The Beginnings of Pathology in America
A Contemporary Analysis of William E. Horner’s A Treatise on Pathological Anatomy

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Context.—A Treatise on Pathological Anatomy, published in 1829 by William E. Horner, is the first American textbook on pathology. Several articles have been written on Horner, but they do not evaluate the role that the knowledge he recorded played on the intellectual origin of the discipline of pathology in America. Only one article, published in 1930, deals in some detail with the content of the Treatise. Because of new historiographic standards, this is an opportunity to expand on, and update, that article. Furthermore, Horner’s book is now available free online, and print-on-demand paperback copies can be ordered for a modest cost from online booksellers.

Objective.—To describe the organization and structure of the scientific knowledge found in the Treatise with the intent of demonstrating how this material created the intellectual basis for the origin of pathology as a discipline in America.

The literature on the history of pathology in the first quarter of the 19th century focuses on developments in Paris, France, with minimal attention on the origin of the specialty in America. Considering its influence, insufficient attention has been focused on A Treatise on Pathological Anatomy, the first North American textbook of pathology, published in Pennsylvania by William E. Horner in 1829. Several authors give credit to another textbook published 10 years later by Samuel D. Gross because of its wide circulation in America and Europe in the following years. Horner’s textbook, however, is a monograph that already contains an accepted organization and structure of knowledge in the field because the author interpreted it primarily from French publications and secondarily from his own experience. Although the book is a seminal work in the history of pathology in America, Esmond Long in an article published in 1930 is the only author that discusses in some detail the contents of the Treatise in relation to 20th century knowledge. Long has also made brief accounts of the intellectual contribution of Horner.

Current historiographic standards demand that historic facts be interpreted based on conditions that were present when a book was written. Otherwise, authors create selection biases by unconsciously choosing information, which reduces the objectivity of the analysis. The Treatise, this article uses a contemporary historiographic approach, which increases the objectivity. This style allows for an understanding of the influence that the knowledge in the Treatise may have had on the origin of pathology as a discipline in America and on the learning possibilities existing in pathology in 1829. The article includes additional data on the biography of Horner and describes the domestic social, professional, and educational conditions existent at the time of publication, allowing valid inferences on the likely influence of the textbook at that time.

Textbooks have been the traditional tools used by students and practitioners as primary sources of information because they contain current scientific developments. Horner’s textbook contains the structure and organization of prevalent educational knowledge and is connected with the scientific ideologies (theories, ideas) of the time. Therefore, even though not all-inclusive, his textbook offers the foundational principles and ideas necessary to understand certain aspects of the intellectual...
origin of pathology as a discipline in America. Additional contextual information suggests the likely effect of the *Treatise* on the practicing medical community.

**WILLIAM E. HORNER: THE PERSON, THE CIRCUMSTANCES, AND HIS BOOK**

Horner was born in Warrenton, Virginia, in 1793. After participating in the War of 1812 as a surgeon’s mate at the Canadian front, he returned to Philadelphia, Pennsylvania, and graduated with a medical degree from the University of Pennsylvania in 1814, at age 21 years. In 1816, he joined the faculty of that university, beginning his career as an anatomist. Horner published 2 books on this subject and several articles in the *American Journal of the Medical Sciences*, in which he made important contributions to the knowledge of human anatomy. He became chair of the department of anatomy in 1832 and held the position for 22 years. Although lecturing was not his strength, he was highly appreciated by his students because of the quality of his dissections and his pious personality. In 1822, Horner was appointed dean of the medical school, a position that he held until 1852. During this tenure, he continued to practice medicine and surgery successfully, a combination of anatomist-surgeon, which was common in those years. Horner was not a pathologist in the modern sense of the word, but he developed expertise as a dissector in postmortem examinations. In Philadelphia, Pennsylvania, he was not a pioneer but an anatomist-surgeon who, as an educator, foresaw the importance of anatomic pathology for the future of medicine.

Socially, America, at the time of Horner’s publication, was evolving into a powerful, dynamic, business-oriented society. Following the War of 1812, the American people began the process of acquiring a national identity. The victory against the British by General Andrew Jackson at the battle of New Orleans in 1815 continued this development, and the outcome was nationalism, whereby Americans were considered as belonging to a republic that was neither England nor a particular state. This nationalism was increased by an industrial revolution that was transforming an agricultural society into a manufacturing society. The transformation was supported by another revolution in transportation and by an influx of immigrants. America—a relatively small country of approximately 13 million in 1829—was also beginning an era of geographic expansionism.

