, MHS**

Ciccarone Center for the Prevention of Heart Disease, Division of Cardiology, Department of Medicine, Johns Hopkins Hospital, Baltimore Maryland [126]

**Kathryn J. Martires, MD**

Clinical Assistant Professor, Department of Dermatology, Stanford University School of Medicine, Palo Alto, California [129]

**Erin F. D. Mathes, MD**

Associate Professor of Clinical Dermatology, University of California, San Francisco, San Francisco, California [163]

**Marcus Maurer, MD**

Charité–Universitätsmedizin Berlin, Department of Dermatology and Allergy, Berlin, Germany [96]

**Aubriana McEvoy**

University of Washington, Seattle, Washington [113]

**John A. McGrath, MBBS, PhD**

St John's Institute of Dermatology, King's College London, London, United Kingdom [18]

**Sean McGregor, DO**

Resident physician, Wake Forest University School of Medicine, Winston-Salem, North Carolina [175]

**Bridget E. McIlwee, DO**

Dermatology Resident, Division of Dermatology University of North Texas Health Science Center, Fort Worth, Texas [209]

**Amy J. McMichael, MD**

Professor and Chair, Department of Dermatology, Wake Forest University School of Medicine, Winston-Salem, North Carolina [90]

**Atul B. Mehta, MA, MB, BChir, MD, FRCP, FRCPath**

Professor, University College London, Royal Free Campus and Royal Free London NHS Foundation Trust, London, United Kingdom [127]

**Thomas Mentzel, MD**

Consultant Dermatopathologist and Associated Professor, Dermatopathologie Bodensee, Friedrichshafen, Germany [122]

**Peter A. Merkel, MD, MPH**

Chief, Division of Rheumatology, Professor of Medicine and Epidemiology, University of Pennsylvania, Philadelphia, Pennsylvania [139]

**Robert G. Micheletti, MD**

University of Pennsylvania, Department of Dermatology, Philadelphia, Pennsylvania [133]

**Ashley N. Millard, MD**

Marshfield Clinic, Marshfield, Wisconsin [98]

**David Michael Miller, MD, PhD**

Clinical Fellow in Medicine, Division of Hematology/ Oncology, Beth Israel Deaconess Medical Center, Clinical Associate, Department of Dermatology, Massachusetts General Hospital, Boston, Massachusetts [194]

**Jami L. Miller, MD**

Department of Internal Medicine, Division of Dermatology, Vanderbilt University Medical Center, Nashville, Tennessee [101]

**Lloyd S. Miller, MD, PhD**

Associate Professor of Dermatology, Infectious Diseases and Orthopaedic Surgery, Johns Hopkins School of Medicine, Baltimore, Maryland [150]

**Leonard M. Milstone, MD**

Professor Emeritus of Dermatology, Yale University School of Medicine, New Haven, Connecticut [47]

**Daniel Mimouni, MD**

Associate Professor of Dermatology, Department of Dermatology, Beilinson Hospital, Petach Tikva, Israel, Faculty of Medicine, Tel Aviv University, Tel Aviv, Israel [53]

**Vineet Mishra, MD**

Assistant Clinical Professor, Division of Dermatology and Cutaneous Surgery, The University of Texas Health Science Center at San Antonio, San Antonio, Texas [212]

**Maja Mockenhaupt, MD, PhD**

Dokumentationszentrum schwerer Hautreaktionen (dZh), Department of Dermatology, Medical Center, University of Freiburg, Freiburg, Germany, Dokumentationszentrum schwerer Hautreaktionen (dZh), Department of Dermatology, Medical Center and Medical Faculty, University of Freiburg, Freiburg, Germany [43, 44]

**Robert L. Modlin, MD, PhD**

Klein Professor of Dermatology, Distinguished Professor of Medicine and Microbiology, Immunology and Molecular Genetics, Chief, Division of Dermatology, Vice Chair for Cutaneous Medicine and Dermatology Research, David Geffen School of Medicine, UCLA Med-Derm, Los Angeles, California [11]

**Pia Moinzadeh, MD**

Department of Dermatology and Venerology, University of Cologne, Cologne, Germany [63]

**Paul A. Monach, MD, PhD**

Division of Rheumatology, Immunology, and Allergy, Brigham and Women's Hospital, Chief, Rheumatology Section, VA Boston Healthcare System, Boston, Massachusetts [139]

**Gary Monheit, MD**

Total Skin and Beauty Dermatology, Birmingham, Alabama [213]

**Robert F. Moore, MD**

Resident in Anatomic Pathology, Department of Pathology, Johns Hopkins Hospital, Baltimore, Maryland [115]

**Breanne Mordorski, BA**

Nanodermatology Research Fellow, Department of Medicine (Division of Dermatology), Albert Einstein College of Medicine, Bronx, New York [154]

**Hansgeorg Müller, MD**

Dermatopathology Friedrichshafen, Friedrichshafen, Germany [121]

**Keisuke Nagao, MD, PhD**

Dermatology Branch, National Institutes of Health, Bethesda, Maryland [13]

**Mio Nakamura, MD**

Clinical Research Fellow, Psoriasis, Phototherapy, and Skin Treatment Center, Department of Dermatology, University of California, San Francisco, San Francisco, California [100]

**Zeena Y. Nawas, MD**

University of Texas Health Science Center, Houston, Texas [191]

**Susan T. Nedorost, MD**

Professor, Dermatology and Environmental Health Sciences, Case Western Reserve University, Director, Graduate Medical Education, University Hospitals Cleveland Medical Center, Cleveland, Ohio [25]

**Isaac M. Neuhaus, MD**

Associate Professor of Dermatology, University of California, San Francisco, San Francisco, California [114]

**Sabrina A. Newman, MD**

Assistant Professor of Dermatology, Director, Inpatient Dermatology, University of Colorado School of Medicine, Anschutz Medical Campus, Aurora, Colorado [148]

**Paul Nghiem, MD, PhD**

University of Washington, Seattle, Washington [113]

**Quynh-Giao Nguyen, MD**

Baylor College of Medicine, Houston, Texas [191]

**Matilda W. Nicholas, MD, PhD**

Assistant Professor, Department of Dermatology, Duke University Medical Center, Duke University Medical Center, Durham, North Carolina [58]

**Elizabeth L. Nieman, MD**

Assistant Professor of Dermatology, Division of Dermatology, Department of Medicine, Washington University School of Medicine, St. Louis, Missouri [131]

**Scott A. Norton, MD, MPH, MSc**

Chief of Dermatology, Children's National Medical Center, Washington, DC [156]

**Cathal O'Connor, MD**

Paediatric Dermatology, Our Lady's Children's Hospital, National Children's Research Centre, Our Lady's Children's Hospital Crumlin, Dublin [51]

**Grainne M. O'Regan, PhD, FRCPI**

Paediatric Dermatology, Our Lady's Children's Hospital, National Children's Research Centre, Our Lady's Children's Hospital Crumlin, Dublin [51]

**Manabu Ohyama, MD, PhD**

Professor and Chairman, Department of Dermatology, Kyorin University School of Medicine, Tokyo, Japan [86]

**Ginette A. Okoye, MD**

Assistant Professor of Dermatology, Johns Hopkins School of Medicine, Baltimore, Maryland [84]

**Ana-Maria Orbai, MD, MHS**

Assistant Professor of Medicine, Director Psoriatic Arthritis Program, Johns Hopkins Arthritis Center, Johns Hopkins School of Medicine, Division of Rheumatology, Baltimore, Maryland [65]

**Anthony E. Oro, MD, PhD**

Department of Dermatology, Stanford University, School of Medicine, Redwood City, California [111]

**Jeffrey S. Orringer, MD**

Professor and Chief, Division of Cosmetic Dermatology, Department of Dermatology, University of Michigan, Ann Arbor, Michigan [210]

**Catherine H. Orteu, MBBS, BSc, MD, FRCP**

University College London, Royal Free Campus and Royal Free London NHS Foundation Trust, London, United Kingdom [127]

**Stephen M. Ostrowski, MD, PhD**

Instructor of Dermatology, Harvard Medical School, Department of Dermatology, Cutaneous Biology Research Center, Massachusetts General Hospital, Boston, Massachusetts [20]

