Adventures in molecular dermatology!
A dermatologist uses space-age x-ray crystallography to determine atomic resolution structures of skin proteins

By Christopher G. Bunick, MD, PhD

Little did I know that, as a kid, those seemingly routine dinnertime conversations in my household would be the start of my physician-scientist career. On one side of the table was my mother, an endocrinologist, and on the other, my father, a structural biologist at Oak Ridge National Laboratory. As you might imagine, the conversations were an odd mix between medicine and basic science research.

Around the time of my junior high school science fair project, my father was working with a NASA program sending x-ray crystallography experiments into space in order to take advantage of the microgravity crystal-growing environment aboard the MIR and international space stations. Naturally, my first foray into structural biology was a science fair project investigating ways to mimic the microgravity environment on earth in order to grow better quality crystals.

Approximately 20 years later, I am using x-ray crystallography to determine 3D structures of proteins relevant to skin function and disease. This research focus on skin developed while I was a resident in the Yale University Department of Dermatology, which encouraged me to join the crystallography laboratory of a Nobel Laureate. This ripe structural biology environment along with support from the Dermatology Foundation has fostered my early career investigations at Yale.

Defining crystallography
Crystallography is a discipline in which a molecule of interest, usually either a small molecule (e.g., a ligand or drug) or macromolecule (e.g., protein, RNA, DNA), is precipitated in a controlled manner from a soluble state in solution to a solid state in the form of a crystal. The crystal represents a highly ordered, repetitive array of the same molecule; this repetition and order enables diffraction of x-rays (or neutrons) to generate diffraction patterns. The specific reflections (diffraction spots) making up a diffraction pattern encode the critical information needed to ultimately determine the high resolution structures of molecules, such as proteins found in the epidermis or dermis.

Benefits of having an atomic resolution structure
The following are four ways in which a new crystal structure of a protein may be used:

Let your capillus down at the Residents’ Reception!

This year’s Residents’ Reception, sponsored by Medicis and Amgen, will be on Friday, March 21, during the 72nd Annual Meeting. The event will be at the Hyatt Regency, Centennial ABC, from 5 to 6:30 p.m.

As residents, you should need no incentive to attend — this premier event is created for you to celebrate and share with your colleagues, peers, and friends. But here are a few more reasons to attend:

• Opportunity to network and socialize with other residents and fellows from across the country.
• Learn how to get involved with Academy programs.
• And, of course, complimentary food and beverage!

We will also have an AAD photographer snapping pictures, so … it must be an important, not-to-be-missed event! See you in Centennial ABC at the Hyatt! R
Transforming the language of life into vital medicines

At Amgen, we believe that the answers to medicine’s most pressing questions are written in the language of our DNA. As pioneers in biotechnology, we use our deep understanding of that language to create vital medicines that address the unmet needs of patients fighting serious illness – to dramatically improve their lives.

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CRYSTALLOGRAPHY from p. 1

Correlates structure with function. At the basic science level, a crystal structure helps understand how and why a protein functions the way it does. It offers a 3D view of the real-space arrangement of amino acid residues; residues far apart in primary sequence may be adjacent in 3D space due to the overall fold of the protein. A crystal structure also displays the molecular surface of a molecule, which may contain unique features, such as highly charged or highly hydrophobic patches, or a deep binding pocket, all of which can dictate interactions with ligands. Thus, a structure complements and enhances our biochemical understanding of how macromolecules work.

Enables analysis of specific mutants. There are two common ways in which mutational studies can be approached. First, viewing of a 3D structure (or having biochemical data) generates hypotheses about the specific biochemical roles of certain residues; these residues can be mutated and studied biochemically and/or structurally to investigate the role of a specific residue in the overall function of the protein. Second, if mutations have been previously characterized directly from patients with a skin disease, a 3D structure of native protein and mutated protein can offer detailed molecular explanations of that skin disease.

Provides template for structure-based drug design. Proteins that function within biologically important signaling pathways and have known 3D structures often contain unique binding pockets that can be harnessed for the development of new drugs.

Facilitates structures of higher order macromolecular complexes. Many molecules function in the setting of “molecular machines,” meaning they exist and function in vivo in complex with other macromolecules. In dermatology, a prime example is the complex interaction between proteins and lipids forming the cornified cell envelope. The crystal structure of one component of a biological complex serves as a springboard to determining structures containing multiple components simultaneously.

