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Richard H. Shryock's "Empiricism versus Rationalism in American Medicine, 1650-1950": A Commentary

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I. Background and Basics

Although this landmark paper was published more than 50 years ago, it continues to be cited in the literature of medical historians such as John S. Haller Jr., Todd Savitt, Michael Dorn, and John Harley Warner. In addition, it still finds its way into numerous doctoral dissertations and master's theses. (The complete essay by Richard H. Shyrock [1893-1972] is available here.)[1] Described as "a principal figure in the professionalization of medical history which occurred in this country in the second third of the [20th] century,"[2] Shyrock is considered one of the first of the so-called "New Historians" who blazed a trail in the field by utilizing a multidisciplinary approach. Forty years after its publication medical sociologist Cullen Clark praised Shryock for creating an epistemological history of American medicine by shifting "his interest from the ends of science to the means employed, from an emphasis on fact to one on method." It is no wonder then that today Google citation analysis reveals that Shryock has found his way into more than 600 review articles. Shryock clearly has something important to say. It is, therefore, crucial to grasp the essential message of this 51-page article. Once Shryock's approach is understood some important facts emerge, which explains the amazing resilience of his essay. And, in the end, we understand not only *what* physicians did but *why* they did them.

Keywords: Richard H. Shryock, American medical history, empiricism, rationalism, medical theory and practice

[1] Thanks to the American Antiquarian Society for permission to link to Shryock's original essay: Richard H. Shryock, "Empiricism versus Rationalism in American Medicine, 1650-1950," *Proceedings of the American Antiquarian Society* 79 (1969): 99- 150. (PDF version courtesy of the AAS.)

[2] Whitfield J. Bell Jr., "Richard H. Shryock: The Life and Work of a Historian," *Journal of the History of Medicine & Allied Sciences* 29, no. 1 (Jan. 1974): 15-31, at 15.

Shryock wants to focus on American medicine's evolving perspective or mental framework for practice—what the French might call its evolving *mentalité*—in order to appreciate medicine's "philosophical and logical bent of scientific thought" for the past 300 years. As will be seen, Shryock digs into America's deep history, into the early colonial period.

We begin by asking, what exactly *is* the so-called "empirical" approach in medicine? The short answer is, it shows little interest in theory or even in cumulative knowledge and relies more on what it considers to be "commonsense" or, more accurately in Shryock's words, "trial-and-error gropings." Here Shryock is careful to distinguish the "extreme empiricists" from what he calls the "scientific empiricists." The former are those distinguished by their devotion "to learning from sense impressions but distrustful of all intuitions and theories"; the latter represent "observation guided by theories and whose theories are checked by observations."

On the whole, however, physicians tended to be rationalists, not so much by clear distinction as by emphasis. The clergyman Cotton Mather (1663-1728), who wrote extensively on medical matters, is an example. As Shryock explains, "He reported some real evidence, cited many authorities, and managed to combine mere dogmas with promising hypotheses. Notable, for example, was his advocacy of germ theory of infections." But Mather also tended to view all illness as caused by sin with germs merely serving as God's agents. In this sense prayer was not just petitionary, it was the medication as well. Thus, Mather constructed a medical practice defined within a larger theological context. For Mather, this was not yielding to superstition but rather acknowledgment of God's will and judgment in a world itself made reasonable by His providential care.

But among a new generation of New England's clergy/physicians (which were still numerous), things were changing. By 1755 physician-cleric Samuel Wigglesworth (1689-1768), for example, emphasized God's absolute authority over sickness and health to his Ipswich, Massachusetts congregation, but refused to connect illness directly with sin or moral turpitude. "In Europe and America," notes Patricia Ann Watson, "a subtle shift was taking place in the ways that people conceived of God's role in the natural world. With the rise of deism and Newtonianism during the Enlightenment, the work of His will was explained as natural law rather than as God's direct intervention."[3]

But if Mather's theological rationalism characterized the colonial period, it was countered by the empiricism of clergyman John Wesley (1703-1791) whose *Primitive Physick* (1747) became tremendously popular in America and eschewed medical theory for an inexpensive

[3] Patricia Ann Watson, *The Angelical Conjunction: The Preacher-Physicians of Colonial New England* (Knoxville: The University of Tennessee Press, 1991), 144.

