UAMS Histology and how we are moving forward

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Presented by

ThermoFisher SCIENTIFIC

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MEDICAL CENTER

UNIVERSITY OF ARKANSAS FOR MEDICAL SCIENCES

The UAMS Medical Center delivers world-class treatment in a comforting, patient- and family-centered environment. Our caring and compassionate health care team provides personalized care to patients from around the world.

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INSTITUTES

Donald W. Reynolds Institute on Aging
Addresses the needs of an aging generation through primary medical care, research on aging and age-related diseases and educational programs.

Jackson T. Stephens Spine & Neurosciences Institute
Encompasses treatment, rehabilitation and care services for the spine, head and neck.

Harvey & Bernice Jones Eye Institute
The place to go for all your eye needs from a general eye exam to diagnosis and treatment for a specific eye disease or trauma.

Myeloma Institute
The world's foremost research and treatment center for multiple myeloma, a cancer of the blood's plasma cells

Psychiatric Research Institute
Provides comprehensive psychiatric treatment and performs groundbreaking mental health research.

The Winthrop P. Rockefeller Cancer Institute
Arkansas' only academic cancer center, uses a team approach to treatment that addresses the wide range of needs of the patient and family.

The Translational Research Institute
Focuses on transforming the pace, effectiveness, and quality of translational research among UAMS and partner institutions.

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Pathology Residency Program

The University of Arkansas for Medical Sciences Residency Program in Pathology involves three closely located and tightly integrated hospitals.

University Hospital (300 beds) is the major tertiary referral hospital for the state of Arkansas, with strong emphasis on neoplastic diseases, ophthalmology and nephrology.

The **John L. McClellan Memorial Veterans Hospital**, adjacent to UAMS, is one of the largest VA facilities in the country with 729 beds in its two divisions. Arkansas Children's Hospital has 278 beds.

The **Arkansas Cancer Research Center**, located on the UAMS campus, is the major referral center for neoplastic disease in the state. The multiple myeloma treatment and bone marrow transplantation programs bring referrals from across the United States and many other countries.

The **Neurosurgery** program also brings a wide range of referred patients with CMS tumors.

How our Histology Department has evolved over the last eight years

Pictorial Story: Evolution of a Histology Laboratory.

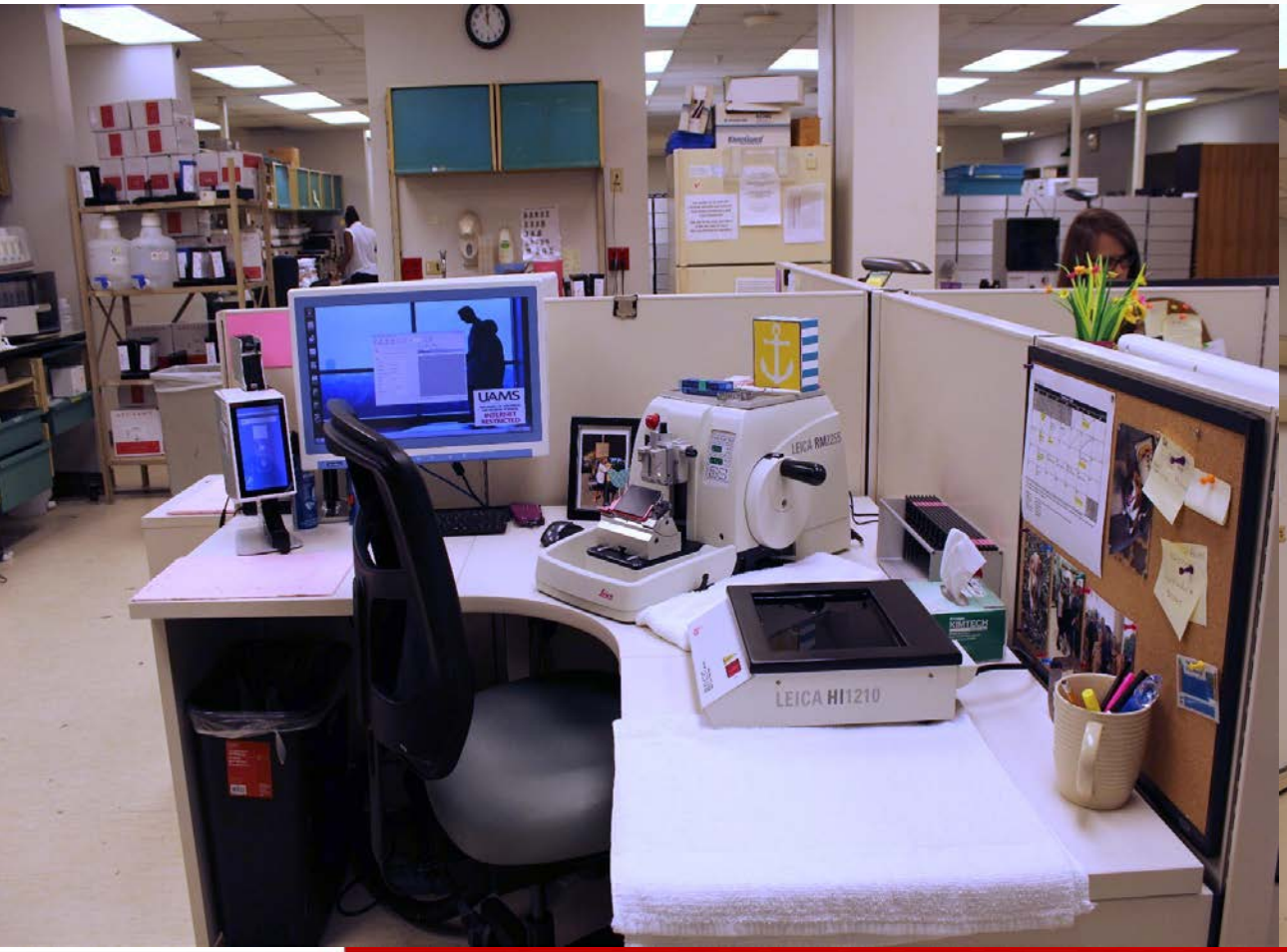
- The following slides will show the way the Histology Laboratory at UAMS evolved, devolved three times in eight years.
- We overhauled the laboratory and had a continuing plan to grow and evolve the laboratory into a state of the art workplace and to improve everything from processing to block (cassette) and slide storage.
- After tissue is processed through a formaldehyde solution to fix the tissue proteins in as close to an in vivo state as possible, we must remove the solution/water by dehydration through a series of alcohols, then remove alcohol with xylene and into final paraffin infiltration.
- We need a solid matrix with tissue contained in it to cut a 4 microns for optimal diagnosis. These are the pictures of those steps grossly.

