Carl Zeiss
MicroImaging AIS

Robotic Microscopy
UPMC / USAF

Andrew Lesniak
Director, Product Management

WE make it visible.
Company Position

Today, we are perceived as tool makers

The Market Wants...

A Company that will help them practice better medicine
• Pathology highly fragmented by geography and expertise

• Amount and Complexity of Information in Pathology Presents Opportunity for Efficiency from IT

  • A Digital Infrastructure can have significant impact providing data quicker and easier, facilitating effective communication, reducing errors and improving the quality of diagnosis.
Robotic Microscopy / History

Trestle, Inc (Carl Zeiss MicrolImaging AIS)
- Introduced Robotic Telepathology in 1998
- Scalable / Upgradeable solutions to Whole Slide Imaging; Initial WSI work in 1999
- Next Generation Imaging / Fluorescence and Workflow

Aperio, Inc
- Development of Whole Slide Imager in 1999
- Early Adopter, “Dedicated” Device Strategy
- Brightfield Focus

Of Course…there are others…

- Nikon / Coolscope
- Olympus (US: NanoZoomer; Europe Dedicated Device)
- Dmetrix; Array-based objective and acquisition modality
- Specialty Focus; ChromaVision, Applied Imaging…

- Early Thought leaders: Dr Ronald Weinstein; Dr Clive Taylor…
Robotic Microscopy / Today

Clariant, Inc (Devices Group) + Trestle, Inc

- Industry Leading Analysis
  - Quantitative Oncology and Molecular Diagnostics
  - ACIS Device Family
    - FDA Class 2 IHC Analysis
    - Rare Event, Differentiation
- Whole Slide Digital Imaging and Robotic Telepathology Solutions
- Image Review, Workflow and Metadata Management
- Image Analysis Development

- Worldwide Support and Service
- Committed R&D Investments for Next Generation Technology
- Interoperability with Existing Zeiss Product Portfolio; Including Advanced Technologies such as PALM MicroBeam Platform for Genomic and Molecular Integration.
Robotic Microscopy / History

Pharmaceutical Companies
- MERCK
- Aventis
- gsk GlaxoSmithKline
- Pfizer

*Plus others

Military Hospitals
- VA Hospitals
- Tripler Army Medical Center

Hospitals / Universities
- Pathology PARTNERS
- KAISER PERMANENTE
- BAYLOR Health Care System
- MEMORIAL SLOAN-KETTERING CANCER CENTER
- NATIONAL CANCER INSTITUTE
- MD ANDERSON CANCER CENTER
- DIANON Systems
- Baystate Health System
- NewYork-Presbyterian
- USC Medical Center
- UNIVERSITY of LOUISVILLE
- University of Michigan

*Plus others
Robotic Microscopy / History


• Three Years of Experience with Routine Use of Telepathology in Assessment of Excisional and Aspirate Biopsies of Breast Lesions, Charles L. Hitchcock, Lauren E. Hitchcock, Department of Pathology, The Ohio State University College of Medicine and Public Health, Columbus, Ohio, USA, Croat Med J 2005;46(3):449-457.

• Clinical Application of Dynamic Telepathology in Mohs Surgery, SEAN A. SUKAL, MD, PHD, KLAUS J. BUSAM, MD, AND KISHWER S. NEHAL, MD, Department of Dermatology, New York Presbyterian Weill Cornell Medical Center, New York, New York; Department of Pathology, Memorial Sloan-Kettering Cancer Center, New York, New York; ‡Dermatology Service, Memorial Sloan-Kettering Cancer Center, New York, New York, Dermatol Surg 2005;31:000–000.


• Using Telepathology To Assess Frozen Sections of Breasts Lesions, Charles Hitchcock, et al., The Ohio State University Medical Center, Columbus, OH.

• Real-Time Telepathology: A Transplant Center Experience, Michael Henry, MD, et al., University of Maryland School of Medicine, Baltimore, MD.