and thoroughly "practical" home remedy-based medicine accessible to all. Wesley complained, "As theories increased, simple medicines, were more and more disregarded and disused; 'till [sic] in the course of years, the greater part of them were forgotten, at least in the politer nations." Casting himself as a "lover of mankind," Wesley began a long line of domestic health and healing in the New World designed to bring medicine to "the people." It was certainly an honorable effort, but its emphasis on trial-end-error at the bedside and practical application of easily obtained remedies (as much the product of old wives' tales as of genuine study) was not likely to bring much medical progress. Although popular, grassroots medicine held little promise. Here empiricism reigned supreme.

Nevertheless, "the prevailing tone" (Shryock's phrase) continued to be rationalism, it expressed itself in an increasingly secular context. In effect, the *reason* of men had replaced the *reasons* of God. Physicians like William Cullen (1710-1790) and Benjamin Rush (1745-1813) constructed, like Galen (129CE-ca.216) before them, elaborate theories of disease with even more elaborate nosologies of disease. For Galen, all disease was due to an imbalance of "humors"—blood, phlegm, yellow bile, and black bile—and restoration of health was a matter of "rebalancing" one or more of these humors. In fact, though useless from today's standpoint, Galen's naturalistic theory provided an avenue for American practitioners, anxious to keep one hand on their patients and one hand their Bibles, to employ empirical methods at the bedside without resorting exclusively to heavenly petitions in administering their care. Galen's belief in a vitalistic life force had a strong Christian appeal and his dogmatism resonated with a people steeped in exegetical absolutes. But one needn't cling to the ancients. For those interested in more contemporary ideas there was always William Cullen, whose theory of "solidism" explained disease not by a humoral imbalance or acrimonies, as the alchemist Paracelsus (1493-1541) thought, but by tension and relaxation of the solid parts of the body. Treatment, therefore, consisted of diminishing nervous tension or stimulating nervous activity. Whereas Cullen had made the nervous system (its *overenergetic* or *underenergetic* reactions) the center of his theory, Rush, his student and American counterpart, narrowed his focus to the responsiveness of the arterial system. Using fever as his paradigm, he said that a state of motion (or what he called the convulsive or irregular action) in the arteries was the sole cause of disease. Since the majority of illnesses appeared to him to arise from increased tension, he logically but overenthusiastically applied bleeding and other depleting remedies to his patients. When it came to rationalism in medicine there was something for everyone. Its problem wasn't logical incoherence, it was reliance on false premises and assumptions.

Thomas Jefferson (1743-1826) accurately captured the state of medicine in his day in a letter to physician Casper Wister (1761-1818):

> . . . the disorders of the animal body, and the symptoms indicating them, are as various as the elements of which the body is composed. The combinations, too, of these symptoms are so infinitely diversified, that many associations of them appear too rarely to establish a definite disease; and to an unknown disease, there cannot be a known remedy. Here, then, the judicious, the moral, the humane physician should stop. Having been so often a witness to the salutary effects which nature makes to re-establish the disordered functions, he should rather trust to their action, than hazard the interruption of that, and a greater derangement of the system, by conjectural experiments on a machine so sacred as human life. Or, if the appearance of doing something be necessary to keep alive the hope and spirits of the patient, it should be of the most innocent character. One of the most successful physicians I have ever known, has assured me, that he used more bread pills, drops of colored water, and powders of hickory ashes, than all of the other medicines put together. It was certainly a pious fraud. But the adventurous physician goes on, and substitutes presumption for knowledge. From the scanty field of what is known, he launches into the boundless region of what is unknown. He establishes for his guide some fanciful theory of corpuscular attraction, of chemical agency, of mechanical powers, of stimuli, of irritability accumulated or exhausted, of depletion by the lancet and repletion by mercury, or some other ingenious dream, which lets him into nature's secrets at short hand. On the principle which he thus assumes, he forms his table of nosologies, arrays his diseases into families, and extends his curative treatments, by analogy, to all the cases he has thus arbitrarily marshalled together. I have lived myself to see the disciples of Hoffman, Boerhaave, Stahl, Cullen, Brown, succeed one another like the shifting figures of a magical lantern, and their fancies, like the dresses of the annual doll-babies from Paris, becoming from their novelty, the vogue of the day, and yielding to the next novelty their ephemeral favor. The patient, treated on the fashionable theory, sometimes gets well in spite of the medicine. The medicine, therefore, restored him, and the young doctor receives new courage to proceed in his bold experiments on the lives of his fellow-creatures.[4]