Vision of molecular dermatology
I envision the concept of “molecular dermatology,” where dermatologic conditions and/or diseases can be explained not only by genotype or phenotype, but by the molecular characteristics of the proteins central to any specific disease. In essence, can the field of dermatology strive to understand the genotype — “structural genotype” — phenotype correlations for all of its diseases? In order to accomplish this, dermatology needs more research efforts on structure determination.

Develop your own crystallography project
For dermatologic researchers desiring a structural biology component to their research, here are some basic tips to get started:

- Examine the Protein Data Bank (PDB) at www.rcsb.org/pdb to see if the macromolecule of interest has already been characterized structurally. If not, great! If yes, then ask whether or not mutational analysis or complexes with binding partners offers a desirable research goal.

- Perform secondary structure prediction (SSP) and multiple sequence alignment (MSA). SSP provides valuable information as to which regions of the target protein are likely to be structured (alpha-helix or beta-sheets, not random coil), and MSA of homologues can provide clues as to conserved (usually well-structured) domains within a protein. The website www.expasy.org offers important bioinformatics tools.

- Consider crystallization of the “structural domain.” Use the results from tip no. 2 to decide whether flexible N- or C-termini should be removed in your construct, or whether to focus crystallization on a well-ordered structural domain that exists within the context of a larger macromolecule (e.g., crystallizing the well-structured, extra-cellular domain of a large transmembrane protein).

- Use purification tags to aide in protein isolation. One of the most commonly used purification tags in crystallography is the His-tag, containing 6 histidine residues at one terminus of a construct. Milligram quantities of a highly purified protein, usually produced by recombinant bacterial expression, are usually needed to perform sparse matrix screening of crystallization conditions.

The crystal structure of the N-terminus of human profilaggrin
For the last two years I have been performing crystallization studies of epidermal proteins in the laboratory. One of the compelling aspects of this study has been my success in determining the x-ray crystal structure of the calcium-binding domain of profilaggrin. The structure offers molecular insights into dimerization and target-binding of this domain of profilaggrin. As I look ahead, I hope this knowledge may translate into new therapeutic approaches for atopic dermatitis and ichthyosis vulgaris and serve as an inroad for fulfilling a vision of “molecular dermatology.”

Christopher G. Bunick, MD, PhD, is an instructor at Yale Dermatology, where he also completed his residency. His studies are currently being conducted in the laboratory of Thomas Steitz, PhD, winner of the 2009 Nobel Prize in Chemistry.
# Panniculitis

Roman Bronfenbrenner, MD

## Septal Predominant

<table>
<thead>
<tr>
<th>Panniculitis</th>
<th>Location</th>
<th>Clinical</th>
<th>Other findings</th>
<th>Pathology</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Erythema Nodosum (EN)</td>
<td>Usually symmetrically in pretibial area, but may be more disseminated with involvement of thighs, forearms, upper arms</td>
<td>Acute eruption of painful, erythematous, subcutaneous nodules</td>
<td>Bruse-like in final stages of evolution</td>
<td>Predominantly septal inflammation</td>
<td>Bedrest NSAIDs Discontinue offending medication</td>
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<tr>
<td></td>
<td></td>
<td>Heal without residual scarring</td>
<td></td>
<td>No vasculitis present</td>
<td>Treatment of underlying condition results in EN improvement</td>
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<td></td>
<td>Characteristic Miescher’s microgranulomas</td>
<td>Portends a good prognosis in sarcoidosis in association with hilar lymphadenopathy, ulcers, fever, and arthralgias (Légeren’s syndrome)</td>
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<td></td>
<td>Macrophages aggregated around empty clefts or polymorphonuclear cells</td>
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</table>