**Nina Otberg, MD**

Hair Clinic, Skin and Laser Center Potsdam, Potsdam, Germany, Otberg Medical, Hair Transplant Center Berlin-Potsdam, Berlin, Germany [87, 88]

**Michael N. Oxman, MD**

Division of Infectious Diseases, Department of Medicine, University of California, San Diego and Infectious Diseases Section, Medical Service, Veterans Affairs San Diego Healthcare System, San Diego, California [165]

**Vikash S. Oza, MD**

Assistant Professor of Dermatology and Pediatrics, The Ronald O. Perleman Department of Dermatology, New York University School of Medicine, New York, New York [163]

**Amy S. Paller, MD**

Walter J. Hamlin Professor and Chair, Department of Dermatology, Professor of Pediatrics, Northwestern University Feinberg School of Medicine, Chicago, Illinois [132]

**Jiun Yit Pan, MBBS, MCI (NUS), GDOM (NUS), DTM&H (Lond), FRCP (Edin)**

Dermatologist, National Skin Centre, Singapore [187]

**Amit G. Pandya, MD**

Department of Dermatology, The University of Texas, Southwestern Medical Center, Dallas, Texas [77]

**Deepa Patel, BS**

Clinical Research Fellow, The Children's Hospital of Philadelphia, Philadelphia, Pennsylvania [89]



**Aimee S. Payne, MD, PhD**

Associate Professor of Dermatology, University of Pennsylvania, Philadelphia, Pennsylvania [15, 52]

**David R. Pearson, MD**

Assistant Professor of Dermatology, University of Minnesota School of Medicine, Minneapolis, Minnesota [151]

**David H. Peng, MD, MPH**

Chair, Department of Dermatology, University of Southern California, Los Angeles, California [143]

**Manuel P. Pereira, MD, PhD**

Center of Chronic Pruritus, Department of Dermatology, University of Münster, Münster, Germany [21]

**Powell Perng, MD**

Johns Hopkins School of Medicine, Department of Dermatology, Baltimore, Maryland [83]

**Peter Petzelbauer, MD**

Professor of Microvascular Research, Department of Dermatology, Medical University Vienna, Vienna, Austria [9]

**Robert G. Phelps, MD**

Professor, Departments of Dermatology and Pathology, Icahn School of Medicine at Mount Sinai, New York, New York [125]

**Rita O. Pichardo, MD**

Associate Professor of Dermatology, Wake Forest University School of Medicine, Winston-Salem, North Carolina [174, 175]

**Warren W. Piette, MD**

Chair, Division of Dermatology, Department of Medicine, John H Stroger, Jr. Hospital of Cook County, Professor, Department of Dermatology, Rush University Medical Center, Chicago, Illinois [66]

**Mark R. Pittelkow, MD**

Professor of Dermatology, Mayo Clinic, Chair of Dermatology, Scottsdale, Arizona [32, 33, 67]

**Jordan S. Pober, MD, PhD**

Bayer Professor of Translational Medicine and Professor of Immunobiology, Pathology and Dermatology, Department of Immunobiology, Yale School of Medicine, New Haven, Connecticut [9]

**Brian P. Pollack, MD, PhD**

Assistant Professor, Departments of Dermatology and Pathology / Laboratory Medicine, Emory University School of Medicine, The Atlanta VA Medical Center, Atlanta, Georgia [198]

**Miriam Keltz Pomeranz, MD**

Associate Professor of Dermatology, The Ronald O. Perleman Department of Dermatology, New York University School of Medicine, Chief of Dermatology, NYC Health + Hospitals / Bellevue, New York, New York [105]

**Julie Powell, MD, FRCPC**

Clinical Professor, Dermatology and Pediatrics, University of Montreal, Director, Pediatric Dermatology, CHU Sainte-Justine, Montreal, Quebec, Canada [70]

**Julie S. Prendiville, MB, FRCPC**

Clinical Professor in Pediatrics, University of British Columbia, Head, Division of Pediatric Dermatology, BC Children's Hospital, Vancouver, British Columbia, Canada [34]

**Katherine Püttgen, MD**

Assistant Professor of Dermatology and Pediatrics, Johns Hopkins University, Baltimore, Maryland [118]

**Sophia Rangwala, MD**

Fellow, Dermatopathology, Johns Hopkins School of Medicine, Baltimore, Maryland [108]

**Caroline L. Rao, MD**

Assistant Professor, Department of Dermatology, Duke University Medical Center, Duke University Medical Center, Durham, North Carolina [58]

**Bobby Y. Reddy, MD**

Clinical Fellow, Department of Dermatology, Wellman Center for Photomedicine, Massachusetts General Hospital, Boston, Massachusetts [194]

**Michelle Rodrigues, MBBS (Hons), FACD**

Chroma Dermatology, Melbourne, Australia, Department of Dermatology, St Vincent's Hospital, Fitzroy, Victoria, Australia [77]

**Thomas E. Rohrer, MD**

SkinCare Physicians, Chestnut Hill, Massachusetts [203]

**Misha Rosenbach, MD**

Assistant Professor, Dermatology and Internal Medicine Associate Program Director, Dermatology Residency Director, Inpatient Dermatology Consult Service Director, Cutaneous Sarcoidosis Clinic, Perelman Center for Advanced Medicine, Dermatology Administration, Philadelphia, Pennsylvania [155]

**Jean-Claude Roujeau MD, PhD**

Emeritus Professor of Dermatology, Université Paris-Est Créteil (UPEC), Créteil, France, Department of Dermatology, Université Paris-Est Créteil, Créteil, France [43, 44]

**Anne H. Rowley, MD**

Professor of Pediatrics and of Microbiology / Immunology, Feinberg School of Medicine, Northwestern University Attending Physician, Division of Infectious Diseases, Ann and Robert H. Lurie Children's Hospital of Chicago, Chicago, Illinois [142]

**Thomas M. Rütger, MD, PhD**

Professor of Dermatology, Pathology, and Laboratory Medicine, Department of Dermatology, Boston University School of Medicine, Boston, Massachusetts [17, 130]

**Arturo P. Saavedra, MD, PhD**

Associate Professor of Dermatology, Harvard University Medical School, Vice-Chairman for Clinical Affairs and Medical Director, Massachusetts General Hospital, Boston, Massachusetts [168]

**Mohammed D. Saleem, MD, MPH**

Department of Dermatology, Wake Forest University School of Medicine, Winston-Salem, North Carolina [183]

**Iman Salem, MD**

Center for Medical Mycology, University Hospitals Cleveland Medical Center, Case Western Reserve University, Cleveland, Ohio [188]

**Claudio Guedes Salgado, MD, PhD**

Associate Professor, Pará Federal University, President of the Brazilian Leprosy Society, Marituba, Pará, Brazil [159]

**Ubirajara Imbiriba Salgado, MD**

Full Professor, Dermatology, Pará State University, Belém, Pará, Brazil [159]

**Liat Samuelov, MD**

Senior Physician, Department of Dermatology, Tel-Aviv Sourasky Medical Center, Tel-Aviv, Israel [48]

**Khaled S. Sanber, MD, PhD**

Baylor College of Medicine, Houston, Texas [191]

**Inbal Sander, MD**

Assistant Professor of Dermatology and Pathology, Johns Hopkins School of Medicine, Baltimore, Maryland [83]

**Julio C. Sartori-Valinotti, MD**

Assistant Professor of Medicine and Dermatology, Mayo Clinic College of Medicine, Department of Dermatology, Rochester, Minnesota [144]

**Vasanth Sathiyakumar, MD**

Ciccarone Center for the Prevention of Heart Disease, Division of Cardiology, Department of Medicine, Johns Hopkins Hospital, Baltimore Maryland [126]

**Takashi K. Satoh, MD, PhD, MSc**

Postdoctoral Research Fellow, Department of Dermatology University of Zurich, Zurich, Switzerland [39]

**Jean-Hilaire Saurat, MD**

Professor Emeritus, University of Geneva, Genève, Switzerland [185]

**April Schachtel, MD**

Dermatology Resident, University of Washington School of Medicine, Division of Dermatology, Seattle, Washington [137]