Of course, the so-called "regular" physicians were not the only theorizers. Of those, none were so given to elaborate speculation than Samuel Hahnemann (1755-1843). His *Organon of the Rational Art of Healing* (multiple editions beginning in 1810) with its doctrine of "Like cures like"—*similia similibus curantur*—became a favorite of urban elites and celebrities, including even Queen Victoria. "One should apply in the disease to be healed, particularly if chronic," argued Hahneman, "that remedy which is able to stimulate another artificially produced disease, as similar as possible; and the former will be healed." He actually coined the term "*homeo*pathy" in 1807 to distinguish it from regular medicine, which he called allopathy—treating by opposites from the Greek *allos* (different or opposing).

[4] Letter from Jefferson to Wister, Washington, June 21, 1807, in *The Life and Selected Writings of Thomas Jefferson*, edited with an introduction by Adrienne Koch and William Peden (New York: The Modern Library, 1998), 534-535.

This system of medicine was brought to America in 1825 by Hans Burch Gram (1786-1840), not to be confused with Danish bacteriologist Hans Christian Gram (1853-1938) notable for his "Gram" staining techniques. His 1825 translation of Hahnemann's *The Characteristic of Homöopathia* introduced homeopathic principles into the U.S. Later the homeopathic movement in America was furthered by Constantine Herring (1800-1880) in 1835. Herring established a homeopathic academy in Allentown, Pennsylvania, and graduates from this school spread homeopathic doctrine across the new Republic east and west. The American Institute of Homeopathy was founded in 1844, becoming the first national medical society.

Given all this theorizing, where was practical (contra crude) empiricism hiding? It hid in gross anatomy. "Research in this field," writes Shryock, "was inspired by pure curiosity and also by some promise of utility, most immediately in surgery and obstetrics. Anatomists advanced knowledge through sense impression, and their findings were usually confirmed by other physicians. Simple descriptions were effective for most of this work, although sophisticated techniques, such as wax injections, were beginning to be introduced. In their research . . . anatomists had no need for theories; and they were rationalists only in so far as they deduced functions (physiology) from the structures actually observed. In due time, empiricism in normal anatomy led to similar approaches in morbid anatomy."

But changes were afoot.

II. The Paris Clinical School, 1794-1848—A Reaction Against Extremes in Medicine

With the executions of the Robespierre radicals in the summer of 1794, the Reign of Terror came to an end and the Thermidorian Republic began. It was *not* the end of the revolution, however, and in medicine it was just its beginning with innovative progressive physicians and chemists like Pierre Joseph Pelletier (1788-1842), Gabriel Andral (1797-1876), Marie-François Bichet (1771-1802), René Laennec (1781-1826), Pierre Louis (1787-1872), and Joseph Bienaimé Caventou (1795-1877).[5] It would last until around 1848 when "laboratory medicine" made its appearance in Paris under a new generation of men like Louis Pasteur (1822-1895), Claude Bernard (1813-1878), and the *Société de Biologie*.

[5] Caventou's placement in this earlier group is appropriate because almost all of his innovative work in chemistry was in association with his collaboration with Pelletier starting in 1817. All his important elucidations came between that year and the next four—chlorophyll and emetine in 1817, strychnine in 1818, brucine 1819, cinchona and quinine in 1820, and caffeine in 1821—by learning Pelletier's method of extracting the constituents of crude drugs with solvents and treatment with dilute acidic and alkaline solutions. After Pelletier's death he published nothing. See Wilfred Vernon Farrar, s.v. "Caventou, Joseph Bienamé," *Collins Biographical Dictionary of Scientists*, edited by Trevor Williams (Glasgow: HarperCollins, 1994).

It would come to have four main tenets: 1) observation of the patient; 2) routine autopsy (and with it the systematization of morbid anatomy); 3) statistical analysis; and 4) a shift in the balance of power between doctor and patient. These features of the Paris Clinical School would be tested not in books or in pamphlet wars or on the lecture podiums of medical schools, but in real-time clinical settings.

