

10<sup>th</sup> ANNUAL DEPARTMENT OF PATHOLOGY YOUNG INVESTIGATORS' DAY  
POSTER SESSION

POSTER #

12

(for Admin. use)

Thursday, April 17<sup>th</sup>, 2008  
TURNER CONCOURSE  
REGISTRATION FORM

Applicant's Name: Toby C. Cornish \_\_\_\_\_ Degree: MD, PhD \_\_\_\_\_

Applicant's Division: Pathology Housestaff \_\_\_\_\_

Faculty Preceptor: Marc K. Halushka \_\_\_\_\_  
(Must hold a primary appointment in Pathology)

Appointment Category:  House Staff  Clin Fellow  Research Fellow  
 Medical Student  Graduate Student (Program: \_\_\_\_\_)

Register for:  Clinical Research  Translational Research  Basic Research

Full Poster Title \* Color deconvolution for the analysis of tissue microarrays

Where has the work been presented?

Meeting Name Advancing Practice, Instruction and Innovation Through  
Informatics (APIII)

Meeting Date Sept 9-12, 2007 \_\_\_\_\_

Not Previously Presented  Note: this work was previously presented as a talk \_\_\_\_\_

Where is this work being published? \_\_\_\_\_

Journal Name, Volume, Page, Date \_\_\_\_\_

In Preparation (Y/N) - Where? Submitted, Am J Path \_\_\_\_\_

Author(s) (First & Last) Cornish, Toby C. and Halushka, Marc K. \_\_\_\_\_

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**\*INCLUDE A ONE-PAGE ABSTRACT (including title and all authors) OF THE WORK  
YOU WILL BE PRESENTING**

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**E-mail COMPLETED Registration form and abstract to:  
Stacey Morgan ([smorgan9@jhmi.edu](mailto:smorgan9@jhmi.edu)) on or before  
Friday, March 14th, 2008**

**If you have questions or problems regarding your submission, please  
contact Stacey Morgan via e-mail ([smorgan9@jhmi.edu](mailto:smorgan9@jhmi.edu))**

*(Paste abstract here)*

## **Color deconvolution for the analysis of tissue microarrays**

The tissue microarray (TMA) is a powerful tool for the simultaneous analysis of multiple tissue specimens. TMAs conserve tissue, provide uniform staining conditions, and permit high-throughput preparation and analysis of slides. TMAs are predominantly stained with chromogenic dyes and analyzed manually using traditional grading systems, but digital imaging is increasingly used to quantify immunohistochemical staining of paraffin-embedded tissue. One method, color deconvolution, separates a color digital photomicrograph into component images representing the contribution of each dye. We employ widely-available, free and open source software tools to automate the color deconvolution and analysis of TMA images. Multiple TMAs were constructed from vascular, pulmonary and renal tissues derived from 100 adult autopsies, and immunohistochemistry for connective tissue growth factor (CTGF) was performed. The image dataset, consisting of individual core images, was annotated to create three binary masks: tissue area, inclusion area, and exclusion area. The masks were combined using boolean operations to create a region of interest for analysis. The diaminobenzidine and hematoxylin signals were deconvolved, and the diaminobenzidine signal was measured for each region of interest. The dorsalis pedis core images were also scored manually, revealing strong correlation (Kendall's tau = 0.71) between the observer score and the median diaminobenzidine intensity in each image. Color deconvolution offers an alternative to other methods of analyzing immunohistochemistry on TMA images.