**Knut Schäkel, MD**

Professor and Vice Chair of Dermatology, Department of Dermatology, University Hospital, Ruprecht-Karls-University Heidelberg, Heidelberg, Germany [29]

**Mark Jordan Scharf, MD**

Clinical Professor of Dermatology, University of Massachusetts Medical School, Worcester, Massachusetts [182]

**Stefan M. Schieke, MD**

Assistant Professor, Department of Dermatology, School of Medicine and Public Health, University of Wisconsin-Madison, Medical Science Center, Madison, Wisconsin [30, 160]

**Gabriel Schlager, MD**

Department of Dermatology, University Hospital Munich, Ludwig-Maximilian University, Munich, Germany [110]

**Kenneth E. Schmader, MD**

Duke University Medical Center and Geriatric Research Education and Clinical Center (GRECC), Durham VA Medical Center. Durham, North Carolina [165]

**Astrid Schmieder, MD**

Senior Consultant, Section Head, Allergy, Psoriasis Competence Center, Department of Dermatology, Venereology and Allergology, University Medical Center and Medical Faculty Mannheim, University of Heidelberg, Mannheim, Germany [117]

**Robert A. Schwartz, MD, MPH, DSc (Hon), FRCP Edin, FAAD**

Professor and Head, Dermatology, Professor of Medicine, Professor of Pediatrics, Professor of Pathology, Rutgers New Jersey Medical School, Visiting Professor, Rutgers School of Public Affairs and Administration, Honorary Professor, China Medical University, Shenyang, China [181, 182]

**Aisha Sethi, MD**

Associate Professor of Dermatology, Director Yale Dermatology Global Health Program, Department of Dermatology, Yale University School of Medicine, New Haven, Connecticut [157]

**Kara N. Shah, MD, PhD**

Kenwood Dermatology, Cincinnati, Ohio [103]

**Jerry Shapiro, MD, FRCP**

Hair Clinic, The Ronald. O. Perelman Department of Dermatology, New York University School of Medicine, New York, New York [87, 88]

**Neil H. Shear, MD, PhD**

Division of Dermatology, Department of Medicine, Sunnybrook Health Sciences Centre, University of Toronto, Division of Dermatology, Department of Medicine, Sunnybrook Health Sciences Centre, Toronto, Ontario, Canada [45]

**Jessica M. Sheehan, MD**

Derick Dermatology, Northbrook, Illinois [203]

**Michael P. Sheehan, MD**

Dermatology Physicians, Columbus, Indiana [24]

**Hiroshi Shimizu, MD, PhD**

Professor and Chairman, Department of Dermatology, Hokkaido University Graduate School of Medicine, Sapporo, Japan [40]

**Kanade Shinkai, MD, PhD**

Associate Professor, University of California, San Francisco, Department of Dermatology, San Francisco, California [1]

**Cathryn Sibbald, BScPhm, MD**

Department of Dermatology, Sunnybrook Health Sciences Centre, University of Toronto, Division of Dermatology, Department of Medicine, Sunnybrook Health Sciences Centre, Toronto, Ontario, Canada [45]

**Daniel Asz Sigall, MD**

Mycology Section, Dr. Manuel Gea Gonzalez General Hospital, Mexico City, Mexico [158]

**Jonathan I. Silverberg, MD, PhD, MPH**

Assistant Professor of Dermatology, Preventive Medicine and Medical Social Sciences, Northwestern University Feinberg School of Medicine, Director, Northwestern Medicine Multidisciplinary Eczema Center, Director, Patch Testing Clinic, Northwestern Memorial Hospital, Chicago, Illinois [23]

**Eric L. Simpson, MD, MCR**

Department of Dermatology, Oregon Health and Science University, Portland, Oregon [22]

**Noah Smith, MD**

Department of Dermatology, University of Michigan Health System, Ann Arbor, Michigan [202]

**Clayton J. Sontheimer, MD**

Acting Assistant Professor, Pediatric Rheumatology, University of Washington School of Medicine, Seattle Children's Hospital, Seattle, Washington [61]

**Richard D. Sontheimer, MD**

Professor, Dermatology, University of Utah School of Medicine, Salt Lake City, Utah [61]

**Nicholas A. Soter, MD**

Professor of Dermatology, New York University School of Medicine, Medical Director, Skin and Cancer Unit, Tisch Hospital, New York, New York [138]

**John Stewart Spencer, PhD**

Associate Professor, Microbiology, Immunology and Pathology, Colorado State University, Fort Collins, Colorado [159]

**Eli Sprecher, MD, PhD**

Professor and Chair, Department of Dermatology, Tel Aviv Sourasky Medical Center, Tel-Aviv, Israel and Department of Human Molecular Genetics and Biochemistry, Sackler Faculty of Medicine, Tel Aviv University, Tel Aviv, Israel, Tel Aviv, Israel [48]

**Rudolf Stadler, MD, PhD**

University Clinic for Dermatology, Johannes Wesling Medical Centre, University of Bochum, Minden, Germany [119, 120]

**Sonja Ständer, MD**

Center of Chronic Pruritus, Department of Dermatology, University of Münster, Münster, Germany [21]

**John R. Stanley, MD**

Professor, Department of Dermatology, Perelman School of Medicine, University of Pennsylvania, Philadelphia, Pennsylvania [52]

**William G. Stebbins, MD**

Vanderbilt University, Nashville, Tennessee [214]

**Christopher J. Steen, MD, FAAD**

Portland, Maine [181]

**Martin Steinhoff, MD, PhD**

Chairman, Department of Dermatology and Venereology, Hamad Medical Corporation, Doha, Qatar, Clinical Professor, Weill-Cornell University-Qatar, School of Medicine, and Qatar University, Medical School, Doha, Qatar, Professor, UCD Charles Institute for Translational Dermatology, University College Dublin, Dublin, Ireland [79]

**Jane C. Sterling, MB, BChir, MA, FRCP, PhD**

Cambridge University Hospitals NHS Foundation Trust, Department of Dermatology, Addenbrooke's Hospital, Cambridge University Hospitals NHS Foundation Trust, Cambridge, United Kingdom [167]

**Georg Stingl, MD**

Professor and Chair, Division of Immunology, Allergy and Infectious Diseases (DIAID), Department of Dermatology, Medical University of Vienna, Vienna, Austria [10]

**Erik J. Stratman, MD**

Clinical Professor, Department of Dermatology, University of Wisconsin School of Medicine and Public Health, Marshfield, Wisconsin [98]

**Lindsay C. Strowd, MD**

Assistant Professor of Dermatology, Wake Forest University School of Medicine, Winston-Salem, North Carolina [175]

**Dae Hun Suh, MD, PhD**

Professor, Department of Dermatology, Seoul National University College of Medicine, Acne and Rosacea Research Laboratory, Seoul National University Hospital, Seoul, South Korea [26]

**Kathryn N. Suh, MD, FRCPC**

Associate Professor of Medicine, University of Ottawa, Division of Infectious Diseases The Ottawa Hospital, Ottawa, Ontario, Canada [177]

**Tamio Suzuki, MD, PhD**

Professor and Chairman of Dermatology, Yamagata University Faculty of Medicine, Yamagata, Japan [75]

**Rolf-Markus Szeimies, MD, PhD**

Professor of Dermatology, Department of Dermatology and Allergology Klinikum Vest Academic Teaching Hospital Ruhr-University of Bochum, Recklinghausen, Germany [199]

**Yoshikazu Takada, PhD**

Department of Dermatology, University of California Davis School of Medicine, Sacramento, California [193]

**Shunsuke Takahagi, MD, PhD**

Department of Dermatology, Institute of Biomedical and Health Sciences, Hiroshima University, Hiroshima, Japan [41]

**Junko Takeshita, MD, PhD, MSCE**

Assistant Professor of Dermatology and Epidemiology, Department of Dermatology, Department of Biostatistics and Epidemiology, University of Pennsylvania Perelman School of Medicine, Philadelphia, Pennsylvania [3]

**Carolina Talhari, MD**

Associate Professor of Dermatology, State University of Amazonas, Manaus, Brazil [171]