It began when François-Joseph-Victor Broussais (1772-1878) was challenged by the younger Pierre Louis, 15 years his junior. When Louis, father of medical statistics, questioned the efficacy of bleeding in TB and challenged Broussais' recommended bleeding regimen for this disease, he was demonstrating his skepticism for the extreme heroic measures of the rationalists and *at the same time* his doubts concerning excessive faith in empiricism. Instead, he could, by meticulously comparing mortality rates and recovery times, demonstrate that Broussais' bleeding had either no effect on the course of the disease or even a deleterious effect.

It might be assumed that Broussais was merely imitating the rationalists' passion for bleeding in obedience to some larger theoretic system similar to Cullen or Rush. But, in fact, this French physician is an example of the opposite extreme. Although he based his practice upon 468 propositions, the idea of "essential fevers" was rejected in favor of localized lesions that based disease upon "a noticeable physiological change in the organs."[6] Disease, for Broussais, was not foreign to the body but a change in bodily function; it was moreover an *empirically-based* change.

René Laennec, like Louis, with his auscultation and percussion along with his development of the stethoscope, opposed the rank empiricism of Broussais and became an outstanding representative of the Paris Clinical School. But he was, at the same time, surprisingly stuck in the past: an adherent of humoral pathology, constitutional disorders, and so-called "bilious" diseases. Thus, in Erwin Ackerknecht's words, Laennec presented a "Janus-faced scientific physiognomy" supporting—even impelling—the innovations of the Paris Clinicians (especially Louis and Andral) and concomitantly giving aid and comfort to the reactionary traditionalists in medicine.[7]

III. Extremes Persist

So in spite of the Paris Clinical School, grand systems still held on, such as in homeopathy. But the litmus test for these medical systems was, could they make meaningful

[6] Quoted in Erwin H. Ackerknecht, *Medicine at the Paris Hospital, 1794-1848* (Baltimore: The Johns Hopkins Press, 1967), 69.

[7] Ibid., 98.

contributions to surgery, gynecology, sanitary reform, or more broadly to fundamental fields in medicine such as physiology and bacteriology? "To none of these areas," says Shyrock, "had the systematists, as far as I can recall, made any major contributions. It is against this backdrop that one may view the changing image of homeopathy, from the dignity of a system to the status of a sect, as a turning point in medical thought."

But rank empiricism remained problematic as well. Good examples can be found in the *Principles of Medicine* (1832) by Samuel Jackson (1787-1872) and in physician/politician Elisha Bartlett (1804-1855), whose *Essay on the Philosophy of Medicine* (1844) carried a rejection of rationalism beyond the bounds of reason itself. Jackson attacked the dogmatism of his former teacher, Benjamin Rush, and ridiculed the so-called "evidence" drawn therefrom as so many impressions. He went on to praise inductive logic and wanted medicine to follow the physical sciences. But Bartlett went even farther. Bartlett distrusted even induction, and he claimed to trust only "facts." Apparently no intuition or even working hypotheses were allowed. This was *extreme empiricism*.[8]

It came to a head under John Hughes Bennett (1812-1875) who showed that the extreme empiricism of Bartlett and Jackson could be just as deceptive as the system-makers. We see this notion tested in the idea that the liver was the source of many illnesses, which, in turn, led to the second fundamental error, which was therapeutic: The notion that an imbalance of biliary secretion was the root of the problem and that this could be manipulated through the administration of calomel or some vegetable substitute. After recounting the many afflictions to which biliary imbalances could be ascribed, James Johnson (1777-1845), famed editor of the *Medico-Chirurgical Review*, spoke for the regulars by declaring, "As an internal medicine, there is none which so steadily increases and meliorates the hepatic secretion as some of the mild preparations of mercury."