• Are Current Image Resolutions Sufficient For Telecytology?, Keith J Kaplan, MD, et al., Walter Reed Army Medical Center, Washington, DC.
Leveraging a Leading Product Portfolio for a Complete Pathology Value Add Solution

Digital Pathology Information Management:
• Leading Computer Aided Diagnostics and Analysis
• AP Workflow and Educational Data Management
Live Telepathology

• Primary Work Station & Remote Viewing Stations.
• Enables remote PC users to manipulate standard microscopes and view slides remotely in real time.

Digital Slide Solution

• High throughput digital slide scanning.
• Enables users to create digital record that can be accessed on-site or remotely and archived into digital slide libraries.
Core Functionality

- Optimized image transmission and interaction
- Resolution Limited Only by Optics
- Infinite Number of Focal Planes
- Multiple Simultaneous Users
- Annotation Tools
- Slide Overview
- Full Microscope Control
- Automated Slide Handling
- Navigation History
Robotic Microscopy / Eyes Everywhere
Live Telepathology Imaging Solutions
Digital slides are electronic facsimiles of histological specimens.

Digital slides are created by merging thousands of microscopic camera images with a high magnification.

Single fields of view (high magnification)

Complete digital slide
MIRAX Lab Automation Digital Pathology Solution

- Small footprint
- 20x Plan-Apo objective with 0.8 NA
- Image capture from barcode area with barcode identification
- Optional 40x Plan-Apo objective with 0.95 NA
- Choice of camera adaptors (1x or 0.63x)
- Optovar options (1.25x and 1.6x)
- Fluorescence options, multi-channel acquisition
- 1, 12, 300 Slide Capacity

Resolution range from 0.11 µm/pixel ... 0.52 µm/pixel
MIRAX Micro Robotic Digital Pathology Solution

- Zeiss AxioImager Platform and Optics Configuration
- Full Robotic functionality, including multi-focal acquisition, condenser settings
- Scalable to Digital Whole Slide Acquisition with user selectable Objective (5, 10, 20, 40, 63)
- Multi-focal plane imaging and robust focus technology ensures robust imaging capability.
- Automated Slide Handling options of 4, 50 slides.
- Fluorescence Multi-Channel Capable
- Additional modalities, DIC, Phase Contrast Imaging, Oil
Making it Possible / Understanding Microscopy
To Overcome Limitations

**Histology**
- Tissue Thickness
- Folds, Tears, Staining Variance

**Imaging**
- Camera Noise
- Optical Noise (Aberration)
- Lighting Variation

**Biological**
- Species, Age & Sex
- Cross-reactivity
- Pre-existing Lesions
- Disease Conditions
Fig. 1: Conventional Area Scanning
Large format sensor subject to optical weakness in both axis.

Fig. 2: Trilinear Array Scanning
Three Lines Capture R, G, & B image on different areas on the optics. Long line extends into weaker periphery of the optics.

Fig. 3: TDI Sensor
Object is exposed multiple times as it passes over each line. Each line captures R,G, B

Fig. 4: Small Field Area Scanning
By utilizing a very small but very high speed sensor, small field imaging produces captures the nearly perfect ‘sweet spot’ of a microscope objective.
Making it Possible / Extended Focus Technologies

- **Extended Focus**
  - Real-Time Acquisition of image series from different focus positions
Making it Possible / Workflow

Image Repository Framework

Toxicology Desktop™
Digital Pathology Classroom™
Histotech Workbench™
Cytotech Workbench™
Anatomic Pathology Desktop™
Cytopathology Desktop™
Making it Possible / Complete Solutions

Virtual Multihead Microscope

Desktops/Laptops Image Database

Grossing Stations

Collaborating Laboratories

Internet/WAN

Security

Printers

Deskops/Laptops

View Station

Internet/LAN

Live Robotic Telepathology

High Throughput Scanner
Carl Zeiss MicroImaging AIS

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