What follows are the abstracts presented at the Joint Meeting of the International Confocal Group (ICG), the International Dermoscopy Society (IDS), and the International Society for Digital Imaging of the Skin (ISDIS). The meeting was held on March 5, 2016, in Washington, DC, USA, in conjunction with the annual meeting of the American Academy of Dermatology (Figure 1). The abstracts appear in the order in which they were presented.

**Low-cost smartphone confocal microscope**

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Spectrally encoded confocal microscopy (SECM) is a high-speed reflectance confocal microscopy technology. SECM utilizes a stationary optical element, a diffraction grating, and a broadband light source to illuminate a line on the tissue with multiple spectrally-encoded spots, which enables scan-less line confocal imaging. In order to conduct two-dimensional confocal imaging, however, SECM still needs to use a beam scanning device or needs to mechanically translate the device. When a slit aperture is used, SECM can image a rectangular area of the tissue with multiple spectrally-encoded lines, which enables two-dimensional confocal imaging without using any beam scanning devices. Resulting confocal images are directly projected on a two-dimensional imaging sensor. This new approach, slit-SECM, can uniquely enable development of a smartphone confocal microscope, in which an optics module is attached to a smartphone to conduct confocal imaging and the smartphone imaging sensor is used to acquire two-dimensional confocal images. Due to its low cost, portability, and inherent network connectivity, smartphone confocal microscopy has a potential to provide an in vivo diagnostic tool in resource-poor countries and also to increase clinical adaptation of confocal imaging in developed countries. We present preliminary results of imaging human skin in vivo with slit-SECM. We developed a slit-SECM bench system with an inexpensive, battery-powered LED ($25) and a low-cost color CMOS sensor ($355). The bench system achieved lateral resolution of 1.3 µm and axial resolution of 6 µm. Confocal images of human skin were acquired at the speed of 10 frames/sec. Acquired confocal images clearly visualized characteristic cellular features of human skin down to the dermal-epidermal junction, including cell nuclei in spinous layer and dermal papilla. Results from this preliminary study show feasibility of conducting skin confocal imaging using inexpensive optical and electrical components and suggest that slit-SECM may be developed into a low-cost smartphone confocal microscope.

**Melanocytic hyperplasia – so what?**

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not be retrieved. There was a significant female predominance (25 cases) and mainly located on upper face (front, peri-oricular and scalp) and lower face (cheeks, peri-oral and chin). The most frequent dermoscopic feature was asymmetric hyperpigmented follicular opening and on RCM most cases showed <5 atypical cells in 3 fields and mild cellular pleomorphism. We discuss correlation with pathology and outcomes.

New developments in RCM of skin: imaging-guided ablation, computational modeling of DEJ morphologic patterns, integration with widefield imaging

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Reflectance confocal microscopy (RCM) has advanced from merely a research tool for diagnosis of skin cancer to being used in the clinic to guide patient care. Here we present three technology solutions that will further impact clinical advances:

An RCM imaging guided-laser ablation approach has been developed for treatment of basal cell carcinomas (BCCs). Initial testing in 48 lesions using an Er:YAG or an CO2 lasers shows feasibility on patients. Twenty of the lesions, assessed with post-ablation histopathology, show 85% agreement with RCM imaging for detection of residual or clearance of BCCs. Tumor clearance of the remaining 28 lesions has been confirmed with imaging and these are currently being followed-up with additional imaging.

An image analysis based automated tool for quantitative analysis of RCM mosaics of melanocytic lesions collected is being developed. The method can distinguish patterns, at dermal-epidermal junction level, of benign (ring, meshwork, clot) from non-specific (potentially malignant) and background non-lesional skin using their textural appearance. Preliminary analysis on 20 RCM mosaics shows classification with 80-67% sensitivity and 99-78% specificity in distinguishing these patterns.

An innovative solution has been developed, that integrates a miniature color camera into the objective lens of our microscope, providing simultaneous widefield dermoscopy images of the skin surface and RCM images of the subsurface cellular structure. Initial in vivo testing on 15 volunteers shows feasibility of the approach.

Advances in dermoscopy-guided microbiopsy for biomarker analysis

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The refining of clinico-pathologic correlation using dermoscopy by Scope et al in the area of dermatology has led to “a plea for a combined diagnostic approach of histopathologic and dermoscopic evaluation of melanocytic lesions”. Integration between dermoscopy and histology was only effective in a limited number of scientific works despite its promising premise. We propose that a sub-millimetre skin biopsy device known as the Microbiopsy for minimally invasive and suture-free skin sampling for molecular diagnosis be used for this purpose. To this end we are integrating microbiopsy based sampling into dermoscopy to enable dermoscopy guided microbiopsy for molecular diagnosis. We discuss our recent advances in microbiopsy technology and the future of dermoscopy-guided microbiopsy.