This concept had been tested in animal experiments (unusual for their day) during the 1850s. The mounting evidence suggested that calomel, in fact, did not have any influence over biliary secretions, and in 1868 the Edinburgh Committee's report published by Dr. J. Hughes Bennett in *The British Medical Journal* thoroughly refuted this idea. By using fistula experiments on dogs, Bennett showed that calomel had no influence on biliary secretions. Nonetheless, the medical community's faith in calomel as a valuable cholagogue remained unshaken. The persistence of this stubborn adherence to calomel derived from physicians' attachment to tradition and over reliance upon empirical observation. The stools

[8] Not only is Shryock critical of Bartlett, but Lester S. King gives a scathing indictment of his empirical fixations in *Transformations in American Medicine: From Benjamin Rush to William Osler* (Baltimore: The Johns Hopkins University Press, 1991), 204-207.

evacuated by a patient dosed with calomel were greenish in color due to the presence of biliverdin. While this alone suggested increased hepatic activity, what the 19th-century physicians did not know was that this greenish color resulted not from more bile production but rather from the antiseptic action of mercury which did not allow the normal conversion of the bile pigment in the bowel due to its violent cathartic action. In short, the intestinal contents were discharged too rapidly for the biliverdin to convert normally into bilirubin.[9]

Unswervingly faithful to their medical forebears in bestowing the liver with major powers over the human constitution and convinced that their eyes were not deceiving them, regulars remained steadfastly devoted to mercurous chloride as a significant weapon in their armamentarium for years. This is an important point in considering American medicine because the innovations prompted by the Paris Clinical School—that as we have seen were both halting and incomplete in themselves—simply did not emigrate from France to the United States to any significant degree.[10]

IV. Balance Discovered (Mostly)

Balance was eventually achieved. The end of extreme rationalism and empiricism ultimately came about through peer pressure and ridicule. But how? One way is not covered by Shryock in any detail; that is the development of anesthesia, which combined rational hypothesis and the application of dose-response relationships with empirical outcomes. It might be regarded as the first application of scientific empiricism that led directly to a new standard of care and at the same time transformed another medical discipline—surgery.[11]

Certain other innovations became increasingly felt in medicine, and this was especially true with microscopy. Shyrock observes that "laboratory medicine could expand its descriptive

[9] This has been definitively described and confirmed in subsequent experiments in Louis Goodman and Alfred Gilman, *The Pharmacological Basis of Therapeutics* (New York: The Macmillan Company, 1941), 804.

[10] This is contrary to John Harley Warner's insistence in *The Therapeutic Perspective: Medical Practice, Knowledge, and Identity in America, 1820-1885* (1986) and *Against the Spirit of System: The French Impulse in Nineteenth-Century American Medicine* (1998) that these Parisian innovations had widespread influence in the mid-19th-century American medical scene. For a reply to this thesis, see M. A. Flannery, "What Did Doctors Really Do? In Search of a Therapeutic Perspective in American Medicine," *Journal of Clinical Pharmacy & Therapeutics* 24 (1999): 151-156.

[11] In America, the elevation of anesthesia to a new standard of care was accelerated by the exigencies of war. See Michael A. Flannery, *Civil War Pharmacy*, 2nd ed. (Carbondale: Southern Illinois University Press, 2017), 162-167.

horizons" to include minute—in effect, invisible—phenomena instead of gross observable data. The breakthrough that brought this about was Rudolph Virchow's cellular pathology. Virchow (1821-1902) was a German pathologist who graduated in medicine at Berlin and became a skilled, if not brilliant, microscopist. He identified leukemia in 1845. In 1850 Virchow became interested in cell theory. For the first time, he sought to apply new developing ideas about the cell to pathology. Virchow was the first to see disease as originating in cells, or as the response of cells to abnormal conditions; especially after 1850 with the introduction of the microtome for making their sections and dyes for selective staining.

Modern pathology begins with Virchow. Virchow is an excellent example of the triumph of scientific empiricism. But when germ theory arose, Virchow was *not* enthusiastic. Although germ theory too was a great outgrowth of scientific empiricism, Virchow saw disease as a continuous change in cells rather than as the result of an invasive agent. Now we know that disease can manifest itself in *both ways*.