## Lobular Predominant

<table>
<thead>
<tr>
<th>Panniculitis</th>
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<th>Other findings</th>
<th>Pathology</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Erythema induratum (nodular vasculitis)</td>
<td>Classically posterior lower legs Also feel, bright, bulging and arms</td>
<td>Female predominate</td>
<td>TB - associated in some cases (tuberculid) Also rocania and certain medications (propylthiouracil) have been linked</td>
<td>Lobular or mixed panniculitis</td>
<td>PPD or interferon Gamma Release assay Treatment of underlying infection if indicated Discontinuation of any offending medications NSAIDs, steroids, SSKI Bedrest, compression stockings, smoking avoidance</td>
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<tr>
<td></td>
<td></td>
<td>Tender, erythematous nodules and ulcerative plaques</td>
<td></td>
<td>Vasculitis of medium sized vessels concurrrently with mixed infiltrate of lymphocytes, neutrophils, and granulomatous inflammation in lobules.</td>
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<td>Fat necrosis with saponification leading to basophilic calcium deposition</td>
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<td></td>
<td></td>
<td>Ghost cells - necrosed lipocytes with thickened walls</td>
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<td></td>
<td></td>
<td></td>
<td>Mixed infiltrate of cells, occasional multinucleated giant cells</td>
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<td>Resolves with fibrosis and fat atrophy</td>
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</table>

##Pancreatic panniculitis

Most commonly, but may be diffuse. Face generally spared

- In patients with acute or chronic pancreatitis, pancreatic carcinoma, or congenital pancreatic duct abnormalities
- Tender, erythematous subcutaneous nodules that may become confluent and exude oily liquid

- May develop in up to 2% of patients with pancreatic disease. Can develop before clinical signs of pancreatic disease.
- Schmid’s triad: Subcutaneous nodules, arthritis, eosinophilia. Associated with poor prognosis
- Heal with hyperpigmented and depressed scars

- Treatment of underlying pancreatic pathology leads to eventual resolution of panniculitis

##Lupus panniculitis

Face, proximal limbs, trunk arising in crops, tends to spare distal extremities

- Associated with overlying cutaneous lupus lesions ranging from mild erythema to discoid lesions

- Associated with chronic cutaneous lupus. Only about 10% have diagnostic criteria for systemic lupus erythematosus

- Lobular inflammation with occasional granulomas, mucin deposition, lymphocytic vasculitis

- Overlying chronic cutaneous lupus may be treated with topical or intralesional therapy

# Directions

New York.

SUNY Stony Brook in MD, is a PGY-2 at 2/11/2014 2:54:02 PM
## Panniculitis

**Roman Bronfenbrener, MD**

### Lobular Predominant (cont.)

<table>
<thead>
<tr>
<th>Panniculitis</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Dermatomyositis panniculitis</td>
<td>Trunk and extremities</td>
<td>Sometimes seen with established disease, but rarely the initial manifestation</td>
<td>Some studies have associated DM panniculitis with favorable prognosis</td>
<td>Lymphocytic and plasmacytic lobular or mixed lobulo/plexiform inflammation</td>
<td>Treat underling dermatomyositis with immunosuppressive therapy; Occasional response to plaquloid</td>
</tr>
<tr>
<td>Traumatic panniculitis</td>
<td>Cold Panniculitis - small children on cheeks and chin; Sclerosing lipogranuloma - male genitalia; Traumatic panniculitis - sites of blunt trauma or injected material</td>
<td>Cold panniculitis - children with history of popsicle ingestion; Sclerosing lipogranuloma - injection of mineral oil, paraffin, or other substances into male genitalia; Traumatic - reports due to injection of Vitamin K, filler materials, as well as fatty substances (milk, feces)</td>
<td>Patient's history is key to diagnosis; however, many patients with psychiatric illness will deny injection of substance</td>
<td>Cold panniculitis - mixed in adults and lobular inflammation, granulomas, mucin, and adipocyte necrosis; Sclerosing lipogranuloma - “Swiss cheese” appearance of vacuoles (injected foreign substance) within subcutaneous fat Injection panniculitis - Localized inflammation with polarizable foreign body, granulomatous reaction, surrounded by mixed infiltrate</td>
<td>Removal of inciting factors; Intralesional steroids; Surgical excision if localized process with foreign body present</td>
</tr>
</tbody>
</table>