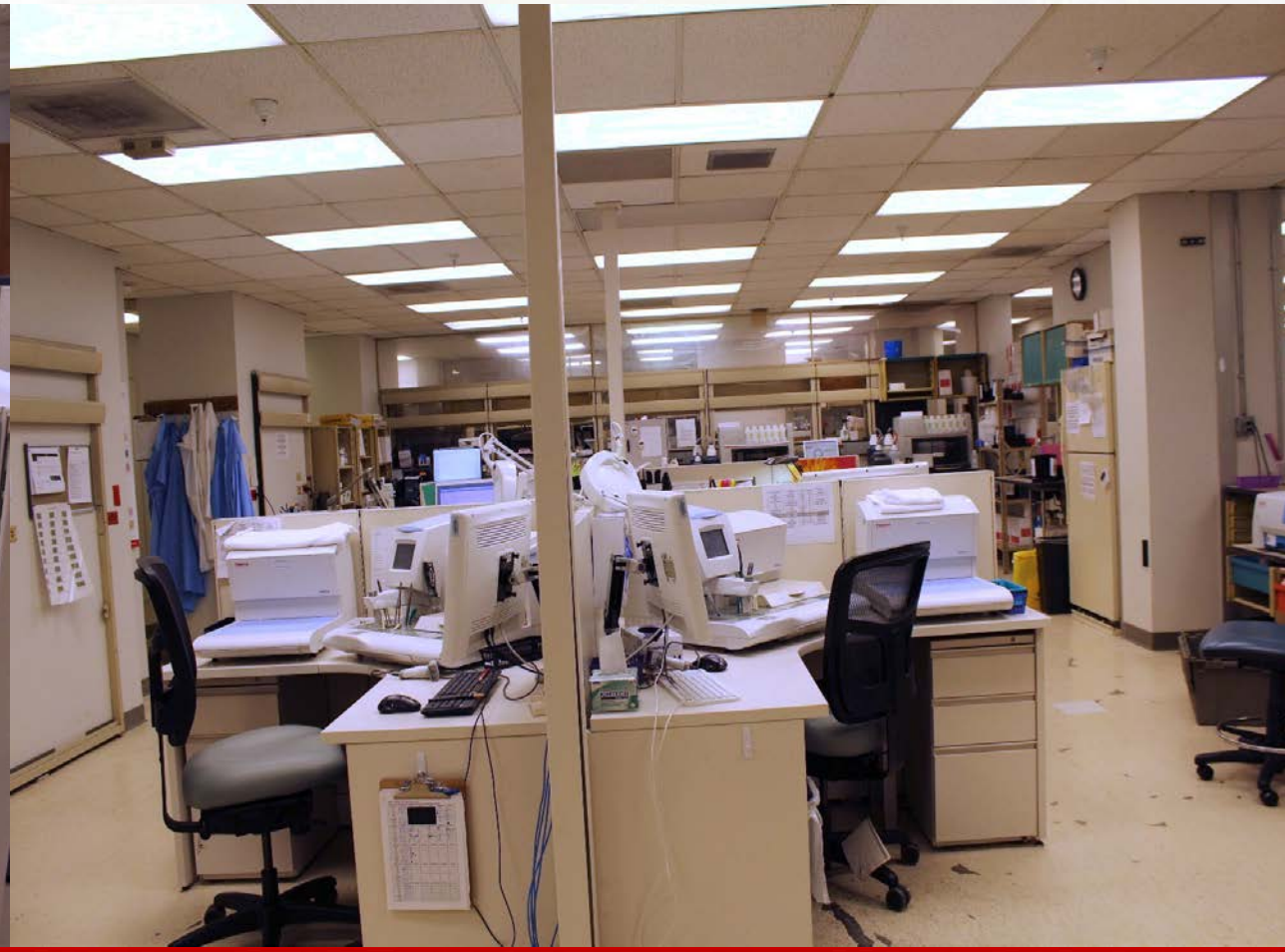
When I arrived, this was the Histology Laboratory. It was ergonomic and this configuration with automated microtomes had reduced repetitive injury issues. We lost this area and were moved to the next picture. (It is a real step back!!)