The role of bacteriology became key in advancing medical perspectives beyond the extremes of empiricism and rationalism toward a new means of medical reasoning. As Shryock explains, "Medical bacteriology, about which there had been some reasoning for at least 150 years, was finally established during the 1870s. This achievement followed on the convergence of a number of trends: on general advances in microbiology, on observations of large parasites, on the postulates of Jacob Henle [1809–1885] (1840)," which were later refined by Robert Koch (1843–1910) and Friedrich Loeffler (1852-1915) in the last half of the 19th century,[12] "and on a shift in focus from the field (epidemiology) into the laboratory. Bacteriology demonstrated causal factors in infections—then the most feared conditions—and so revealed an exciting panorama of future prevention and cures. At the same time, these developments again encouraged 'ontologic' concepts: had it not turned out that diseases *were* real things, incarnate in microorganisms, rather than just bodily reactions to adverse stimuli?" Bacteriology answered with an emphatic Yes!

Medicine had obviously been plagued by system-makers—just look at the elaborate systems of Cullen, Rush, and Hahnemann. But Virchow and Pasteur were system-makers too. Shryock agrees, but with an important methodological distinction. Earlier system-makers, kneeling at the altar of unbridled rationalism, presented claims to final truth. For them no revisions were needed. But Virchow, Pasteur or Koch made no such claims; there was no final cause or cure. In fact, they opened the door to *further investigations*. The

[12] See esp. Koch, "De Aetiology der Milzbrand-Krankeit, begründet auf die Entwicklungsgeschichte des Bacillus anthracis," *Beiträge zur Biologie der Pflanzen* 2 bd., no. 2 (1876): 277-310.

pragmatic empiricisms of the anatomists were similar since their discoveries and elucidations were meant as adjuncts to further medical advancement and found their most useful applications in the morbid anatomy of the Paris Clinical School. As Shryock put it, "They envisioned acceptance of their syntheses in terms of scientific evidence rather than of authority or faith."

Often the sectarians increasingly marginalized themselves by emphasizing one cure or even one disease. At the same time, they could fall into the other extreme of crude empiricism by claiming no theory, no hypothesis about illness or healing, which is precisely what the Eclectics did. When some Eclectics questioned the "germ-crazed theorists" for promoting their "most cruel deception," they became little more than symbols of anachronistic medical nihilism, a position that finally caught up to them when the Eclectic Medical College in Cincinnati closed its doors to its last graduating class on June 7, 1939.[13]

The one area where unverified speculation seemed to reappear was in psychoanalysis, especially with Sigmund Freud (1856-1939). Whatever else might be said of Freud, Shyrock is right in concluding even in 1969 that "Freud is no longer, in American psychiatry, the great father-figure that he once was. It is recognized that, although psychoanalysis may leave a residuum of continuing value, there is much that is doctrinaire and exaggerated in its teachings." Writing in 2010, one observer has declared "The Fall of Freud" and argued, "The works of Sigmund Freud . . . [have] now been reduced to little more than a fringe belief system." A PubMed search finds that Freudian terms like *psychoanalytic* and others have "flat-lined for the past 50 years." This represents "a serious collapse of influence, given the enormous expansion in the amount of research being published over this time." According to Hans Eysenck's *Decline and Fall of the Freudian Empire* (1984; 2nd ed., 2004), psychoanalysis is a "bogus" theory, unscientific with no legitimate basis in observation or in formal experiment that has only the status of unverified speculation. The veracity of psychoanalysis is indeed testable, according to Eysenck, through traditional empirical means, and it has in all cases failed such tests. Eysenck calls Freud, "a genius, not of science, but of propaganda, not of rigorous proof, but of persuasion, not of the design of experiments, but of literary art." According to Eysenck, Freud set back the study of psychology and psychiatry by around fifty years. Eysenck argues that the dreams Freud cites in *The Interpretation of Dreams* (1899, 3rd English trans. 1913) do not really support his theories, and that Freud's examples actually disprove his dream theory. We need not be so harsh or heavy handed, but we can certainly see in Eysenck's analysis a critique aimed not just at Freud but ultimately at the kind of extreme rationalism outlined by Shyrock.

[13] See John S. Haller Jr., *Medical Protestants: The Eclectics in American Medicine, 1825-1939* (Carbondale: Southern Illinois University Press, 1994), 191-192, 243-246.

V. Summary and Conclusion

Shryock offers three penetrating analyses or approaches to Medicine:

1) crude empiricism

2) dogmatic rationalism

3) scientific empiricism

The progress from 1 and 2 to 3 was not linear nor immediate. We have a tendency to exhibit professional amnesia. Even in their heydays, crude empiricism and dogmatic rationalism could yield some basic truths and point the way towards future medical advance, but they were either ignored or forgotten by their own generation.