### Lipodermatosclerosis

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Medial lower extremities</td>
<td>Acute phase - tender, erythematous nodules and plaques; “pseudo cellulitis” appearance</td>
<td>Chronic venous stasis changes with increased capillary permeability and resultant anoxia leads to sclerosing panniculitis</td>
<td>Early - lobular necrosis and lymphocytic septal infiltrate with congested capillaries and hemosiderin deposits; Chronic - “lipomembranous changes” with thickening of adipocyte membranes</td>
<td>Leg elevation; Compression support stockings; Intralesional kenalog; Oral androgen therapy; Pentoxifylline; other therapeutic alternatives</td>
</tr>
</tbody>
</table>

### Infection-induced panniculitis

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>May be at sites of direct inoculation, or as disseminated lesions in septic patients</td>
<td>Subcutaneous fat involvement by infectious processes; Frequently immunosuppressed patients</td>
<td>Causative agents include bacterial, mycobacterial, fungal, and parasitic organisms; Pathogen directly present within subcutis</td>
<td>Traumatic panniculitis may be associated with concurrent infectious panniculitis</td>
<td>Appropriate antimicrobial therapy; Surgery for more vegetative processes (i.e Botryomycosis)</td>
</tr>
</tbody>
</table>

### Lobular with Crystal Formation

<table>
<thead>
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<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sclerema neonatorum</td>
<td>Widely spread with volar and genital sparing</td>
<td>Diffusely hardened skin at premature infants occurring within first week after birth</td>
<td>Death frequently from sepsis, heart failure, or respiratory failure</td>
<td>Increased saturated fat content in lipocytes precipitates to crystalization</td>
<td>Treatment of underlying prematurity-related medical conditions; Even with treatment, 75% of infants succumb to death; Sclerema neonatorum is a sign of underlying illness, not the cause of demise</td>
</tr>
<tr>
<td>Subcutaneous fat necrosis of the newborn</td>
<td>Cheeks, trunk, thighs</td>
<td>Localized and circumscribed subcutaneous nodules with induration, but generally freely mobile</td>
<td>Hypercalcemia; thrombocytopenia; hypertriglyceridemia</td>
<td>Needle-shaped clefs in adipocytes with minimal surrounding inflammation</td>
<td>Treatment of underlying process - no treatment necessary; Follow calcium for associated hypercalcemia (increased 1α hydroxylase by macrophages in subcutaneous fat)</td>
</tr>
<tr>
<td>Post-Steroid Panniculitis</td>
<td>Cheeks, upper extremities, trunk</td>
<td>Toddlers to adolescents previously treated with systemic glucocorticoids (1-3 weeks prior to presentation)</td>
<td>History of rapid steroid withdrawal in children with high cumulative doses</td>
<td>Lobular involvement with needle-shaped clefs, multinucleated giant cells, lymphocytes, and macrophages with occasional giant cells</td>
<td>Self-limiting process - no treatment necessary; Restarting steroids and initiating slow taper may help</td>
</tr>
</tbody>
</table>

**References**

Race for the Case
By Aaron M. Secrest, MD, PhD

A 49-year-old Caucasian male admitted for an ischemic stroke who presents with a 3-year history of petechiae, purpura, and ecchymoses at sites of pressure or minor trauma. On exam, he is noted to have ecchymoses on both eyelids. He has a history of multiple myeloma status post autologous stem cell transplant. The easy bruising started about 1 year prior to the diagnosis of multiple myeloma and is mostly on the face and forearms, usually resulting from straining, lifting objects, coughs, stress, or pressure on the skin. He also reports having several small waxy papules on his dorsal hands and face in the past. He denies fevers, chills, or weight loss, but endorses increased fatigue over the past 6 months. He denies any dyspnea, paresthesias or syncopal episodes. He reports that at times his tongue has felt large and swollen, but is not so currently. Examination of his tongue shows dental impressions along the lateral edges, but no overt macroglossia.

1) What is the name of this sign?
2) What is the name of this disease?
3) Name three special stains that can be used to detect the defect in the skin.
4) If skin findings are not present, name two other preferred biopsy sites.
5) What is the preferred treatment for younger patients (age < 50 years)?

Respond today with the correct diagnosis to Allison Evans, staff editor, at aevans@aad.org, and you will be part of our drawing to win a Starbucks gift card and have your photo in Directions!

Answers to Winter 2013 Race for the Case

A 40-year-old female presents with progressive, woody sclerosis of the skin and reduced range of motion of mouth and fingers. On exam she had multiple waxy, 2–4 mm, dome-shaped papules on face, ears, dorsal hands, and extensor forearms.