This was the new area. These are embedding centers and please note we no longer have ergonomic work areas. The metal cabinets at the back of the photo are where we store slides and blocks produced in Histology. They take up a large area as we produce approximately 90,000 blocks a year and about 150,000 slides again per year. We need to plan better for all storage!

Microtome table at the top of picture, also non-ergonomic and lateral movement causing repetitive lower back problems during sectioning of the blocks.

Note: Ergonomic workstations with half round area and the microtome in the center. This allows the person sectioning or embedding to turn a chair rather than a stretch the shoulders and back to reach the waterbath or any area of the station. We have had fewer complaints since installing these of low back or shoulder pain. As Histologists, we have issues with wrists and shoulders remain although this arrangement had also helped our staff.





Current tissue processor placement: >15 feet from embedding centers. We have three Excelsior ES Processors with one for placentas/autopsies only, one used for routine surgicals (loaded at 5:00 PM), and one routine surgical. The last two units are: one used for two-hour processing of cytologies and rush kidney/liver/other very small biopsies and the last processor is used for bone marrows and routine biopsies on a four-hour program. The four processors are all loaded and started on immediate or delayed starts at 7:00 PM by the Gross Room staff. The Gross Room is actually ¼ mile from us (each way) until we move next door. All slides are currently taken to the Residents and Attending Pathologists in the Gross Room area for viewing. The move will put us all within feet of each other. Has both up- and downsides!

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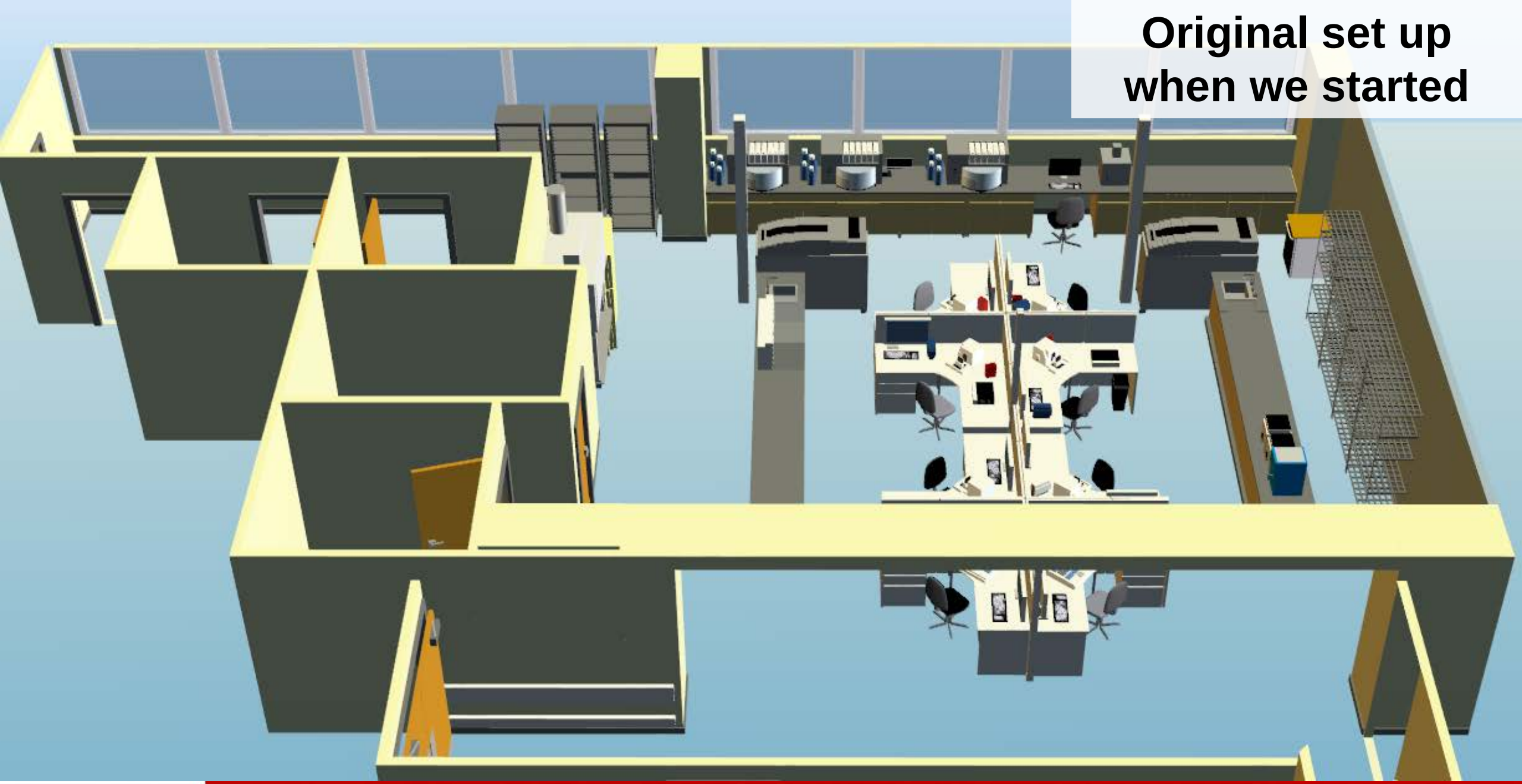
The following slides will show the NEW laboratory and layout developed for a LEAN, ergonomic and convenient histology laboratory.