And this ultimately explains why scientific empiricism matters. "It was difficult," Shyrock explains, "to select the few worthwhile items until scientific empiricism, in the form of controlled experiments, took over. In consequence, promising remedies or procedures were sometimes ignored or later lost, because they did not stand out amid a chaos of claims."

Both extreme empiricism and dogmatic rationalism tended to discourage research. For strong—even radical—empiricists no research project could really be launched in an atmosphere of distrust towards *any* and *all* hypotheses. After all, no research can ever proceed without a hypothesis to test. Conversely, the dogmatic rationalists presented themselves as absolute truth. After all, if the theory is pure truth it is really a final solution and nothing further need be tested.

But when the empirical and the rational were blended, real progress could begin in medicine. This occurred when medical reformers "in the second half of the [20th] century abandoned their predecessors' trust in the judgment of experienced clinicians. In its place," writes Harry Marks, "they offered an impersonal standard of scientific integrity: the double-blind, randomized, controlled clinical trial."[14] But the groundwork had already been prepared, and we see this in the development of modern pharmacology. The application of receptor models to explain drug behavior preceded accurate knowledge of receptors by many years. But John Newport Langley (1852-1925) and Paul Ehrlich (1854-1915) introduced the concept of a receptor that would mediate drug action at the beginning of the 20th century.

[14] Harry M. Marks, *The Progress of Experiment: Science and Therapeutic Reform in the United States, 1900-1990* (Cambridge: Cambridge University Press, 1997), 3.

So we have here the development of what I call the therapeutic equation: a testable theory put into an equally testable etiological concept, then transformed into a therapeutic modality, and finally released as a treatment. The second part of the equation is at least as important as the first. It is not enough to have a testable theory and a testable cause of a disease; an effective therapy must be discovered and a reliable treatment applied in a suitable mechanism and/or dosage form. These are rarely the work of one person, but usually involve increasingly large collaborations. That is certainly true if the pathbreaking 1929 article "On the Antibacterial Action of Cultures of a Penicillium" by Alexander Fleming (1881-1955) is considered, then the discovery of that article by Ernst Chain (1906-1979) and his collaboration with Howard Florey (1898-1968) in 1935, and their joint publication in the *Lancet* on "Penicillin as a Chemotherapeutic Agent" in 1940. Finally, by 1943 and working with the pharmaceutical industry they were able to produce enough penicillin to provide an effective therapy, and it was first used to treat burn victims of the Boston Cocoanut Grove fire on November 28, 1942. All the while working with Jasper Kane (1903-2004) and chemists at Pfizer to develop the practical, deep-tank fermentation method for production of large quantities of pharmaceutical-grade penicillin. Finally, it was released for widespread allied soldiers' use involved in the D-Day invasion force on June 6, 1944.

And yet systemic disease is not quite a dead relic of the past. Today we understand that disease can be extrinsic and intrinsic, a product of environmental influences and intrinsic influences such as our genetic make-up and our allele group, that distinctive ancestral grouping with its own ancestral inheritance along with an associated distinctive clustering of chromosomes that define ethnic predisposition to and immunity from certain diseases. Genetic medicine has brought a return to systemic concepts of disease, albeit in drastically different form. It is no longer systemic "humors" or "solidism" or corpuscular "tension" that plagues humanity but hereditary structures riding on our chromosomes. Yes, we become ill from foreign invaders but illness *also* comes from within. We are systemically haunted by our past.

But that's not all. If the end-game of all this is to increase life expectancy in some appreciable way, we have to look at a range of factors. If life expectancy in 1860 was under 45, we don't see a tremendous increase 40 years later. We do see a surprising dip just prior to 1920 due to the so-called "Spanish" flu pandemic of 1918 (more accurately the H1N1 virus) where an estimated 40 million died. In the fall of 1918, for example, this flu killed 11,000 people in Philadelphia in a single month.

