The Evolution of Histology Teaching in US Medical Schools

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“A good microscope has become so essential to the physician, that no apology is needed for calling attention of our readers to this subject”
New York Journal of Medicine, 1847
Joseph M. Leidy
1st president of the American Association of Anatomists 1888-1891
Joseph Leidy (1823-1891)

His biography by Leonard Warren is entitled:

“The Last Man Who Knew Everything”

He was a:

- Microscopist
- Anatomist
- Paleontologist
- Anthropologist
- Protozoologist
- Parasitologist
  and...much more

Leidy called the microscope “his first love” and was one of the first active microscopists in the US (from 1845)
Leidy is said to be the first person in America to utilize the microscope for forensic purposes. In January, 1846, Joseph Leidy’s cousin, Napoleon Leidy, asked him to examine evidence (blood on clothing and a hatchet) in a murder case to see if it was chicken blood, as the suspect claimed. Caught in a lie by Leidy’s research, the suspect confessed.

Joseph Leidy was one of the earliest US medical educators to routinely use microscopic images in his teaching.

In 1841 (age 18) he learned to use the microscope from Paul Goddard at University of Pennsylvania.

As early as the Fall of 1848, Leidy delivered a course of lectures on Microscopic Anatomy at the Medical Institute of Philadelphia.

(Oliver Wendell Holmes taught the use of the microscope to medical students in Boston as early as 1837)

1853-1891 Professor of Anatomy at the University of Pennsylvania School of Medicine.
Preferred sites for US doctors to seek training in Europe

- Training in London emphasized very formal pedagogical teaching – students passive
- Edinburgh – Scottish enlightenment – some of the earliest use of microscopes in med ed
- Paris – concept of extensive patient contact – numerical medicine – Pierre Louis
- Germany/Austria/Switzerland – **pioneered serious laboratory training for physicians**
What happened in the second half of the 19th century (post Civil War)?

• The beginnings of microphotography
• Improved microtomes; improved stains
• Advances in microscope design and the beginnings of US made research microscopes and of low cost student microscopes (B&L)
• Appearance of dedicated histology textbooks (some by US authors)
• Rapid expansion of the number of US medical schools – the rise of the proprietary (for profit) medical schools
• The concept of medical student laboratories beyond Gross Anatomy (inspired by the German medical school model)
• Dedicated histology laboratory courses by the 1880s in select medical schools
HUMAN HISTOLOGY

IN ITS RELATIONS TO

DESCRIPTIVE ANATOMY, PHYSIOLOGY, AND PATHOLOGY.

With Four Hundred and Thirty-Four Illustrations on Wood.

BY

E. R. PEASLEE, A.M., M.D.,

Professor of Physiology and Pathology in the New York Medical College; of Anatomy in Dartmouth College; and of Surgery in the Medical School of Maine.

Member of the American Medical Association; of the New York Academy of Medicine; of the New York Pathological Society; of the Society of Statistical Medicine, etc.

"Maxime in minimis."

PHILADELPHIA:
BLANCHARD AND LEA.
1857.
text included actual lab experiments
Photography through the Microscope

- 1st photomicrographs probably taken with the solar microscope around the 1830s
- 1st photomicrograph published in 1853
- Use of lantern slides of photomicrographs in lectures in 1880s
- Photomicrographs showing up in histology textbooks by 1917
Abraham Flexner argued for the scientific basis for medical education. His plan for a uniform medical curriculum included:

- Two years of laboratory work
- Two years of bedside/clinic work

"The country needs fewer and better doctors," Flexner argued, "and the way to get the better is to produce fewer."
Impact of the 1910 Flexner Report

In 1911 there were 160 US Medical Schools

In 1920 there were 85 US Medical Schools

Loss of the proprietary (for profit) medical schools that were not aligned with an academic institution and did not invest in equipment and laboratory teaching.

Routine laboratory instruction (including histology) at virtually all remaining medical schools
To put a human face on histology teaching post-Flexner: 1918-1919

A TEXT-BOOK OF HISTOLOGY

BY
HARVEY ERNEST JORDAN, A.M., Ph.D.
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WITH FIVE HUNDRED AND NINETY-FOUR ILLUSTRATIONS IN THE TEXT,
AND FOUR PLATES

NEW YORK AND LONDON
D. APPLETON AND COMPANY
1917
THE BLOOD SUPPLY.