We have windows again, which is a great morale booster.

We space to grow and plan the best layout for everyone to work and be productive without being confined and constantly breathing fumes from the equipment and reagents we use daily.

It looks new and fresh!!!

Original set up when we started



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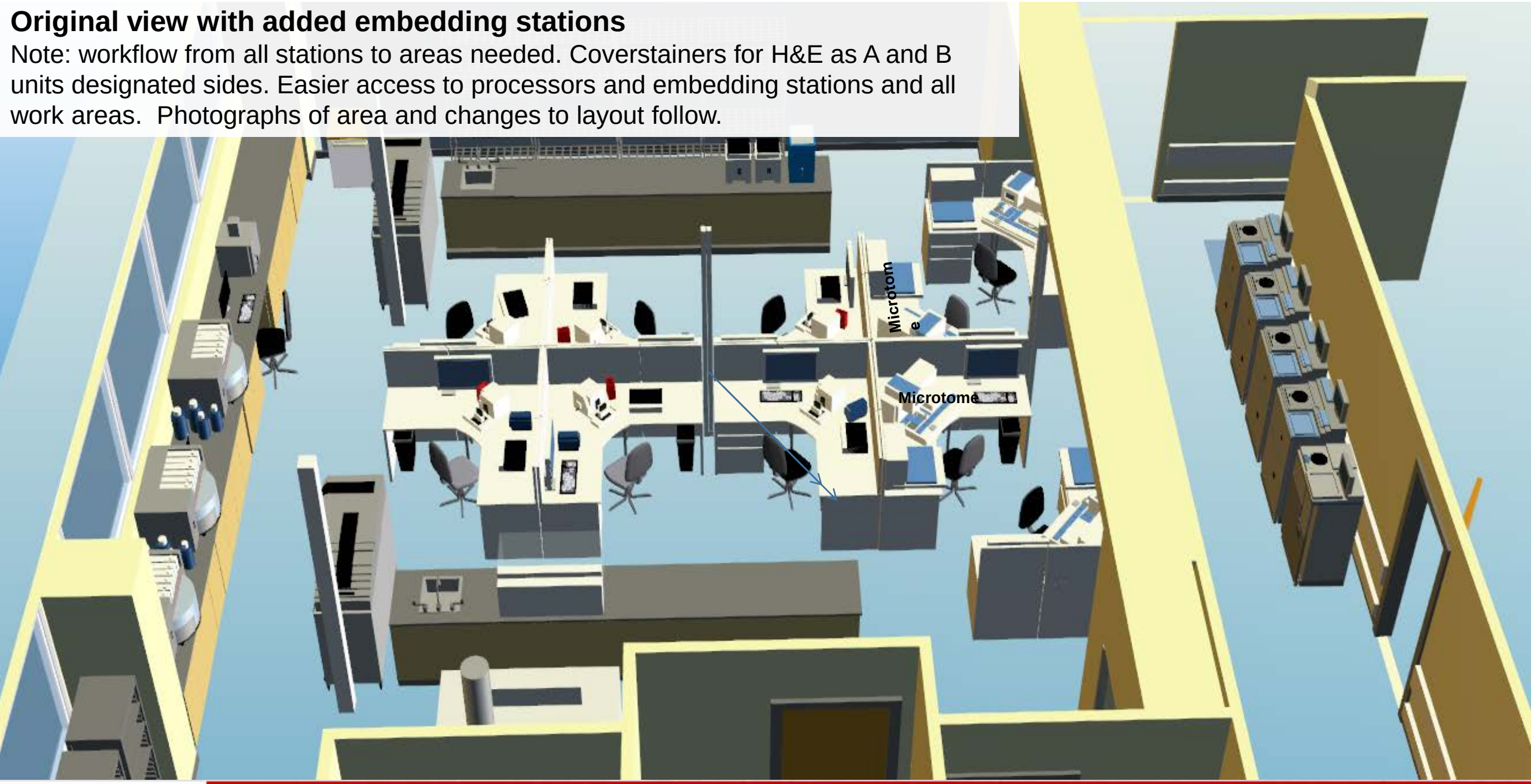
Original view with added embedding stations

Note: workflow from all stations to areas needed. Coverstainers for H&E as A and B units designated sides. Easier access to processors and embedding stations and all work areas. Photographs of area and changes to layout follow.