Horner’s book was written when Americans were interested in building a new society on different principles than those extant in Europe. They were under the influence of capitalism, religion, and politics, with science not foremost on their minds.

Professionally, medical practitioners offered treatments that often proved to be ineffective, such as bleeding, emetics, and cathartics. These treatments frequently killed rather than cured, and the approach of medical practitioners was reminiscent of a modified humoral theory of disease. The contribution of the profession to society, therefore, was minimal. Medical practitioners were not adequately compensated, and their socioeconomic conditions were adverse. Such was the low status of the profession and its political influence that, in the 1830s and 1840s, many state legislatures eliminated licenses to practice medicine. Americans chose to believe more in common sense than in science. Domestic therapies were published in periodicals and almanacs, and the general population considered disease to be a consequence of sin. Physicians also had competition from other schools of thought, including Thomsonians (botany), homeopathic physicians, and eclectics.

Educationally, the academic conditions in Philadelphia, Pennsylvania, have been described by Shryock. Medical education was poorly delivered, with the exception of a few institutions, including the College of Physicians and Surgeons (New York, New York), Harvard University (Cambridge, Massachusetts), and the University of Pennsylvania (Philadelphia). Physicians in Horner’s times, therefore, were poorly trained and lacked specialized knowledge. For example, the nature of disease was not explicit in their minds, causing erroneous assumptions, such as the belief that cholera was not contagious.

Teaching of pathology as an independent discipline did not exist; it was considered part of anatomy. This precluded the existence of professional pathologists and its emergence as an independent science. Rather, pathology was taught as part of the *Institutes of Medicine* (more or less corresponding to the basic sciences of today), the *Theory and Practice of Medicine*, and other medical subjects. Medicine remained dominated by the speculative systems of John Brown from Scotland and the American Benjamin Rush, with French pathology only beginning to make inroads in America. Because of these challenging educational circumstances, the *Treatise* may have had limited circulation at that time, but it already contained the fundamental principles important for the foundation of pathology as we know it today.

Horner died in Pennsylvania in 1853, most likely without ever envisioning the importance of his work. His motivations and intentions were grounded on personal experiences as an educator and practitioner. As an educator, he regarded pathology as anatomic in nature and, like physiology and surgery, as one of the 3 pillars of medicine. Horner considered medical practice without pathology to be unscientific and illustrated this importance in its application to criminal jurisprudence, a field known as *anatomia forensis* in Germany. Horner emphasized the important contribution of the autopsy to knowledge when compared with the limitations of vivisection. As a practitioner, he wanted to provide a guide to physicians because pathology was viewed, in his opinion, as “comparatively strange to the mass of medical men” in America. This was because medical colleges, including the University of Pennsylvania, had ignored teaching on the subject. He attributed its lack of popularity to the revulsion produced by body dissection and the intense labor associated with the procedure. There were no professional pathologists, only practitioners who had peripheral interests in performing autopsies. Horner contrasted this situation to the advanced developments in the field in Europe.

The influence of European literature on the writing of the *Treatise* is undeniable, in particular, the French influence. This is not surprising because Horner had visited Paris, France, in 1821; Creole physicians in New Orleans practiced French medicine since the previous century; and numerous American students went to France rather than Britain for training. A quantitative evaluation of the sources that Horner mentioned in the footnotes gives an estimate of such influence. Of 247 references, 193 were French (78%), 28 (11%) were British, and 26 (11%) were American. The 4 French authors
mentioned most frequently were Laennec (52 times), M. Gendrin (25 times), Rostan (20 times), and Bichat (19 times), amounting to nearly two-thirds of all French authors referenced (60%).

Organization and Structure of the Knowledge Contained in the Treatise

_A Treatise on Pathological Anatomy_ was published by Carey, Lea, and Carey in Philadelphia, Pennsylvania, in 1829, and was written when tuberculosis and malaria were endemic in North America, between the yellow fever and cholera epidemics of 1822 and 1832, respectively. The book contained 460 pages, 4 plates of illustrations, and an extensive index. Its content was organized into 25 chapters. (Table 1) For the purpose of our analysis and interpretation, such content was thematically arranged into the following sections: practice of hospital autopsies, fundamental concepts, cause and nature of disease, general effects of disease in the body, and effects of disease in particular body organs.