Principles of inflammatory dermoscopy

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Although traditionally used for evaluation of skin tumors, dermoscopy continuously gains appreciation in other fields of dermatology. The dermoscopic patterns of several inflammatory and infectious skin diseases have already been described, and the technique has been shown to improve clinical performance in terms of differential diagnosis in the daily practice. The increasing use of dermoscopy in general dermatology was significantly enhanced by the development of the new generation hand-held dermatoscopes, which can be easily placed in every dermatologist’s pocket and do not require use of immersion fluid. Four main categories of dermoscopic criteria should be considered when applying the technique in inflammatory diseases: 1) vascular features, including purpuric structures (morphology distribution); 2) color variegations; 3) follicular abnormalities and 4) specific features. Nowadays, the dermatoscope should not be regarded a second-level diagnostic equipment, but an irreplaceable diagnostic tool in every-day clinical setting, similarly to the stethoscope in general medicine. We provide an up-to-date summary of data on dermoscopy in general dermatology, attempting to assist clinicians to profitably utilize and apply the available knowledge in the everyday practice.

Management of surgical margins of basal cell carcinoma using High Frequency Ultrasound

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Introduction & Objectives: High Frequency Ultrasound (HFUS) is a non-invasive technique that allows visualizing skin tumors in vivo to obtain size, shape and tumor volume. In this study, we sought to measure the correlation between ex vivo HFUS and histopathology surgical margins of basal cell carcinoma.

Material & Methods: This was a prospective, single-blinded study. All patients had been sent for tumor excision. HFUS
was performed with a 22 MHz Ultrasound (Taberna Pro-
Medicum, Lüneburg, Germany®) before and immediately af-
ter excision to determine length and depth. Tumor measure-
ments and surgical margins (SM) were evaluated. SM were
established by observing echogenicity differences and tumor
shape. The pathologist was blinded to HFUS measurements
and SM.

Results: A total of 79 basal cell carcinoma (BCC) (56 nod-
ular, 15 superficial and 8 with more than one histological
subtype) were included. Out of 79 BCC, 76 (96.2%) had
a correspondence between ex vivo HFUS and histology (72
had negative and 4 had positive SM by ex vivo HFUS and
histology). Of the remaining 3 tumors, one had uncertain
and 2 had negative SM by ex vivo HFUS while positive SM
by histology. In this study, ex vivo HFUS allowed correct
visualization of negative SM in 72/79 BCC (91.1%).

Conclusions: other non invasive techniques such as dermosc
opy and confocal microscopy allow an accurate diagnosis
in most BCC cases. However, the information related to
depth and tumor volume is limited. HFUS devices are por-
table and give extra valuable information for BCC surgical
management. Future studies are needed to compare ex vivo
HFUS with other non-invasive technique such optical coher-
ence tomography and confocal microscopy.

International Skin Imaging
Collaboration (ISIC) Update
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Overview: The International Skin Imaging Collaboration is
an academia/industry partnership designed to facilitate the
application of digital skin imaging to help reduce melanoma
mortality. The mobile era presents an exciting opportunity
for the application of digital photography as an aid to ear-
ly diagnosis of melanoma. ISIC is designed to address two
barriers to the broad successful implementation of mobile
solutions for melanoma diagnosis: A lack of standards for
dermatologic imaging, and limited access of educators and
developers to large numbers of high quality clinically anno-
tated skin lesion images.

Standards: There are currently no DICOM standards for
dermatologic imaging. Through the efforts of 5 working
groups comprised of international melanoma thought lead-
ers from academia and industry we are using the Delphi
method to propose standards related to 5 areas of skin can-
cer imaging: technology, terminology, techniques, privacy,
and metadata. The working groups have prepared several
publications to date that are in press and/or under review.
It is hoped that the efforts of the working groups will serve
as the basis for convening a successful DICOM process for
dermatologic imaging with an initial focus on melano-
ma.

The ISIC Archive: Current efforts in melanoma educa-
tion and automated diagnosis typically rely on convenience
samples of small numbers of images that vary in quality and
annotation. The ISIC archive is a partnership of leading in-
ternational melanoma centers to provide a large public re-
pository of clinically annotated high quality skin images. The
ISIC Archive software is open source and the images in the
archive are publicly available through a Creative Commons
zero License (CC0). The individual lesion images in the ar-
chive are annotated with clinical (e.g., pathology diagnosis)
and technical (e.g., EXIF header content) attributes. In addi-
tion, a process has been developed to append morphologic
annotations to the images at the lesion level (e.g., symmetry)
and at the sub-lesion level (e.g., the presence of pigment net-
work in a specific region within a lesion). The initial focus of
the archive and annotations has been on dermoscopic images,
as these are most diagnostic for melanoma. The archive has
been selected for an ongoing 2016-2017 image analysis chal-
enge (for automated lesion segmentation and classification)
by the International Symposium of Biomedical Imaging.

OHSU/Apple Mole Mapper
ResearchKit Project
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Mobile technologies are revolutionizing medicine. Smart
phones are being leveraged by the ‘quantified self’ move-
ment and major health systems to empower individuals to
take a bigger and more direct role in their own health and
medical care. Skin cancer is no exception. There is an ongoing
proliferation of apps to educate and assist the public in skin
cancer recognition.

In October 2015, Oregon Health & Science University
released an iPhone app “Mole Mapper” designed to advance
melanoma research by giving users the ability to accurately
measure and monitor moles, and contribute photos of the
evolution of their moles over time to Apple’s open source
‘ResearchKit’. Sage Bionetworks, a nonprofit research insti-
tute is a key partner in managing and analyzing the melanoma
data and images for this project.

In this presentation, Drs. Leachman and Webster provide
a brief overview of the current state of consumer apps for
melanoma detection and the progress of the ResearchKit
melanoma project.