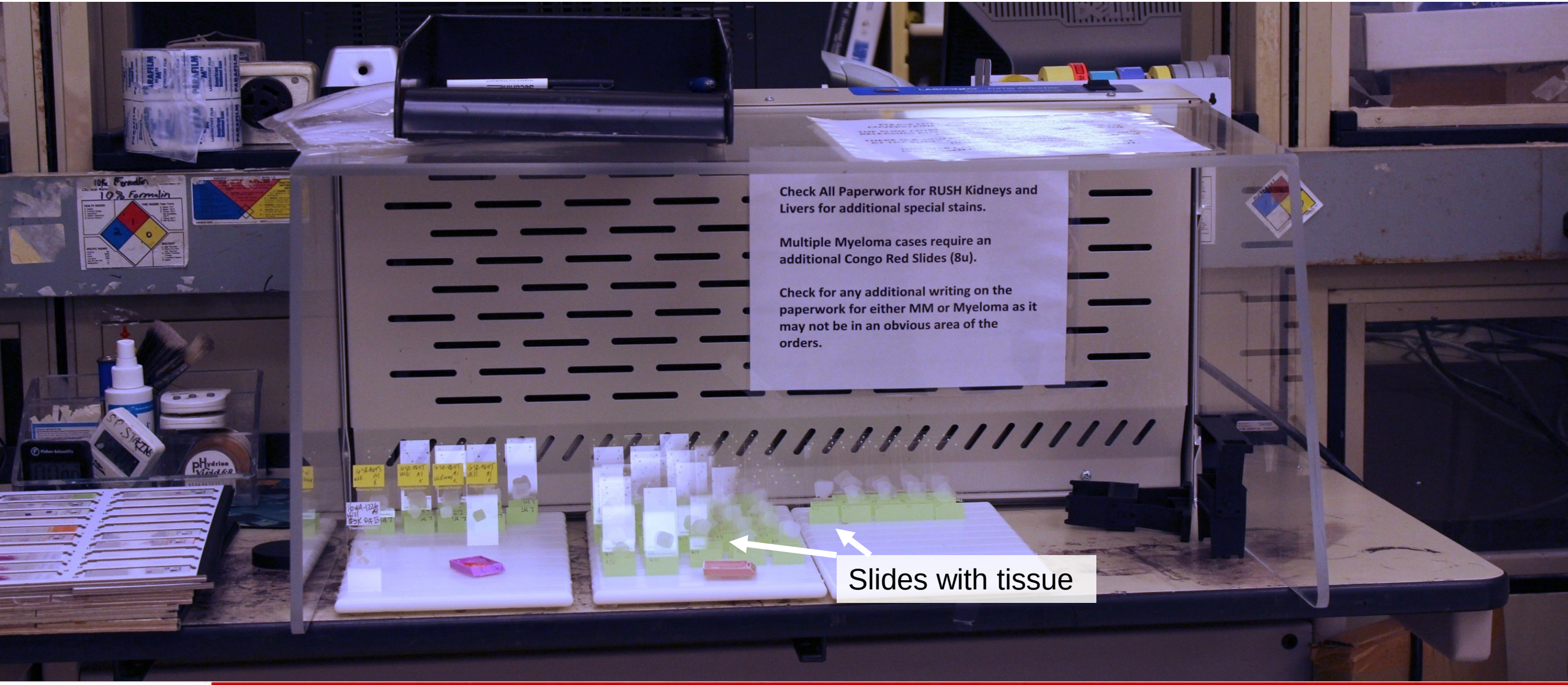



Ventilation over top of windows
Waste Barrel
Table for Computer and/or Oven?
3 Artisan Special Stainers and 2 Computers
Refrig
Table for Computer
Check out and Computer
Artisan Storage Area