**Jean Y. Tang, MD, PhD**

Department of Dermatology, Stanford University, School of Medicine, Redwood City, California [111]

**Akiko Tanikawa, MD, PhD**

Assistant Professor, Department of Dermatology, Keio University School of Medicine, Tokyo, Japan [68]

**Janis M. Taube, MD**

Associate Professor of Dermatology, Johns Hopkins School of Medicine, Section Head, Dermatopathology, Baltimore, Maryland [108]

**Bailey Tayebi, MD, MBA**

Total Skin and Beauty Dermatology, Birmingham, Alabama [213]

**Michael D. Tharp, MD**

The Clark W. Finnerud, MD Professor and Chair, Department of Dermatology, Rush University Medical Center, Chicago, Illinois [42, 189]

**Diane M. Thiboutot, MD**

Professor of Dermatology, Associate Dean of Clinical and Translational Research Education, Penn State University College of Medicine, Hershey, Pennsylvania [78, 80]

**Thusanth Thuraisingam, MD, PhD**

Division of Dermatology, McGill University, Montreal, Quebec, Canada [90]

**Kenneth J. Tomecki, MD**

Department of Dermatology, Cleveland Clinic, Cleveland, Ohio [186]

**Franz Trautinger, MD**

Professor of Dermatology and Venereology, Karl Landsteiner University of Health Sciences, Chairman, Department of Dermatology and Venereology, University Hospital of St. Pölten, St. Pölten, Austria [38]

**Jeffrey B. Travers, MD, PhD**

Chair of Pharmacology and Toxicology, Professor of Dermatology, Boonshoft School of Medicine at Wright State University, Dayton, Ohio [152]

**Kenneth Y. Tsai, MD, PhD**

Associate Member, Departments of Anatomic Pathology and Tumor Biology, Section Head, Non-Melanoma Skin Cancer and Treatment, Donald A. Adam Melanoma and Skin Cancer Center of Excellence, Moffitt Cancer Center, Tampa, Florida [19]

**Hensin Tsao, MD, PhD**

Professor of Dermatology, Head, Skin Cancer Genetics Laboratory/Wellman Center for Photomedicine, Director, Massachusetts General Hospital Melanoma and Pigmented Lesion Center/Department of Dermatology, Director, Massachusetts General Hospital Melanoma Genetics Program/MGH Cancer Center, Boston, Massachusetts [194]

**Susan A. Tuddenham, MD, MPH**

Division of Infectious Diseases, Bayview Medical Center, Johns Hopkins University, Baltimore, Maryland [170]

**Jake E. Turrentine, MD**

Assistant Professor, Division of Dermatology, Department of Medicine, Augusta University, Augusta, Georgia [24]

**Stephen K. Tyring, MD, PhD**

University of Texas Health Science Center, Houston, Texas [191]

**Mark C. Udey, MD, PhD**

Dermatology Branch, National Institutes of Health, Bethesda, Maryland [13]

**Hideyuki Ujiie, MD, PhD**

Assistant Professor, Department of Dermatology, Hokkaido University Graduate School of Medicine, Sapporo, Japan [40]

**Robin H. Unger, MD**

American Board of Hair Restoration Surgery, International Society of Hair Restoration Surgeons, Assistant Clinical Professor, Dermatology, Mt. Sinai School of Medicine, New York, New York [217]

**Walter P. Unger, MD, FRCP (C)**

American Board of Dermatology, American Board of Hair Restoration Surgery, International Society of Hair Restoration Surgeons, Clinical Professor, Dermatology, Mt. Sinai School of Medicine, New York, New York [217]

**Jochen Utikal, MD**

Professor of Dermatology, Section Head Dermato-Oncology, Skin Cancer Unit, German Cancer Research Center (DKFZ), Department of Dermatology, Venereology and Allergology, University Medical Center and Medical Faculty Mannheim, University of Heidelberg, Mannheim, Germany [117]

**Anders Vahlquist, MD**

Professor, Department of Medical Sciences, Dermatology and Venereology, Uppsala University, Uppsala, Sweden [185]

**Travis Vandergriff, MD**

Assistant Professor of Dermatology and Pathology, Director of Dermatopathology, UT Southwestern Medical Center, Dallas, Texas [93, 94]

**Miikka Vikkula, MD, PhD**

Head of Laboratory of Human Molecular Genetics, de Duve Institute, University of Louvain, Brussels, Belgium [147]

**Ruth Ann Vleugels, MD, MPH**

Associate Professor, Harvard Medical School, Director, Autoimmune Skin Diseases Program, Director, Connective Tissue Diseases Clinic, Department of Dermatology, Brigham and Women's Hospital, Boston, Massachusetts [145, 192]

**Esther von Stebut, MD**

Associate Professor of Dermatology and Infectious Diseases, Department for Dermatology, University Medical Center, Johannes Gutenberg-University, Mainz, Germany [176]

**John J. Voorhees, MD, FRCP**

Duncan and Ella Poth Distinguished Professor and Chairman, Department of Dermatology, University of Michigan Medical School, Ann Arbor, Michigan [185]

**Justin J. Vujevich, MD**

Vujevich Dermatology Associates, Pittsburgh, Pennsylvania [206]

**Etienne C. E. Wang, BA(Hons), MBBS, MA, MPhil**

National Skin Center, Singapore, Department of Dermatology, Columbia University, New York, New York [18]

**Stewart Wang, MD, PhD**

Professor, Department of Surgery, Chief, Burn Surgery, Division of Plastic Surgery, Department of Surgery, University of Michigan Health Systems, Ann Arbor, Michigan [99]

**Roger H. Weenig, MD**

Associated Skin Care Specialists, Fridley, Minnesota [67]

**Karsten Weller, MD**

Department of Dermatology and Allergy, Allergie-Centrum-Charité, Charité-Universitätsmedizin Berlin, Berlin, Germany [96]

**Victoria Werth, MD**

Professor of Dermatology, Department of Dermatology, University of Pennsylvania School of Medicine, Philadelphia, Pennsylvania [184]

**Chikoti M. Wheat, MD**

Johns Hopkins School of Medicine, Baltimore, Maryland [178]

**Lynn D. Wilson, MD, MPH, FASTRO**

Professor, Vice Chairman and Clinical Director, Department of Therapeutic Radiology, Yale School of Medicine, New Haven, Connecticut [200]

**Lauren E. Wiznia, MD**

The Ronald O. Perelman Department of Dermatology, New York University School of Medicine, New York, New York [105]

**Peter Wolf, MD**

Professor of Dermatology and Bioimmunotherapy, Vice Chair of the Department of Dermatology, Medical University of Graz, Research Unit for Photodermatology, Department of Dermatology, Medical University of Graz, Graz, Austria [92]

**Gary S. Wood, MD**

Johnson Professor and Chairman, Department of Dermatology, School of Medicine and Public Health, University of Wisconsin-Madison, Madison, Wisconsin [30]

**David T. Woodley, MD**

Professor and Emeritus Founding Chair, Department of Dermatology, The Keck School of Medicine, University of Southern California, Los Angeles, California [56]

**Sophie M. Worobec, MD**

University of Illinois at Chicago, Chicago, Illinois [73]

**Albert C. Yan, MD, FAAP, FAAD**

Chief, Section of Pediatric Dermatology, Children's Hospital of Philadelphia, Professor, Pediatrics and Dermatology, Perelman School of Medicine at the University of Pennsylvania, Philadelphia, Pennsylvania [123]

**Kim B. Yancey, MD**

Professor and Chair, Department of Dermatology, University of Texas Southwestern Medical Center, Dallas, Texas [55]

**Howa Yeung, MD**

Chief Resident in Dermatology, Emory University School of Medicine, Atlanta, Georgia [107]

**Andrea L. Zaenglein, MD**

Professor of Dermatology and Pediatrics, Penn State College of Medicine, Penn State/ Hershey Medical Center, Hershey, Pennsylvania [78, 80]

**Jonathan M. Zenilman, MD**

Division of Infectious Diseases, Bayview Medical Center, Johns Hopkins University, Baltimore, Maryland [170]

**Christos C. Zouboulis, MD, PhD**

Departments of Dermatology, Venereology, Allergology and Immunology, Dessau Medical Center, Brandenburg Medical School Theodor Fontane, Dessau, Germany [6, 82, 141]

*This page intentionally left blank*

# PREFACE

A much-treasured legacy of Dr. Thomas B. Fitzpatrick, who served as editor-in-chief for the first four editions of the book, *Fitzpatrick's Dermatology in General Medicine* (DIGM) has always aimed to be a comprehensive source of information for those interested in the clinical and basic science of dermatology. Indeed, from the very first edition of *Fitzpatrick's DIGM*, printed in 1971, this authoritative textbook has been grounded in science. We have continued this tradition in the ninth edition of the book whilst rearranging the discussion to make it more reader friendly and to minimize repetition. With coverage of subject matters expanding beyond General Medicine, we have appropriately modified the book title to *Fitzpatrick's Dermatology*. Important general basic science concepts are extensively covered in dedicated chapters appearing in an early section of the book, allowing subsequent clinical chapters to focus on relevant disease-specific pathophysiology in addition to clinical features, diagnosis, clinical course, and management.