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Practice of Hospital Autopsies in Horner’s Times

A description of the conditions in the practice of autopsies in the first third of the 19th century helps contextualize the qualitative aspects of the _Treatise_. The conditions were found in the reports of 48 autopsies, clustered in separate chapters of the book, illustrating the pathology of the abdomen, thorax, and nervous system. By describing these protocols, Horner left us a first-hand report on the practice of autopsies, including their clinical importance and the use of ancillary techniques. Reports are composed of clinical presentations, autopsy findings, and clinicopathologic correlations, although frequently comments on the latter were short or nonexistent. On occasion, no conclusions were reached, and the author admitted that, “pathological anatomy is not sufficiently advanced, to throw light upon every case of death.”

Horner performed autopsies on his own patients and on referrals from other practitioners. Previous approval of the family was required, and patients’ names were recorded only if the body came from the Alms House (forerunner of the charitable hospital), not in private cases. Practitioners were routinely present at the autopsies, which were usually performed 24 to 48 hours after death. There was no refrigeration of corpses, and weather conditions were always reported as either cold or warm. Consequently, the presence or absence of decomposition of the body was routinely described.

Autopsies were performed partially or completely, depending on the clinical questions. Partial autopsies included cases limited to the head. An example of an examination technique is illustrated in the handling of medulla spinalis. Horner described, “... after its membranes were peeled off, [it] could be divided from one end to another into an indefinite number of strings or cords, running parallel with one another like the fibres [sic] of a piece of white oak. I imagine that this test will be found to prove its healthiness when there is a doubt of its being too hard or too soft.”

Measurements during autopsies were inconsistently applied. For instance, sometimes only an estimation of size...
was used (“at least one half beyond its common size,” 4p313) “nearly twice the natural size,” 4p314). At other times, the following units were used: lines, ounces, drachms, inches, etc.1 Chemical tests were part of the protocol as illustrated by the following description of an eye tumor, “… had the consistency of thick glue, when permitted to cool after being boiled. It was principally albuminous, as it coagulated, and became opaque on immersion in sp. wine.” 4p486 An anatomic museum to exhibit interesting specimens was also in existence.4

The importance of postmortem examinations in clinical practice was also evident in these autopsy reports. Two types of pathology were described in this material: infectious and tumoral. Examples of cases were acute peritonitis, gastrointestinal tumors, tuberculosis, hyper- trophy and enlargement of the heart, meningitis, and tetanus, among others. One of these cases, a description of a boy with tetanus, was published in the American Journal of Medical Sciences, vol. 5, p. 321, by the referring physician.4p412 The importance was also illustrated in a case of a strangulated inguinal hernia whose diagnosis was missed at the time of surgery because of the highly located obstruction. Findings, however, were clear at the time of the autopsy.4pp209-210

Fundamental Concepts in Pathology

Fundamental concepts delineated throughout the Treatise define the framework of knowledge as interpreted by Horner. These fundamentals were relevant to medicine in general but important to pathology in particular. As a clinician, Horner understood the importance of pathology in practice, and as an anatomist, he understood its significance to medical education.

Given the importance attributed to European developments, Horner made a brief review of the history of pathology on that continent. In that historic review, he referred to the novel concept of “tissue,” developed by Bichat and G. Dupuytren, and whether the attempt was to replace the concept of “organ,” introduced by G. B. Morgagni. According to Horner, Bichat “adhered simply to the nature of the altered texture and to its symptoms, and thereby produced a complete and detailed classification of organic lesions.” 4p313 Therefore, it was not a concept developed because of microscopic observations, but a gross concept based on tactile analysis. Horner then mentioned a series of authors who benefited from this idea, men like G.L. Laennec, G. Bayle, M.R. Andral, etc. He also referred to M. Broussais, who applied the concept to the phenomenon of inflammation.4p313