What a difference a move can make

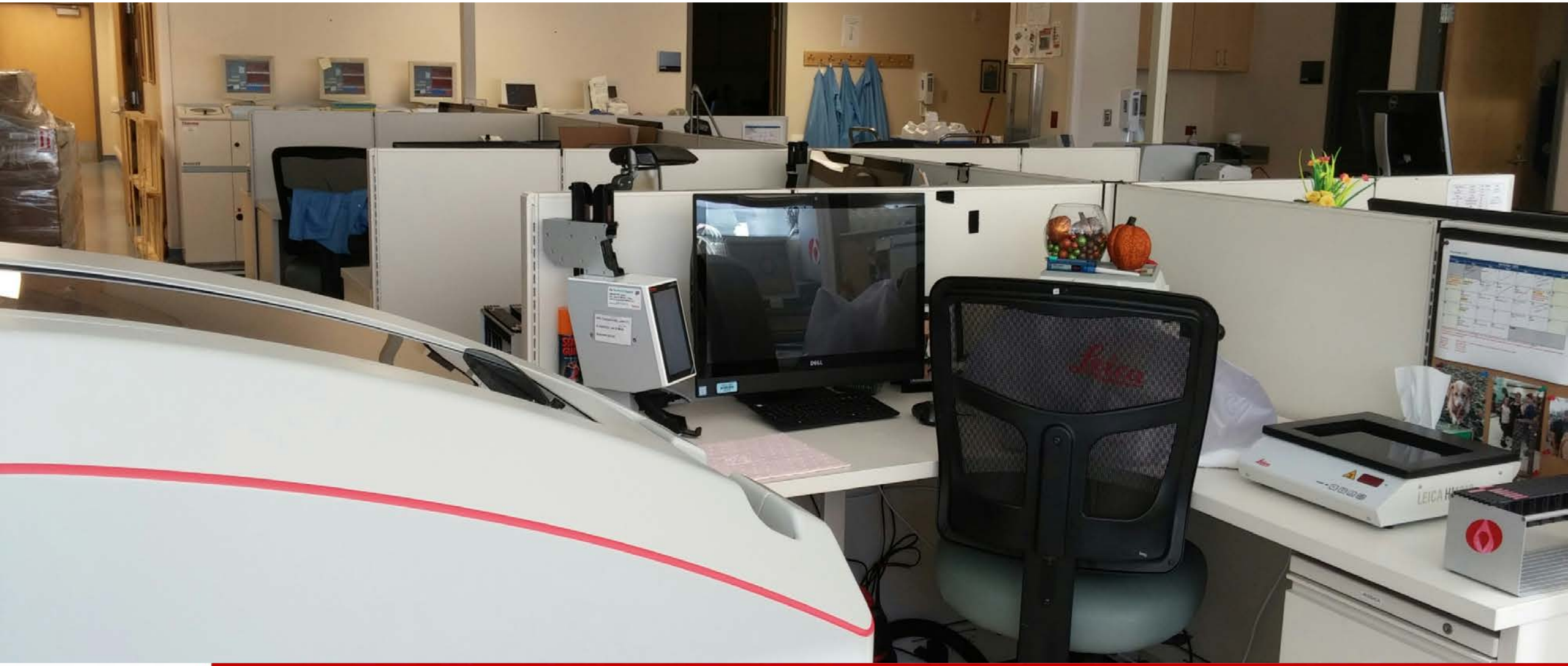
- The processors are now ten feet from the embedding centers and much easier to organize blocks.
- The coverstainers are located at the end of each counter and designated A and B for the four cutting stations on each side.
- Using the suggestion of colour coding from Agilent on the slide racks of the coverstainer H&Es improved our throughput and delivery of our slides by 90%.
  (We were a ¼ mile one way from the Gross Room.)
- The slide racks are organized by case and easily scanned into Epic for placing in order slide folders.
- This also cut down on confusion when cases come off and helps keep them in order from the coverstainer.
- The coding helps us know who cut the case and which slides to look for with the larger cases.
- Reorganizing the area with the Artisan special stainers and supplies allowed fewer steps.
- We were able to set up the portable fume hood and oven within ten feet of the Artisans.
- The use of the block scanner and storage area saves us about five hours a week looking for "lost blocks" or miss files.
- The linear storage area along one wall is used for all dry goods storage.
- Our only open system is our Leica coverslipper used for bone marrows and extra slides not completed on the coverstainers or Artisans.

Portable hood for rundown line will be less than ten feet from the Artisans and the coverslippers. The oven will next to the run down line or less than ten feet away.




Ventilation
3 Excelsior ES and 2 AS Tissue Processors
Arcos Block Storage System
COVERSTAINER A

The new lab: Note the stainers at the back near the Histologist Sectioning Stations with ergonomic desks. Eight sectioning stations and two embedding at the front, near the processors. We have slide writers at each station, so no sharing or confusion.