Dermatology is a particularly visual specialty. In the preparation of this edition of the book, we have placed special emphasis on display items (in the form of clinical images, tables, and algorithmic summaries), as we strongly believe that these components are vital for the complete understanding of all readers, but particularly for those in training. What better way to optimize the visual content provided in our chapters than to seek input from trainees themselves? We had trainees review every chapter and provide feedback on additional display items they would find useful.

To further enhance the utility of this gold-standard textbook we have also improved the indexing. A good index is imperative to allow readers, including busy practicing clinicians, to easily and quickly find the particular information about a concept, condition, or therapy that they are interested in at any given time. We hope that you agree the improved indexing allows you to achieve this aim.

No modern textbook is complete without an online presence. The ninth edition is also available in the online format, and we plan to regularly post online updates to the book as new studies and/or guidelines are published. You will also have access to other useful features in the online version of *Fitzpatrick's Dermatology* on *AccessMedicine.com*.

Finally, as a completely new group of editors that is diverse in expertise and international in location of practice, we have endeavored to build on the achievements of previous editorial groups led by Drs. Thomas B. Fitzpatrick, Irwin M. Freedberg, Klaus Wolff, and Lowell A. Goldsmith, whilst providing fresh insight into the content, new thinking regarding the optimal structure of the book, and ultimately helping the book to evolve into the most relevant resource for the modern practicing or trainee dermatologist or skin biologist.

**Sewon Kang**  
**Masayuki Amagai**  
**Anna L. Bruckner**  
**Alexander H. Enk**  
**David J. Margolis**  
**Amy J. McMichael**  
**Jeffrey S. Orringer**

*This page intentionally left blank*



# ACKNOWLEDGMENTS

We thank the many expert authors who wrote chapters for the ninth edition of *Fitzpatrick's Dermatology*. We greatly appreciate the time they dedicated to creating their masterpieces and acknowledge how difficult it must have been to fit the task in with the demands of their dermatology practice, teaching, and research. We are truly grateful. We also appreciate their patience with the editorial team while we reviewed the submissions and then reviewed them again because we wanted to carefully consider all the visual elements included in the book.

With regard to visual elements, we owe much gratitude to Noori Kim and Hester Lim who took the time to carefully read every individual chapter and provide detailed feedback on what additional display items they thought would aid the reader. With more than 200 chapters included in the book, we appreciate the sheer enormity of this task and their dedication to attention to detail.

As a completely new editorial board, we are very grateful for the engagement, advice, and encouragement afforded to us by the previous editor-in-chief Lowell A. Goldsmith. We truly appreciate the time and effort he invested to enable the smooth transition of editorial direction for the new edition of this much-loved book.

A special shout-out to Karen Edmonson, our straight-talking and very patient senior editor at

McGraw-Hill Education who kept the whole editorial team motivated and helped to bring our ideas to fruition, and to our editorial project manager Bryony Mearns, who helped to coordinate submission and review of the 217 chapters, keep on top of the status of each chapter, and encourage authors and editors to progress with their book-related tasks. We also appreciate the efforts of Kim Davis and Sonam Arora who expertly coordinated everything from submission of the finalized chapters to the McGraw-Hill team through to print publication.

Finally, we are truly grateful for the understanding and patience of our families. Without their support, this textbook would never have been completed. A book like *Fitzpatrick's Dermatology* demands many evening and weekend hours that would normally be spent with loved ones, and we thank them for allowing us to dedicate many of these hours to *Fitzpatrick's Dermatology*.

**Sewon Kang  
Masayuki Amagai  
Anna L. Bruckner  
Alexander H. Enk  
David J. Margolis  
Amy J. McMichael  
Jeffrey S. Orringer**

*This page intentionally left blank*

## Chapter 1 :: Fundamentals of Clinical Dermatology: Morphology and Special Clinical Considerations

:: Erin H. Amerson, Susan Burgin, & Kanade Shinkai

### AT-A-GLANCE

- Skin diseases have characteristic morphology and distribution.
- Morphologic characteristics and reaction patterns of the skin suggest disease pathophysiology, helping focus the differential diagnosis.
- The history is indispensable in elucidating complex diagnoses.
- Knowledge and appropriate use of dermatologic terminology is essential.
- The comprehensive mucocutaneous examination, including hair and nails, should always be performed.

### THE ART AND SCIENCE OF DERMATOLOGIC DIAGNOSIS

The diagnosis and treatment of cutaneous diseases requires the physician's ability to recognize the primary lesions and reaction patterns of the skin, and to put these visual clues into context with the patient's history and overall health. In this chapter, we discuss a fundamental approach to the patient presenting with a skin problem. We introduce the technical vocabulary of dermatologic description, also known as morphology. Accurately identifying morphology is an essential step

in generating a differential diagnosis. Use of standard dermatologic terminology is also critical for effective clinical documentation, research, and communication with other health care providers.

The process of examining and describing skin lesions requires perception of subtle details: appreciation of a specific hue of erythema, a shape or distribution, or the presence of characteristic findings on nails or mucous membranes often hold the key to the correct diagnosis. Repeated patient encounters help to train the eye to recognize such patterns. With time and experience, the physician can associate clinical skin findings with histopathologic features, enabling a rich understanding of the pathophysiology of skin disease, as well as clinical-pathologic correlation.

### APPROACH TO THE PATIENT

#### HISTORY

Dermatology is a visual specialty, and some skin conditions may be diagnosed at a glance. History may be crucial in complex cases, such as the patient with rash and fever, or the patient with generalized pruritus. There is therapeutic value in receiving a patient's narrative thread, as they feel heard, and they may reveal information relevant to treatment choice or invite opportunities for education and reassurance. In practice, many dermatologists take a brief history, perform a physical examination, then undertake more detailed

questioning based on the differential diagnosis that the examination suggests.

In taking a history from a patient presenting with a new skin complaint, the physician's primary goal is to establish a diagnosis, with a secondary goal of evaluating the patient as a candidate for therapy. In patients whose diagnosis is already established, the physician's goals are to reevaluate the original diagnosis, monitor disease progress and complications, and modify treatment accordingly.

Table 1-1 presents an approach to obtaining the history in a patient presenting with a skin problem. The physician may choose to customize the history depending on whether the chief complaint is a growth or an eruption, a nail or hair disorder, or another condition, and whether it is a new problem or a followup visit for an ongoing condition.

## PHYSICAL EXAMINATION

### SCOPE OF THE COMPLETE CUTANEOUS EXAMINATION

The complete cutaneous examination includes inspection of the entire skin surface, including often-overlooked areas such as the scalp, eyelids, ears, genitals, buttocks, perineum, and interdigital spaces; the hair; the nails; and the mucous membranes of the eyes, nose, mouth, genitals, and anus. Patients presenting with a highly focused complaint, such as a single wart or acne, may not require a comprehensive skin examination in routine clinical practice. There are many advantages to performing a complete cutaneous examination, including identification of potentially harmful lesions, such as skin cancers, providing reassurance for benign skin findings, locating additional diagnostic clues (Wickham's striae on the buccal mucosa in lichen planus, for instance), opportunities for patient education (eg, lentiginos are a sign of sun damage and suggest the need for improved sun protection), and an opportunity to convey the physician's concern about the patient's skin health through a thorough examination. A thorough evaluation increases the possibility of making a diagnosis at the bedside and mitigates the risk of overlooking another diagnosis. A guide to performing the physical examination of the patient presenting with a skin problem is presented in Table 1-2.