1) Study in stained section injected specimen of skin and scalp. Sketch ( ). Note the precise location of the several vascular pleuses of the derma and the tela subcutanea; and the blood supply of the sweat glands, hair follicles, sebaceous glands, and the fat lobules of the tela.

XIII. THE RESPIRATORY SYSTEM.

THE NASAL CAVITY.

1) Study in a stained section the lining mucous membrane of the vestibule. Note transition from external skin to internal mucous membrane; note also the vibrissae and the associated sebaceous glands. Make h.p. sketch of narrow segment ( ).
2) Study mucosa of respiratory portion (Schneiderian membrane). Note the pseudo-stratified ciliated columnar epithelium, goblet cells, the extensive vascular corium, and the serous-mucous glands. Sketch h.p. a narrow segment ( ).
3) Make h.p. sketch ( ) of olfactory mucous membrane, noting: a, sustentacular cells; b, olfactory cells; c, basal cells; d, serous glands of Bowman. In what respect is the olfactory cell unique?
4) In addition, note note the inner nasal orifice of Jacobson. b, the mucous receptacle or inner side of the cartilaginous plate. Inner wall segment

THE LARYNX.

1) Study a stained vertical section through lateral wall of the larynx. Note vocal cords and ventricle. Sketch ( ), indicating the types of epithelium and the contents of the corium at different levels. What are the fundamental tissues comprised in the vocal cords?

THE TRACHEA.

1) Study a stained transverse section of the trachea. Note: a, character of the lining epithelium; b, goblet cells; c, elastic layer in submucosa proper; d, muscularis mucosae; e, submucosa, with its mucous glands; f, lamina propria; g, fibro-cartilaginous tunic. Trace the duct of a mucous-secreting gland to the surface. Note its apulia in the corium. What is the character of the cartilage of the adventitia? Explain the trachealis muscle. Sketch h.p. ( ) a narrow segment of the complete width of the wall.

THE BRONCHI.

1) Study a stained transverse section of a primary bronchus. Compare with trachea. In what points do they differ?

THE LUNG (Fibro -)

1) Make h.p. sketch of narrow segment of wall of SECONDARY or TERTIARY BRONCHUS. Note: a, muscularis mucosae; b, lymphoid tissue; c, mucous glands; d, character of lining epithelium. How are the pulmonary artery and vein and the bronchial artery and vein related to these bronchi?
What happened after World War II?

- Biological Electron Microscopy ~1954

- Technology blossomed leading to digital cameras, microcomputers and the WWW 1980-90

- Expansion of medical care as a role of academic medical centers

- Expansion of the NIH and the flow of research money into medical schools

- Changes in the reward system at medical schools

Changes in Institutional and Individual Incentives
Competing Missions of Medical Schools

Tuition fees as a percentage of total medical school income:

- 1910: 70%
- 1948: 28%
- 1968: 7%
National Trend in Hours of Histology Laboratory Instruction

(Gartner, 2003; Bloodgood and Ogilvie, 2006; AAA Surveys)
Rise of the microcomputer and the WWW: Evolution of the Digital Microscopic Image

1990: WWW opened to public; 1991: 1st image archive of any kind on the WWW

Basic Images

Digestive Tract (Tongue)

Labeled Images

Male Reproductive System (Testis)

Virtual Slides

Nested images; mouse rollovers; sounds
First volume published on Virtual Microscopy and Virtual Slides (2005)
Challenges/Opportunities Facing Histology Teaching Today and into the Future

- Changes in the nature of the students entering medical school
- Move towards integrated medical curricula
- Emphasis on small groups and active learning
- More physician involvement in the control of the pre-Clerkship curriculum
- Reduction in scheduled time for basic science in the curriculum
- The temptation to use computer technology to turn histology into a self-study exercise (freeing up space; money; faculty time)
- Competition for faculty time by the other missions of academic medical centers
- The reward system in medical schools focuses on evaluation of faculty based on their income generating potential (clinical income or research grant income)
- Changes in the way that physicians practice medicine (will they be using microscopes?)

Question: Are we at risk of losing the Medical Educator from the teaching of Histology?