Horner focused on the new concept of “tissue” by discussing its importance in medical practice. According to him, this concept was significant because it was an organizing principle that put order to the numerous and sometimes confusing descriptions made by gross observation of organs alone. Up to that time, there was neither systematization nor consistency of medical facts. Horner indicated, “The masterly and brilliant idea of Bichat of the elementary tissues of the body” 4p313 came to resolve an existing confusion introduced by Morgagni in Seats and Causes of Disease.21 Horner considered Morgagni’s work confusing because of the writing style and the topographic division of diseases into head, thorax, belly, chirurgical, and universal. In his opinion, this classification system was unsatisfactory because body systems were not recognizable.4p313 Therefore, he replaced Morgagni’s classification with 2 categories of diseases using Bichat’s new concept. The first, called organic, represented those diseases that had lesions in the tissues of one or more body organs. They were the ones studied by anatomic pathology. The second, called nervous, included diseases with no demonstrable lesion to the naked eye.4 They could not be studied by pathology. According to Horner, nervous diseases were closely connected with physiology, which he interpreted as signs and symptoms and not function.4 What Bichat’s tissue concept did, in his opinion, was to replace “a deranged texture of organs as a cause of disease.” 4p313

Horner, consequently, considered that European developments in pathology had contributed to replace medical theories based on speculation with a new conceptualization of disease. Evidently he was referring to the medical systems so influential in America in those years and, in particular, at the University of Pennsylvania, for example, those by J. Brown and B. Rush, and in particular, the latter.4 Conceptually, Horner concluded that, “The modern pathologist has ceased to consider disease as an independent existence, …; and whenever its name is mentioned, he invariably associates with it the existence of a change or lesion in the structure of some part of the body, which, in fact, is the disease itself.” 4p313 For him, “… disease implies a loss of equilibrium in the actions of the body.” 4p313 Clinically, Horner dealt with disease extensively (ie, causes, progress, termination, diagnosis, and treatment), even discussing “cholera infantum” as a model of disease.4pp171-190

Sympathy and metastasis were clinical phenomena used by Horner to better understand disease processes. He defined sympathy as a process whereby “Each organ of the body exercises a marked influence upon the others, which becomes very obvious in disease.” 4p313 According to the French authors Broussais and Th. de Bordeu, the channels of sympathies were the nerves or the blood vessels. Closely related to sympathy was the concept of metastasis, which referred to an initial symptom that disappears from one part of the body only to reappear in another.4p313

Horner used the concept of sympathy to bring forward the idea of “vitalism” that explained his approach to pathology. For instance, he expressed, “if the [inflammatory] tumefaction goes on regularly increasing, the sympathies of other parts of the body are strongly excited, ….” 4p313 He ascribed “shivering” to a concentration of vital powers in body organs and “putrefaction” to the abandonment of the vital condition from the solids of the body.4p313 Death occurred when vital powers abandoned the periphery of the body and concentrated into the heart and fluids.4p313 As a follower of Bichat, his belief in “vitalism” was not surprising.22

Cause and Nature of Disease

Another thematic section in Horner’s text focused on his conceptualization of etiology and pathogenesis. In causality, he was descriptive only, not analytical. Once connecting cause with organ damage, Horner concluded that the main contribution of anatomic pathology to medicine was the concept that disease consisted of alterations of body tissues because of irritation. In this theme, he offered a contemporary view of the organization and structure of scientific knowledge giving us a baseline under which future developments in pathology in America could be referred to for comparison.
Horner considered the “etiology” of disease a process involving the synergistic interaction of the environment, agent, and the susceptibilities and organs of the host. The agents were physical in nature, presented in the environment (eg, air, water, light, food), and acted when applied in an excessive or diminished degree. The host, depending on her or his habits, could present an increased or decreased susceptibility when in contact with the agents. One or several organs could be affected, and they would explain signs and symptoms of disease.

Horner’s understanding of pathogenesis was compatible with the idea that “diseases consist in alterations of the tissues of our bodies.” To address pathogenesis, he began by offering a classification of diseases obtained from the literature, and dividing them into 13 classes. Following Broussais, he only took the first class for explanation, that is, diseases due to “irritations.” Irritation had to be distinguished from “excitation,” which is a property of healthy organs. He understood that the degree of irritability of the organs played a complementary role to produce disease. When irritation occurred, Horner proposed that fluids started moving toward the interstitial tissues, but organs continued functioning normally. Later, the irritation affected the functioning of the organs and became a morbid irritation that would be followed by organ decomposition. Irritation always began as a local phenomenon but could extend to other organs by “sympathy.” Following French authors, Horner concluded that this analysis was “physiological medicine.”