### IDEAL CONDITIONS FOR THE COMPLETE SKIN EXAMINATION

A complete skin examination is most effective when performed under ideal conditions. Excellent lighting, preferably bright, natural light, is paramount; without good lighting, subtle but important details may be missed. The patient should be fully undressed, and gowned with additional draping, if desired.

TABLE 1-1

### History Taking in Dermatologic Diagnosis

#### Chief Complaint and History of the Present Illness

- **Duration:** When the condition was first noted and dates of recurrences or remissions
- **Timing:** Constant, intermittent, worst at night, worst in winter
- **Evolution:** How the condition has changed or progressed over time
- **Location:** Where lesions were first noted, and how they have spread, if applicable
- **Symptoms:** Pruritus, pain, bleeding, nonhealing, change of preexisting skin lesions, associated with fever or other systemic signs
- **Severity:** Ask patient to rate severity of pain or pruritus on a 10-point scale to follow severity over time
- **Ameliorating and Exacerbating Factors:** Sun exposure, heat, cold, trauma, exposures (such as chemicals, medications, cosmetics, perfumes, plants, or metals), relation to menses or pregnancy
- Preceding illness, new medications, new topical products, or exposures
- Therapies tried, including nonprescription or home remedies, and response to therapy
- Prior similar problems, prior diagnosis, results of biopsies or other studies performed

#### Medical History

- A history of all chronic illnesses, particularly those that may manifest in the skin, (diabetes, renal and hepatic disease, infection with HIV or other viruses, polycystic ovarian syndrome, lupus, thyroid disease) and those that are associated with skin disease (asthma, allergies)
- History of surgical procedures, including organ transplantation
- **Immunosuppression:** iatrogenic, infectious, or inherited
- Pregnancies
- Psychiatric disease
- History of blistering sunburns, exposure to arsenic or ionizing radiation
- **Medication History:** A detailed history, including prescriptions, nonprescription medications, vitamins, dietary supplements, herbal remedies, with particular attention to those medications started recently
- **Allergies:** To medications, foods, environmental antigens, and contactants
- **Social History:** Occupation, hobbies and leisure activities, alcohol and tobacco use, illicit drug use, sexual history (including high-risk activities for sexually transmitted diseases), diet, bathing habits, pets, living conditions (eg, alone, with family, homeless, in an institution), history of travel or residence in endemic areas for infectious diseases, cultural or religious practices
- **Family History:** Of skin disease, atopy (atopic dermatitis, asthma, hay fever) or skin cancer
- **Review of Systems:** May be focused or comprehensive depending on the diagnosis (asking about specific symptoms that may accompany a dermatologic condition, such as joint symptoms in psoriasis; asking a comprehensive ROS in the setting of cutaneous signs of systemic disease such as palpable purpura)

Underwear, socks, shoes, makeup, and eyeglasses should be removed. The examining table should be at a comfortable height, with a head that reclines, an extendable footrest, and gynecologic stirrups. The examining room should be at a comfortable temperature for the lightly dressed patient. It should contain a sink for hand washing and disinfecting hand foam, as patients are reassured by seeing their physician wash

**TABLE 1-2**  
**Physical Examination in Dermatologic Diagnosis**

**General Impression of the Patient**

- Well or ill
- Obese, cachectic, or normal weight
- **Skin Color:** Degree of pigmentation, pallor (anemia), jaundice
- **Skin Temperature:** Warm, cool, or clammy
- **Skin Surface Characteristics:** Xerosis (dryness), seborrhea (excessive oil), turgor, hyper- or hypohidrosis (excessive or decreased sweating), and texture
- **Degree of Photoaging:** Lentigines, actinic purpura, rhytides

**Morphology**

- Define the primary lesion
- Describe their color, texture
- Describe any secondary changes
- Describe their shape and configuration
- Describe the Distribution of Lesions: Localized (isolated), grouped, regional, generalized, universal, symmetrical, sun-exposed, flexural, extensor extremities, acral, intertriginous, dermatomal, follicular

**Aspects of General Physical Examination That May Be Helpful**

- Vital signs
- Abdominal examination for hepatosplenomegaly
- Pulses
- Lymph node examination (especially in cases of suspected infection and malignancy)

hands before the examination. If the patient and physician are of opposite genders, having a chaperone in the room may be required.

## RECOMMENDED TOOLS FOR THE COMPLETE SKIN EXAMINATION

Although the physician's eyes and hands are the only essential tools for examination of the skin, the following are often useful and highly recommended:

- A magnifying tool such as a loupe, magnifying glass, and/or dermatoscope.
- A bright focused light such as a flashlight or penlight.
- Glass slides for diascopy and viral direct fluorescent antibody (DFA) testing, fungal scrapings and touch preparations, Tzanck smears, scabies prep.
- Alcohol pads to remove scale or surface oil.
- Gauze pads or tissues with water for removing makeup.
- Gloves: when any contagious condition is suspected, when contact with body fluids is possible, when examining mucous membranes and genital areas, and when performing any procedure.
- A ruler for measuring lesions.
- No. 15 and No. 11 scalpel blades for scraping and incising lesions, respectively.
- Diagnostic solutions: potassium hydroxide solution, oil, Tzanck smear, bacterial, viral, and fungal culture media.
- A camera for photographic documentation.
- A Wood lamp (365 nm) for highlighting subtle pigmentary changes.

## TECHNIQUE OF THE DERMATOLOGIC PHYSICAL EXAMINATION

Consistency in a comprehensive mucocutaneous examination is essential to ensure that no areas are overlooked. One approach to the complete skin examination is presented here. First, observe the patient at a distance for general impressions (eg, asymmetry due to a stroke, cachexia, jaundice). Next, examine the patient in a systematic way, usually from head to toe, uncovering one area at a time to preserve patient modesty. Move the patient and the illumination as needed for the best view of each body area. Sometimes side lighting best reveals depth and details of skin lesion borders. Palpate lesions to determine whether they are soft, firm, tender, or fluid-filled. A magnifier worn on the head leaves both hands free for palpation of lesions. Certain lesions, especially pigmented lesions, are best examined with a dermatoscope to identify characteristic concerning features. Mucosal sites should be carefully examined with additional illumination with a penlight or flashlight. During the examination, patients may be reassured by the physician's reporting of benign lesions as they are encountered.

Special examination techniques for hair and nail disorders are discussed in Chaps. 85 through 91.

After completing the examination, it is important to document the skin findings, including the type of lesions and their locations, either descriptively or on a body map. Specific documentation using photography and triangulation based on anatomic landmarks is particularly important for lesions suspicious for skin malignancy undergoing biopsy, so that the exact location may be found and definitively treated at a later date.

## INTRODUCTION TO MORPHOLOGY

Joseph Jakob von Plenck's (1738–1807) and Robert Willan's (1757–1812) work in defining basic morphologic terminology laid the foundation for the description and comparison of fundamental lesions, thereby facilitating characterization and recognition of skin disease.

The eminent dermatology professors Wolff and Johnson have asserted: to read words, one must recognize letters; to read the skin, one must recognize the basic lesions. The "letters," or elemental building blocks of morphology, are the primary lesion and secondary (epidermal) change. The skilled clinician uses macroscopic characteristics noted on examination to understand where and what types of microscopic pathologic changes are present, achieving clinical–pathologic correlation. For example, flat-topped or planar papules and plaques tend to be processes affecting the epidermis and superficial dermis, while dome-shaped or nodular lesions often exhibit deeper infiltration into

the dermis or subcutis. Scaling or crusting indicates that the epidermis is affected, while a smooth, intact surface on a palpable lesion reflects a purely dermal or subcutaneous process.