But longevity rebounded, and it rebounded dramatically. If we ascribe it to antibiotics we need to explain the upward longevity curve *before* their widespread availability in the mid-1940s. By far the most important factor is the shift from acute illness to chronic disease, or

in other words the change from mortality to morbidity as the principal factor in the public's health.[15] A variety of factors were involved, but clearly the fact that improvements in sanitation and public hygiene were widely felt after 1900 played a role. One thing seems incontrovertible, it was *not* due to strictly medical therapies. Paul Beeson (1908-2006), for example, examined the therapies recommended in Cecil's textbook in 1927 and determined that most of the recommended therapies were ineffectual. Something else was going on and it was riding the crest of scientific empiricism applied to public health.

Here we see the *indirect* impact of this methodology. If Pasteur and Koch's work was the product of scientific empiricism then we can see how they opened up questions not only of disease etiology but also of susceptibility and immunity. Many of the real discoveries in microbiology during the period took place not in medicine but in the Dept. of Agriculture with men like veterinarian Daniel E. Salmon (1850-1914) and epidemiologist Theobald Smith (1859-1934) studying diseases in animals. In fact, most of the early funding for medical research at the federal level came from the Dept. of Agriculture. But soon the medical department at the most progressive institutions would catch on and begin their own studies.

These innovations brought a revolution in medicine and, in particular, public health. No longer was public health the mission of a few zealous 19th-century crusaders like John Snow (1813-1858) and William Farr (1807-1883) of London and Lemuel Shattuck (1793-1859) of Boston, germ theory made public health and sanitation *everyone's* business, and it became a demand of citizens calling for public action. The key word here is "official" vigilance. This led to improvements in sewage, drainage, water purity, etc. Its impact on the shift from acute infectious mortality to long-term morbidity of chronic disease occurred precisely because people were living longer and they were living longer due to the benefits of the innovations that Pasteur and Koch put into public action.

To summarize, Shyrock's model of understanding the history of medicine in the Western health and healing traditions provides eight take-home points:

1) Medicine has been characterized by a historic tension between rationalism and empiricism;
2) Examples of the former include humoral pathology, solidism, and homeopathy;
3) Examples of the latter include Wesley's *Primitive Physick*, Broussai's empirical physiology, and faith in the therapeutic value of calomel;

[15] For an excellent discussion of this shift, see Gerald N. Grob's chapter 9, "The Discovery of Chronic Illness," in *The Deadly Truth: A History of Disease in America* (Cambridge, MA: Harvard University Press, 2002.

4) The Paris Clinical School, general anesthesia, the experimental method, and germ theory helped establish scientific empiricism;
5) Despite this development, medicine has been witness to periodic bouts of collective amnesia;
6) The supreme triumph of scientific empiricism came with a synthesizing of bacteriology and clinical pharmacology with a better understanding of the etiology of disease and how the body responds through receptor-site analysis;
7) Medicine began with ideas of systemic illness borne of extreme rationalism—no symptom could escape the clutches of these almost fanatical system-makers; it has been reintroduced this time with genetics (including genetic engineering) and more generally a broader holistic approach to human physiology borne of *scientific empiricism* now brought to the forefront with the increasing importance of chronic *systemic* morbidities such as diabetes, high blood pressure, heart disease, COPD, and a host of kindred maladies;
8) In returning to systemic disease concepts, medicine has not come full circle because that implies that we've ended precisely where we'd begun, and that is surely *not the case*. Scientific empiricism has made an important difference. In that sense this article reveals that medical progress is not a chimeral fancy. Progress is *real*.

The ethical implications of these points—genetic engineering, the role of Big Pharma, access to healthcare among disproportionately at-risk populations—are *not* addressed by Shryock, but they can hardly be recognized, much less discussed intelligently, without understanding them. While Shryock's "Empiricism versus Rationalism" may not be the end-point of historical inquiry in American medicine, it certainly seems to be an indispensable starting point for its thoughtful investigation. Here Shryock provides a framework that is timeless. He once wrote that knowledge of history "does not provide any sure guide to present decisions or policies, nor any certainty of the future. One can only say that, inadequate as it is, history is all we have by way of guidance—beyond the awareness of immediate circumstance."[16] But without that guidance it is fair to say we would all be at sea. In this one prescient article Shryock helps us find our moorings.

[16] Quoted in Whitfield (see n. 2),31.