### Effects of Disease on the Body in General and on Organs in Particular

Horner’s classification of the effects of “irritation” in the body, that is, “body tissue reactions,” was because of a combination of autopsy findings and clinical signs and symptoms (Table 2). Such reactions were inflammation, subinflammation, hemorrhage, nervous, nutritive, and secretory. He defined inflammation or phlegmasia as the most frequent and “where the seat of the irritation becomes painful, warm, swollen, and red from the increased afflux of blood into its capillary system.”

Subinflammation occurred when there was an afflux of the white portions of the blood. It was produced by the same causes as inflammation, and most frequently followed it. The hemorrhagic form resulted from discharge of blood in the affected part. It was the consequence of a predisposition of the body characterized by a well-developed arterial system that responded quickly to nervous impulses. The reaction was called nervous when there was only pain. At postmortem examination, a nervous irritation of short duration had no observable changes. In “neurosis” of long duration, changes included hemorrhage, subinflammation, suppuration, resolution, or gangrene. The tissue reaction was named nutritive when there was an excessive growth or nutrition of the part. Obesity and hypertrophy were examples.

Finally, a secretory irritation constituted an irritation manifested only by an increase of normal secretions.

Following the description of the tissue’s reaction to irritation, Horner applied these findings to diseases that occurred in the particular organs of the body, making the reactions the core knowledge of anatomic pathology (Table 1). This was the style under which future reference textbooks of pathology would be written in America and was the same one pioneered by Baillie in 1793.

Horner illustrated his descriptions with autopsy cases and mentioned experiments performed either by himself or others in his work. For example, in one experiment, he examined the normal mucosa of the stomach in a living rabbit and then saw the effect of corrosive sublimate on the mucosa. Horner did such experiments to clarify some of the findings he made in postmortem examinations.

In spite of his criticism of Morgagni, Horner used similar classification of the body’s constituents, namely, systemic, abdominal, thoracic, and nervous. Systemic referred to cellular tissue and corresponded to the organic material present between organs, especially fat, blood vessels, and nerves. By abdominal, he designated serous and mucous membranes. By thoracic, he meant the lung and heart; and by nervous system, he denoted the encephalon, medulla spinalis and nerves.

Illustrative of the particular influence of Bichat was Horner’s focus on membranes. Membrane was a variant of tissue that Bichat dealt with extensively in his book, A Treatise on the Membranes in General, and on Different Membranes in Particular. Bichat classified membranes into simple (serous, mucous, and fibrous) and compound (fibro-serous, sero-mucous, and fibro-mucous). Horner referred only to the serous and mucous ones. In this theme, he discussed extensively their healthy and diseased appearances, including the follicular inflammation of the gastrointestinal tract that he considered as the typical mucous membrane. In his description, Horner emphasized the importance of establishing the color of the gastrointestinal mucosa in postmortem examinations, something he considered “one of the most extensive fields for disputation, in pathology.” These examples illustrate the application of Bichat’s ideas as understood by Horner.

### CONCLUSIONS

This article evaluates the Horner’s 1829 publication A Treatise on Pathological Anatomy from the point of view of its organization and the structure of its educational knowledge. Fulfilling present-day historiographic standards, the content of the Treatise is contextualized by the
particular social, professional, and educational circumstances existing at the time of its publication. The resulting assessment indicates that the textbook contains the principles, ideas, and practices that created the intellectual basis of modern-day pathology and reveals the influence of French literature on the author. The data do not suggest extensive circulation of the Treatise, and one can only speculate on its immediate effect when considering the contextual evidence at that time. This may explain why the Gross’s Elements of Pathological Anatomy, first published in 1839, has been considered by some as the first textbook of pathology in America. However, one can conclude that the Horner textbook was already connected with prevalent scientific ideologies and that it offered a clear insight on the use and application of knowledge at the time of the beginning of pathology. For these reasons, the Horner Treatise is of such sufficient importance as a historic explanation of the intellectual origin of this medical discipline in America that its proper contribution should be recognized.

References