The combination of primary morphology and secondary change (or absence of secondary change) determine a diagnostic category, also known as the “reaction pattern.” For example, when the primary lesion is a circumscribed papule or plaque with scale, it likely falls into the “papulosquamous” reaction pattern, which suggests a specific set of diagnostic possibilities. Once the reaction pattern has been determined, a differential diagnosis comes into focus. This differential diagnosis may be further honed by other lesional characteristics, including shape or color, and the arrangement of lesions in relationship to one another (configuration) and on the body (distribution).

It is important for the dermatologist in training to be aware that variation and ambiguity in definitions of morphologic terms exist among the dermatology community. For example, in dermatology textbooks, a papule has been described as no greater than 1 cm in size, no less than 0.5 cm, or ranging from the size of a pinhead to that of a split pea. In this chapter, the authors have selected definitions that reduce the subjectivity inherent in some morphologic frameworks.

## PRIMARY MORPHOLOGY

The primary morphology describes 3 lesional characteristics: size, topography, and the character of contents (Table 1-3). The primary morphology should be the “noun” which all other “adjectives” (such as color, shape, size, texture) describe. A macule or patch is not palpable (a color change only) and raised or depressed lesions that are palpable are papules or plaques. Erosions and ulcerations may be primary or secondary.

TABLE 1-3

### Primary Morphology

PRIMARY LESION	SIZE	TOPOGRAPHY	CONTENTS
Macule	<1 cm	Flat	N/A (color change only)
Patch	≥1 cm	Flat	N/A (color change only)
Papule	<1 cm	Raised/Depressed	Solid
Plaque	≥1 cm	Raised/Depressed	Solid
Nodule	≥1 cm	Raised	Solid or fluid
Vesicle	<1 cm	Raised	Fluid (serum, blood, lymph)
Bulla	≥1 cm	Raised	Fluid (serum, blood, lymph)
Pustule	<1 cm	Raised	Fluid (pus)
Erosion	Any	Depressed	N/A
Ulceration	Any	Depressed	N/A



Figure 1-1 Macule, petechiae.

## FLAT (NONPALPABLE) PRIMARY LESIONS

**Macule:** A macule is flat, even with the surface level of surrounding skin or mucous membranes, and perceptible only as an area of color different from the surrounding skin or mucous membrane. Macules are less than 1 cm in size (Fig. 1-1).

**Patch:** A patch, like a macule, is a flat area of skin or mucous membranes with a different color from its surrounding. Patches are 1 cm or larger in size (Fig. 1-2).

## RAISED (PALPABLE) PRIMARY LESIONS

**Papule:** A papule is an elevated or depressed lesion less than 1 cm in size, which may be solid or cystic. Among other characteristics, papules may be further described by their topography. Some examples include papules that are sessile, pedunculated, dome-shaped, flat-topped, filiform, mammillated, acuminate (conical), or umbilicated (Fig. 1-3).



Figure 1-2 Patch, fixed drug eruption.



Figure 1-3 Papule, lichen nitidus.

**Plaque:** A plaque is a solid plateau-like elevation or depression that has a diameter of 1 cm or larger (Fig. 1-4).

**Nodule:** A nodule is a palpable lesion greater than 1 cm with a domed, spherical or ovoid shape. They may be solid or cystic. Depending on the anatomic component(s) primarily involved, nodules are of 5 main types: (1) epidermal, (2) epidermal–dermal, (3) dermal, (4) dermal–subdermal, and (5) subcutaneous. Texture is an important additional feature of nodules: firm, soft, boggy, fluctuant, etc. Similarly, different surfaces of nodules, such as smooth, keratotic, ulcerated, or fungating, also help direct diagnostic considerations (Fig. 1-5). *Tumor*, also sometimes included under the heading of nodule, may be used to describe a more irregularly shaped mass, benign or malignant.

## FLUID-FILLED PRIMARY LESIONS

**Vesicle and Bulla:** A vesicle is a fluid-filled papule smaller than 1 cm (Fig. 1-6), whereas a bulla (blister) measures 1 cm or larger (Fig. 1-7). By definition, the wall is thin and translucent enough to visualize the contents, which may be clear, serous, or hemorrhagic.



Figure 1-4 Plaque, psoriasis.



Figure 1-5 Nodule, lymphoma cutis.

Vesicles and bullae arise from cleavage at various levels of the epidermis (intraepidermal) or the dermal–epidermal interface (subepidermal), sometimes extending into the dermis. The tensesness or flaccidity of the vesicle or bulla may help determine the depth of the split. However, reliable differentiation requires histopathologic examination of the blister edge.

**Pustule:** A pustule is a circumscribed, raised papule in the epidermis or infundibulum containing visible pus. The purulent exudate, composed of leukocytes with or without cellular debris, may contain organisms or may be sterile. The exudate may be white, yellow, or greenish-yellow in color. Pustules may vary in size and, in certain situations, may coalesce to form “lakes” of pus. When associated with hair follicles, pustules may appear conical and contain a hair in the center (Fig. 1-8).



Figure 1-6 Vesicle, bullous lupus erythematosus. Note brown incipient crusts marking the sites of earlier blisters now ruptured.



Figure 1-7 Vesicles and bullae, linear IgA disease.

## SECONDARY CHANGE (EPIDERMAL OR SURFACE CHANGE)

*Scale* is a macroscopic finding indicating a change in the epidermis, usually the stratum corneum. Scale may have many different descriptive characteristics, for instance, soft, rough, gritty, bran-like, or micaceous (Table 1-4).

*Crust* describes dried fluid on the skin's surface due to serum, blood, pus, or a combination. When crust is round or oval, it points to the former presence of a vesicle, bulla or pustule (as seen in Fig. 1-6). Linear or angulated crusts are indicative of excoriations. Other specialized types of crust include eschar, which is dry, adherent, and dark red-purple, brown, or black in color and signals skin necrosis (Fig. 1-11), or fibrin, which is a soft, yellow crust on the surface of some ulcers.

*Lichenification* is a thickening and accentuation of the skin lines that results from repeated rubbing or scratching of the skin. It is found primarily in chronic eczematous processes or neurogenic processes (Fig. 1-12).

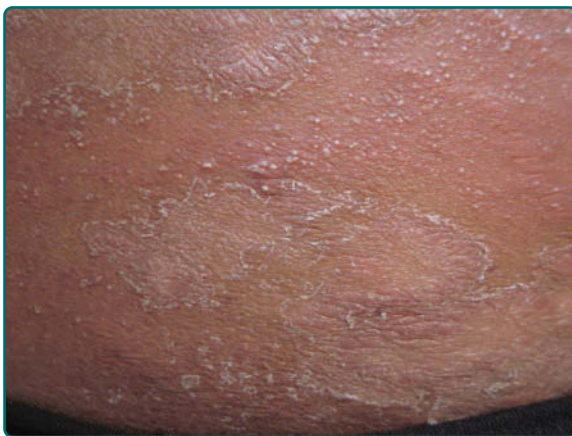


Figure 1-8 Pustule, pustular psoriasis.

TABLE 1-4  
Types of Scale

TYPE OF SCALE	DESCRIPTION
Craquelé/xerotic	Desquamation giving the appearance of dried, cracked skin. Combination of hyperkeratosis and fissuring, which appears like the cracked bed of a dry river.
Cutaneous horn	Conical projection of compact stratum corneum.
Exfoliative/desquamative	Scales split off from the epidermis in finer scales or in sheets.
Follicular	Scales appear as keratotic plugs, spines, or filaments.
Gritty	Densely adherent scale with a sandpaper texture.
Ichthyosiform	Scales are regular, polygonal plates arranged in parallel rows or diamond patterns (fish-like, tessellated, Fig. 1-9).
Keratotic/hyperkeratotic	Scales appear as thick, compact, adherent layers of stratum corneum.
Lamellar	Scales are thin large plates or shields attached in the middle and looser around the edges.
Pityriasiform	Scale is small and branny.
Psoriasiform (micaceous and ostraceous)	Scale is silvery and brittle and forms thin plates in several loose sheets, like mica (micaceous scale). Large scales may accumulate in heaps, giving the appearance of an oyster shell (ostraceous scale, Fig. 1-10).
Seborrheic	Scales are thick, waxy or greasy, yellow-to-brown, flakes.
Shellac-like	Scale is shiny with a sheet-like desquamating edge, like peeling paint
Wickham striae	Scale appears as a lacy white pattern overlying violaceous flat-topped papules.