1. What is the diagnosis?
   Scleromyxedema (generalized lichen myxedematosus)

2. What is the most common systemic organ involvement?
   GI involvement causing dysphagia

3. What would a skin biopsy show?
   Proliferation of fibroblasts, mucin deposition, and many thick collagen fibers

4. What is the characteristic hematologic finding on serum protein electrophoresis? IgG-κ gammopathy

The race you can run without moving

With the growing number of Directions in Residency readers in print and online, a Race for the Case feature is a great way to showcase you and your smarts in an AAD publication. And for this race, you can stay in your chair. You just need to email a clinical photo (that you have permission to use), a few short questions and answers to create a quiz, and a photo of yourself.

Our easy guidelines are designed for busy residents (are there any other kind?) who wish to gain a publication credit (and impress your colleagues, family, and future employers). Submit your Race for the Case query to Allison Evans, staff editor, at aevans@aad.org.

You can see examples and test yourself on past Race for the Case photo quizzes by visiting the Directions in Residency archives at www.aad.org./DIRarchives.
Watch residents battle it out Jeopardy-style!

**When:** Friday, March 21, 9 a.m. – 12 p.m.

**Where:** Four Seasons Ballroom 4, Colorado Convention Center

It’s back — Resident Jeopardy, the only symposium that takes places in a game show format! Eight teams of residents will compete in trivia challenges that test their dermatologic knowledge. The battle is fierce, and the prize is highly coveted. Last year, Georgia Health Sciences University walked away with the trophy. This year, it’s anyone’s game!

And now (cue the dramatic music), here are your 2014 Teams:

- Ohio State University: Ben Kaffenberger, MD, and Katya Hartmann, MD
- University of Connecticut: Logan D’Souza, MD, and Mona Shahriari, MD
- Harbor-UCLA: Aman Samrao, MD
- University of Massachusetts: Vincent Criscione, MD and Erik Domingues, MD
- Walter Reed National Military Medical Center: Nicholas Logemann, MD, and Jonathan Smith, MD
- University of Chicago: Sonya Kenkare, MD, and Adaobi Nwaneshiudu, MD
- Medical College of Georgia-Georgia Regents University: Mary “Holly” Grover, MD, and Lyndsay Shipp, MD

Resident Jeopardy is “the not-to-miss event at the Annual Meeting for residents,” said April Armstrong, MD, the session director. “Come for this fun-filled, high-yield, fast-paced symposium, and see how your dermatology knowledge stacks up against others. Come for the excitement, learning, and fun!”

**Boards and Beyond is back!**

**When:** Sunday, March 22, 8-10 a.m.

**Where:** Room 301/302, Colorado Convention Center

**Boards and Beyond** (F091) is returning to the AAD Annual Meeting in Denver on March 23. The session will provide information about the structure, format, and process for taking the American Board of Dermatology examination from the perspective of ABD administrators as well as dermatologists who recently took the exam.

Co-directed by Gopal Patel, MD, and Jeannette Jakus, MD, MBA, the session also features invited speakers on specific topics who will share challenges they faced when starting their careers. Featured topics and speakers include:

- “Dermatology Advocacy Advice” (Bruce A. Brod, MD)
- “What is MOC?” (Robert S. Kirsner, MD, PhD)
- “The Board Exam – A Breakdown” (Thomas D. Horn, MD)
- “Dermatology Career Paths” (Michael P. Heffernan, MD)
- “Top Tips for Studying for the Boards from Recent Test Takers” (panel discussion)

“Trophies and bragging rights for the next year! “This is the not-to-miss event at the Annual Meeting for residents,” said April Armstrong, MD, the session director. “Come for this fun-filled, high-yield, fast-paced symposium, and see how your dermatology knowledge stacks up against others. Come for the excitement, learning, and fun!”