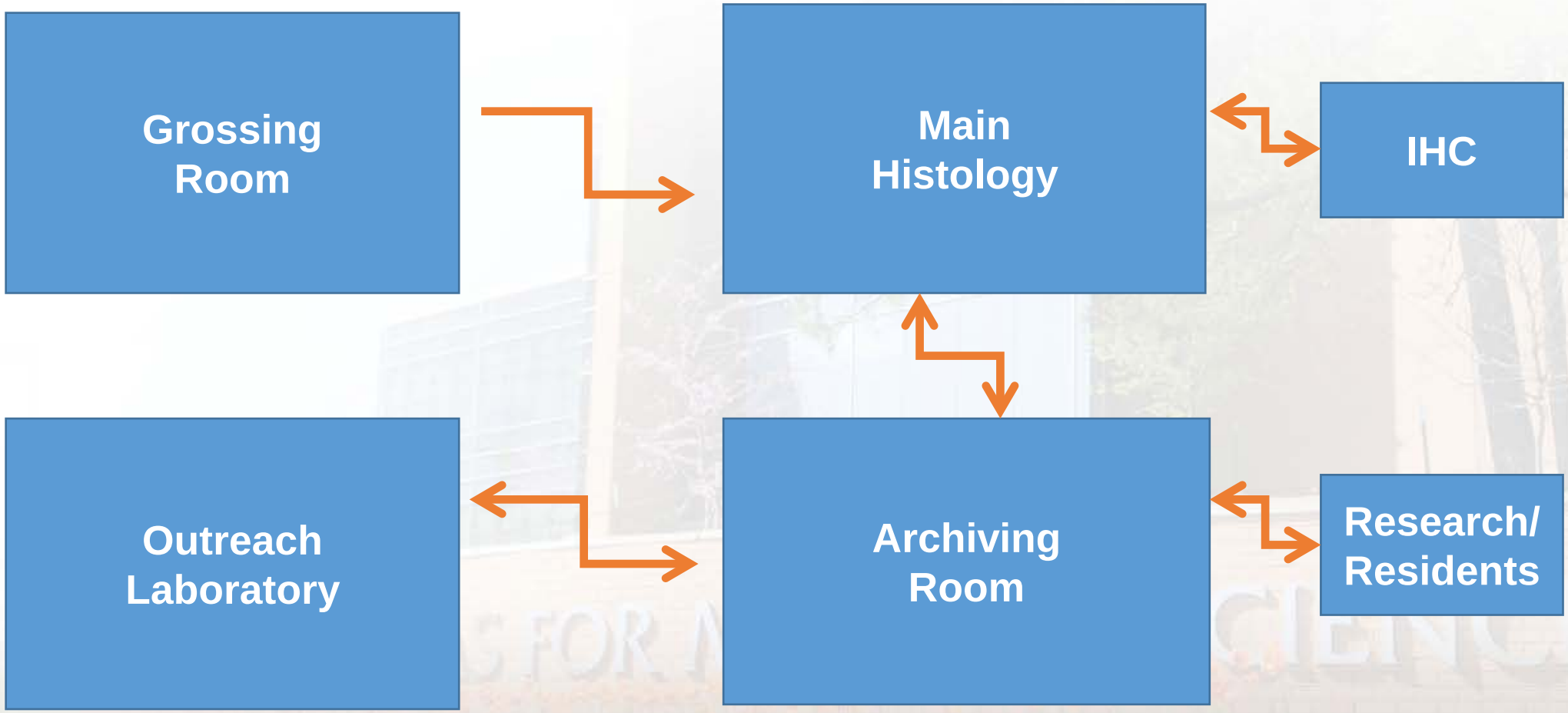


Five tissue processors with embedding at six feet away. Convenient and easy to remove and transport without dripping across the floor and creating a fall hazard.

Block management improvement project scope:

- How do we better track our patient tissue samples throughout the facility?
- How do we build a chain of custody around the movement of the tissue samples?
- How do we decrease hands on time and eliminate filing errors that occur during the block management workflow?
- How do we keep residents from pulling patient samples at all hours with no traceability?
- How can we better utilize our resources to keep up with increasing volumes and resource limitaions?

Block movement map:



Proposed solution

Histology as database host lab

Histology lab using Thermo Scientific Arcos Host Software

Scanner and PC

One or several PDAs

Zebra printer

Archives using Arcos App

Scanner and PC

One or several PDAs

Zebra printer

Outreach Lab using Arcos App

Scanner and PC

One or several PDAs

Zebra printer

Challenges to overcome and parties involved

- With multiple laboratories producing / receiving samples, how can we ensure one centralized database that has all needed block information?
- How do we work with our LIS and tracking systems that have already been implemented to further improve tracings of patient samples?
- How do we show the administrative team, that this will allow for re-allocation of resources, improve patient care and contribute to our lean processing goals?
- By working with the supervisors of each section of the lab, we were able to work together to develop the map for the ROI

Arcos cost/time savings calculator

	CURRENT	WITH ARCOS
Blocks / week	2,250	2,250
Current storage cost / block	$0.07	$0.20
Block storage cost / week	$165.00	$459.38
Technical hours / week	30	8
Employee hourly cost	$25.00	$25.00
Technical cost / week	$750.00	$200.00
Cost of lost block	???	
Total cost / week:	**$915.00**	**$659.38**