*Atrophy* of the epidermis results in a shiny quality with “cigarette-paper” wrinkling. Atrophy of the dermis results in a depressed lesion.

A *fissure* is a linear loss of continuity of the skin's surface or mucosa that results from excessive tension



Figure 1-9 Ichthyosiform scale, ichthyosis vulgaris.





Figure 1-10 Ostraceous scale, psoriasis.

or decreased elasticity of the involved tissue. Fissures frequently occur on the palms and soles where the thick stratum corneum is least expandable.

## OTHER LESIONAL CHARACTERISTICS

In addition to primary morphology, other features of lesions can be important in narrowing a differential diagnosis; sometimes, these other characteristics are the most important determinants of the differential. For instance, the most notable feature of a rash or lesion might be its shape or distribution, which points the clinician to a specific list of possible diagnoses.

## COLOR

Perhaps the most important additional feature of a lesion other than primary morphology is color. The experienced dermatologist will notice subtle variations in hue and saturation of a particular color, and can ascribe meaning to these variations. The most



Figure 1-11 Eschar overlying stellate purpura, calciphylaxis.



Figure 1-12 Lichenification, lichen simplex chronicus.

common types of color on the skin are variations in brown (hyperpigmentation) and red (erythema), which will be discussed in depth below. Other colors and their histopathologic correlations are described in Table 1-5.

**Brown:** Brown color is most often representative of melanin, either within melanocytes or outside of melanocytes. Less frequently, a brown hue also may be caused by deposition of other pigments, cells, or materials in the dermis (such as deposition of hemosiderin, amyloid, or mucin; certain types of inflammation, including inflammation that is granulomatous, histiocytic, plasmacytic, or mixed). Mast cells induce melanin production in the overlying epidermis, often leading to brown color overlying the focus of mast cells in the dermis. Melanin in the epidermis, whether contained within or outside of melanocytes, appears tan to muddy brown; when it is very concentrated, as in some nevi or melanomas or heavily pigmented seborrheic keratoses, it may appear brown-black. Melanin in the dermis, either within melanocytes or extracellular, may appear brown, gray, or blue. This gray-blue color results from the “Tyndall effect,” named for the 19th-century physicist John Tyndall, who described the preferential transmission of longer wavelengths (blue photospectrum) when particles are suspended in a medium (in this case, melanin or other brown pigment suspended in the dermis). Differentiation between epidermal and dermal melanin also can be aided by a Wood lamp, which accentuates epidermal but not dermal melanin.

Oxidized keratin, (within an infundibular cyst, for instance) and foreign pigmentation (such as tattoos) can also exhibit the Tyndall effect when located in the dermis.

When the epidermis is inflamed or damaged, melanin often drops to into the dermis. Therefore, many subacute, chronic, or recently resolved epidermal inflammatory diseases or injuries have a brown or gray-brown tone. The more constitutive pigment in an individual’s skin, the more prominent these changes will be.

**Red:** Also known as “erythema,” red can have infinite hues. Pale red, pink, or purple may result from

**TABLE 1-5**  
**Implications of Color Changes in Altered Skin**

COLOR	PATHOLOGY	DIAGNOSTIC EXAMPLES
White	Reduced or absent melanin synthesis	Tinea versicolor, vitiligo
	Keratin	Milium
	Calcium deposit	Calcinosis cutis
	Scar	Atrophie blanche
Black	Dense melanin	Melanoma
	Intraepidermal hemorrhage	Talon noir
	Necrosis	Cutaneous anthrax
	Oxidized keratin (brown to black)	Open comedone
Brown	Melanin	Melanocytic nevus, melasma
Red-brown	Hemosiderin ("cayenne pepper")	Pigmented purpuric dermatosis
	Granulomatous inflammation ("apple jelly")	Sarcoidosis (Fig. 1-15)
	Histiocytic inflammation	Langerhans cell histiocytosis
	Mixed inflammation	Granuloma faciale
	Plasmacytic inflammation ("copper"- or "ham"-colored)	Secondary syphilis
	Mast cell inflammation	Urticaria pigmentosa
	Mucin deposition	Pretibial myxedema
	Amyloid deposition	Lichen amyloidosis
	Infiltration with smooth muscle	Cutaneous leiomyoma
Subacute or chronic epidermal inflammation	Subacute lupus erythematosus	
Red	Vascular dilation or congestion	Erysipelas
	Neutrophilic inflammation	Sweet syndrome
	Vascular neoplasm	Cherry angioma
Pink or salmon	Acute inflammation with dilation of superficial dermal vessels	Eczema, drug eruptions, urticaria, pityriasis rubra pilaris, psoriasis
Orange	Granulomatous inflammation with histiocytes having abundant cytoplasm	Juvenile xanthogranuloma
Yellow	Pus	Folliculitis
	Lipid	Xanthelasma
	Histiocytic inflammation	Necrobiosis lipoidica (Fig. 1-16)
	Elastolysis	Pseudoxanthoma elasticum
	Sebaceous glands	Sebaceous hyperplasia
	Bilirubin	Jaundice
Green	Deep hemosiderin	Ecchymosis
	Pyocyanin pigment	Pseudomonas infection
	Myeloperoxidase	Chloroma
	Tissue eosinophilia	Wells syndrome
Blue/gray	Deep dermal melanin	Blue nevus
	Deep deposition of other pigment	Argyria, tattoo
Violet to lilac	Acute lymphocytic inflammation with dilation of deep dermal blood vessels	Borders of evolving morphea, dermatomyositis, lichen planus
Plum	Vascular neoplasm	Kaposi sarcoma
	Dense lymphocytic inflammation	Lymphoma cutis
	Malignant neoplasm	Nodular amelanotic melanoma
	Hemorrhage	Ecchymosis

inflammation leading to hyperemia (subtle vascular dilation). More saturated red to purple can indicate intense hyperemia or vascular congestion (also called rubor, as seen in erysipelas); even more saturated red

to purple hue can result from the either malformed or ectopic blood vessels (Fig. 1-13) or extravasated erythrocytes (petechiae or purpura, see "vascular reaction pattern" below). Variations in the hue of erythema are vast



Figure 1-13 Purple papules, Kaposi sarcoma.

and provide subtle clues to the type of inflammation present. True red is often associated with neutrophilic inflammation (as seen in cellulitis or Sweet syndrome); red-purple (violaceous erythema, Fig. 1-14) with lymphocytic inflammation (lymphoma cutis, connective tissue disease, interface reactions such as lichen planus). Granulomatous inflammation may appear red-brown (sarcoidosis, marked by the classis “apple jelly” color seen in Fig. 1-15, or a juvenile xanthogranuloma) to orange or yellow (Fig. 1-16, necrobiosis lipoidica).

One major caveat is that the true hue of erythema is easiest to visualize in acute conditions affecting fair skin. Sub-acute or chronic conditions, particularly with epidermal involvement, will have epidermal alteration causing epidermal pigment drop-out into the dermis, making lesions appear more brown or gray. Hemorrhage can also alter the hue, making lesions appear more purple.

## SHAPE AND CONFIGURATION OF LESIONS

“Shape” describes an individual macule, patch, papule, or plaque; “configuration” refers to shapes made from the arrangement of individual primary lesions in



Figure 1-14 Violaceous Gottron papules, dermatomyositis.



Figure 1-15 Apple-jelly sign, sarcoidosis.

relation to one another. For example, *annular* or *linear* may be the shape of a single plaque, or a configuration of discrete papules. *Demarcation* refers to the edge of an individual lesion and whether it is sharply defined from or blends into the surrounding skin.

**Annular:** Ring-shaped; implies that the edge of the lesion has a color and/or texture change that is more prominent on the leading edge than the center (as seen in granuloma annulare, tinea corporis, erythema annulare centrifugum) (Fig. 1-17).

**Round/Nummular/Discoïd:** Coin-shaped; solid circle or oval; usually with uniform morphology



Figure 1-16 Yellow, necrobiosis lipoidica diabeticorum.