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**Expand job opportunities at AAD’s new Career Networking Event**

**When:** Sunday, March 22, 8-10 a.m.

**Where:** Hyatt Regency, Capitol Ballroom 1–3

In response to a recent resident survey, HealthCareers is hosting a new Career Networking Event, offered during the Academy’s 72nd Annual Meeting in Denver, Colo. For this event, AADCareerCompass.org has partnered with HEALTheCAREERS to provide an informal networking opportunity for residents and young physicians. The Career Networking Event will replace what used to be the Career Development Fair held on Friday night of Annual Meeting. This new event — at a more convenient time — will offer attendees the chance to meet and network with approximately 30 different exhibitors as well as receive access to an abundance of career planning resources.

And if that’s not enticing enough, a complimentary breakfast will be provided! To reserve a space and receive more detailed information about the Career Networking Event, visit [bit.ly/aad2014](http://bit.ly/aad2014).
Greetings from Louisville! It is hard to believe that the Academy’s 72nd Annual Meeting is fast approaching. I’d like to provide some direction for residents who have never attended Annual Meeting or those that are simply looking for high-yield sessions. In reflecting back on my first Academy meeting, I recall the inherent challenges of digesting the event calendar. The panoply of courses, sessions, and forums, makes the meeting a beneficial educational program (and a great excuse to socialize!) for all residents learning dermatology.

In order to help you better navigate your session schedule, you will be able to download the Annual Meeting app onto your smartphone and see all session listings, including those shown below. We also plan to use the Academy’s Meeting News Twitter feed to get more information to you during the meeting. Follow us on Twitter at www.twitter.com/aadmtgs to get all the latest meeting info first.

I hope to present a well-unified group of residents at the 72nd Annual Meeting or, at the very least, an impressively great party train that will attend the Residents’ Reception, Friday, March 21, 5 – 6:30 p.m. at the Hyatt Regency, Centennial ABC. Please come — there will be good food and good company! Let’s show the other receptions what residents are made of.

See you all in the Rockies … or more like, at the foot of the Rockies!

Brian R. Hinds, MD

Directions in Residency

Friday, March 21
7:15 a.m. – 8:45 a.m. Focus Session U005: Cost Conscious Dermatology
9:00 a.m. – 12:00 p.m. Symposium S004: Resident Jeopardy (see page 7)
1:00 p.m. – 3:00 p.m. Forum F022: What Your Fellow Physicians Think of You and Why It Matters
3:30 p.m. – 5:30 p.m. Discussion D002: Challenging Pediatric Dermatology Cases

Saturday, March 22
7:15 a.m. – 8:45 a.m. Focus Session U028: Dermatopathology Board Review
10:00 a.m. – 12:00 p.m. Symposium S017: Skin Signs of Internal Disease: Case-Based Challenges
1:00 p.m. – 3:00 p.m. Forum F062: Cutaneous Lymphoma CPC: A Practical Approach
3:30 p.m. – 5:30 p.m. Forum F066: Practical Management of Atypical Melanocytic Lesions

Sunday, March 23
7:00 a.m. – 8:00 a.m. Focus Session U042: Approach to Sclerosing Conditions
8:00 a.m. – 12:00 p.m. Plenary Session
11:00 a.m. – 2:00 p.m. Symposium S028: Resident Fellows Symposium

1:00 p.m. – 3:00 p.m. Forum F091: Boards and Beyond (see page 7)
3:30 p.m. – 5:30 p.m. Forum F093: Young Physician Pearls and Pitfalls: A Survival Guide for the First 10 Years

Monday, March 24
9:00 a.m. – 5:00 p.m. Course C022: Advanced Self-Assessment of Dermatopathology

Tuesday, March 25
7:15 a.m. – 8:45 a.m. Focus Session U049: Update of Hair Growth Disorders
9:00 a.m. – 12:00 p.m. Symposium S037: Boards Blitz
1:00 p.m. – 3:00 p.m. Forum F121. From Dysesthesias to Dysmorphia
3:30 p.m. – 5:30 p.m. Forum F139. Leading Your Team by Coaching and Mentoring

Spring 2014
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Kathryn Beleznay, MD 2015
Brett Blake, MD 2014
Jeannette R. Jakus, MD 2014
Anna Y. Kirkorian, MD 2014
Jenna L. O’Neill, MD 2015
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Sara Samimi, MD, physician reviewer 2014
Veena Vanchinathan, MD 2014
Lindsay H. Wilson, MD, physician reviewer 2014
Jeremy Brauer, MD 2014
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Immediate past chair
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