Savings per week: **$255.62.** Savings per year: **$13,292.24**

Pilot Site Project and Results Found

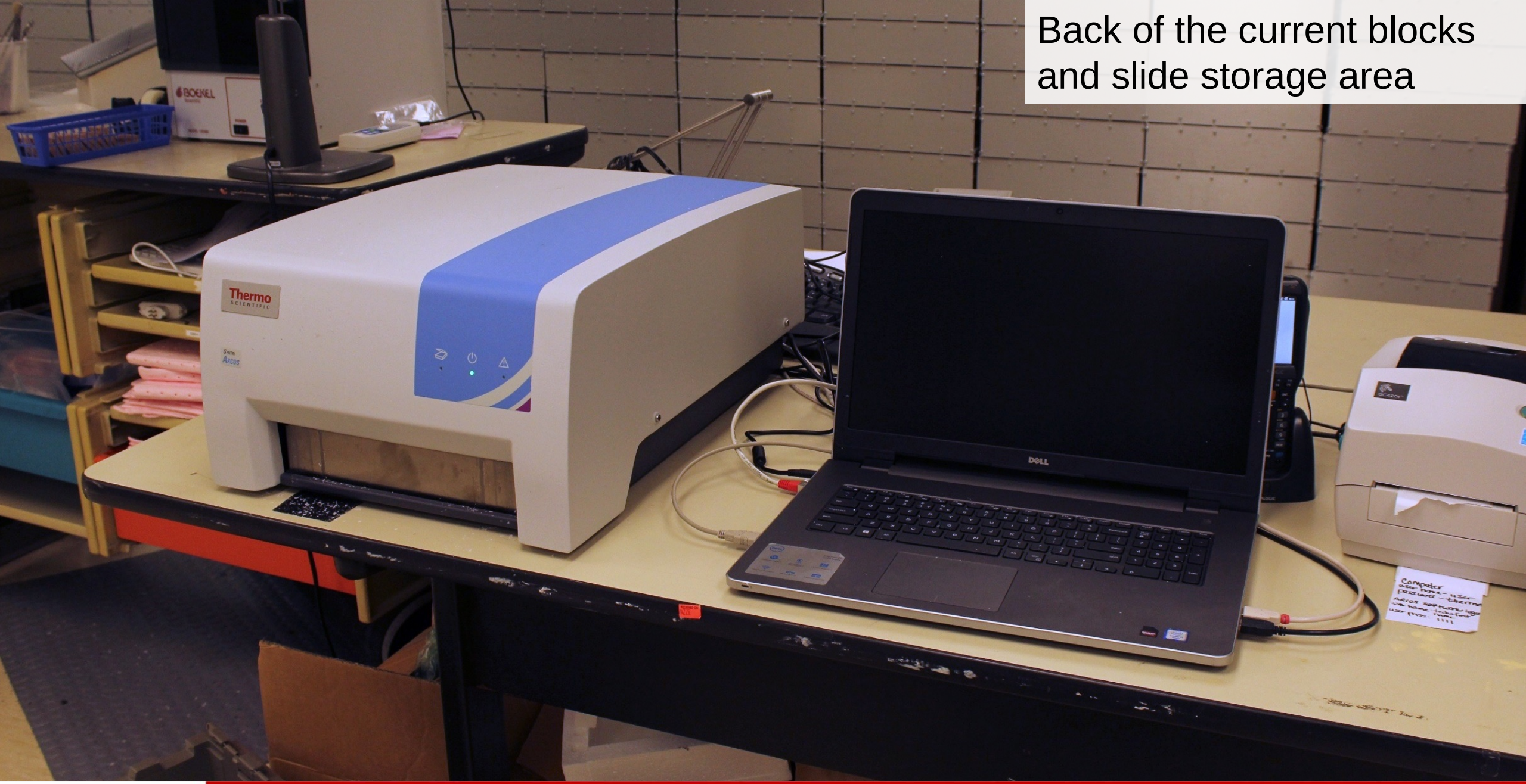
- One unit placed May, 2016 served as a pilot site for the Arcos system and allowed us to understand how it would help our workflow
- Utilization was not identical to the desired goal, due to the placement of only 1 unit
- Used the system in the main histology laboratory in conjunction with the IHC team
- Results found during pilot site study:
- Arcos system saved 5 hours/week of FTE's looking for blocks
- Saved FTE's 8 hours/week by not needing to put blocks in numerical order

Administrative Changes and Acquisition

- During the course of the pilot study and acquisition process of 3 units, we experienced turnover of several leadership positions within administration
- This caused project delays and the need to re-explain the benefits and needs for a block management system
- Concerns during acquisition process-
  - How do we acquire these units with our current budget and conflicting priorities
  - What will full implementation look like, and how can we balance it with our daily work

Acquisition Success and Implementation

- Due to a master lease agreement that was currently in place at the institution, we were able to acquire 3 units through a lease addendum.
- While the units still had to go through contracting and needed signatures from the administrators, the addendum process helped us push the acquisition through more smoothly
- Implementation of the 3 units occurred September, 2017
- Since the staff in main histology had already been using the system, the implementation was seamless
- Archiving room required 2 training sessions of their staff
- Out-reach lab required 1 session of their staff
- Implementation/training took 3 days



Back of the current blocks and slide storage area

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Filing system for blocks held for two weeks only and then given over for routine storage.

This shows the evolution of a Histology Lab

- The addition of a all these steps is leading the way for Histology to become a part of the LEAN and improved world we now live in.
- Histology has been behind the times for so long and relegated to small or inappropriate areas in the hospital that no one realized we were even there.
- New ideas like ergonomic desks and chairs along with improve staining systems that avoid exposure to fumes or reduces them have made life easier.
- The new processors we have are easier to change and again reduce exposure to fumes from the chemicals we use and, many are carcinogens or toxic.
- New ideas for slide an block storage are making our work faster and safer.
- No longer can anyone just walk in, find blocks (and soon slides) and walk out without recording the event. This is so much safer for everyone.
- I hope everyone here now understands the importance of Histology and role in everyday medical care from surgery through diagnosis!