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Richard Leblanc, *Fearful Asymmetry: Bouillaud, Dax, Broca, and the Localization of Language, Paris, 1825-1879*. Montreal & Chicago: McGill-Queen's University Press, 2017. ii + 255 pp. Tables, figures, appendices, notes, and index. \$39.95 CAD (cl). ISBN 978-0-7735-5132-9; \$31.96 CAD (eb) ISBN 978-0-7735-1328.

Review by Anne Quartararo, U.S. Naval Academy.

Richard Leblanc's *Fearful Asymmetry* is a detailed investigation of how physicians in mid-nineteenth-century France discovered the anatomical location of language in the human brain and why its localization in the left frontal lobe was an important scientific discovery. Through his study, Leblanc reminds us how medicine is sometimes an inexact science, but that discoveries gradually emerge from ongoing debate, controversy and the application of the scientific method.

*Fearful Asymmetry* is divided into four parts, each with specific chapters and followed by appendices, notes and a helpful index. In part one, "A Universe of Wonder within Our Tiny Globe," Leblanc provides some historical context from the era of the classical Greeks to age of René Descartes to show how different intellectuals became interested in brain function and human language. In chapter three, we encounter one of the key persons of Leblanc's study in Jean-Baptiste Bouillaud who Leblanc asserts was "one of the most renowned physicians of the nineteenth-century (p.24)." Bouillaud joined the Royal Academy of Medicine in Paris at the age of thirty in 1826. Like many of the physician-scientists of the nineteenth-century, Bouillaud presented research papers to the medical community at the Royal Academy based on clinical case studies. Besides his interest in the localization of language, Bouillaud had published books on encephalitis, arthritis and diseases of the heart (p. 37). As he conducted patient studies, Bouillaud pointed out that the loss of language did not always preclude "the ability to understand the meaning of words...and communicate non-verbally (p. 34)." Bouillaud seemed to open the door to a more complex understanding of language, one that hinted at the brain's capacity to adapt to adverse situations. Leblanc details the debates that Bouillaud's discoveries animated inside the French medical community; as he amassed more case studies, Bouillaud became more confident in his hypothesis that language was located in the anterior portion of both frontal lobes of the brain. Leblanc admires Bouillaud for his clinical method, but also argues that he "suffered from a surfeit of passion over reason. (p. 41)." A little more historical context would be appropriate here to connect the man with his practice of medicine.

In part two, "Descartes's Skull," Leblanc discusses developments in clinical theory about the brain from the perspective of Paul Broca, a surgeon who worked at the hospice of Bicêtre, and was a founder (along with eighteen other men) of the Anthropological Society of Paris in 1859. Broca's new "scientific" group was interested in studying human skulls to determine whether form or size affected human intelligence. Their measurement of skulls carried over into social analysis, as for example, Broca claimed that "a man having received an adequate education has a bigger skull than someone who is unschooled. (p. 59)." Broca then used his clinical observations to prove the inequality of races (p.60). Through the work of Ernest Aubertin (Bouillaud's son-in-law), Broca was challenged to look beyond his racial views of "skull

science” to study the localization of language in the brain. In April 1861 he brought to the Anthropological Society the case of a patient known as Tan (né Leborgne) who had been admitted to Bicêtre for an infection of his right leg. Tan was unable to speak or write, but he could respond to simple questions (p.71). After Tan’s death, Broca determined at the autopsy that he had suffered from a cystic lesion in the frontal lobe. His gradual loss of motor function as well as his inability to speak were both connected to the lesion. Thus, Broca began to suspect that the localization of language was indeed in the frontal lobe. Broca would create a scientific term for Leborgne’s brain—*aphemia*—in which a physical defect prevented a person from speaking (p. 75). However, without a critical mass of subject cases, Broca refrained from making the leap to a new paradigm about the localization of language (p. 86). The last key figure in the debate over language and brain function was Gustave Dax, a physician from Sommières (near Montpellier). Gustave Dax drew on the observations of his father, Marc (also a physician) to argue that language was localized in the frontal lobe. Known as Dax’s Law, the doctor concluded that “not all illnesses of the left hemisphere must alter verbal memory, but that when this memory is altered by an illness of the brain, the cause of the disorder must be sought in the left hemisphere, and that we must look there even if both hemispheres are affected. (pp. 92-93).” Eventually, Gustave Dax was able to publish (in 1865) his findings in *The Weekly Gazette of Medicine and Surgery* after his manuscript was rejected by the Academy of Medicine and the Academy of Sciences. The medical community could not assuredly resolve the controversy over the localization of language. Though Broca was aware of Dax’s theory, he did not yet think that he had sufficient evidence from case studies to identify the location of language in the brain with scientific certainty.

In part three, “A Singular Law,” Leblanc continues to discuss the controversy over language localization in the brain. The debates from the Academy of Medicine in the mid-1860s were on-going and sometimes heated among physicians who each claimed a principled stand. Besides Dr. Bouillaud (who declined to support either Broca’s or Dax’s views on language), the ideas of Armand Trousseau (a respected professor of medicine and practitioner at the Hôtel-Dieu) tried to assemble the data with case studies to determine which line of reasoning about the localization of language was the most theoretically defensible. In the end, Trousseau concluded that Bouillaud’s theory was more “generally true (p.134),” because it was broader in scope than the theory presented by Dr. Dax. Another prominent figure in the discussion was Jules Baillarger who had been studying the human brain and its “layering of cortical neurons (p.141).” Dr. Baillarger was inclined to support Marc Dax’s findings about language location and referred to Dax’s discovery as “a singular law (p.143).” The paradigm of localization of language was now taking shape inside the French Academy of Medicine.

In part four, “The Critical Stage,” Leblanc continues to follow the career of Paul Broca who was collecting more case studies of patients with language impairment. At the Anthropological Society, Broca presented his idea that “language can be represented, in whole or in part, in the right hemisphere if damage occurs to the left hemisphere *in utero* or in early childhood (pp. 151-52).” Broca, who seemed truly interested in the rehabilitation of his patients, determined that adults who had lost the use of spoken language were learning to speak again by a different process than what was normal in childhood. He was the first physician to explore the connection between left or right handedness and the localization of language. Despite his clinical discoveries, Broca was passed over in 1868 for a seat at the Imperial Academy of Medicine. He lost the vote to Jean-Baptiste Bouillaud. Leblanc points out that only in the second half of the twentieth-century in the work of Brenda Milner and Theodore Rasmussen was the concept of the use of right or left hand connected to speech in the human brain (p. 154). Broca had apparently been ahead of his time. Leblanc also notes that Broca in 1877 gave a rather uncharitable rendering of why Dr. Marc Dax’s medical memoir on language impairment remained unpublished; Broca maintained that he lacked the “courage” to defend his scientific hypothesis at a medical conference (p. 204). But in reality, Marc Dax could not defend his medical discoveries because he died suddenly after writing his memoir. It would be useful here to learn more about how intellectual and personal biases might affect the scientific method through the case of Paul Broca.

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Richard Leblanc's *Fearful Asymmetry* is a very detailed study of the debates between clinicians of the human brain in mid-nineteenth century France. At times, Leblanc seems content to use medical terminology rather than explain key ideas in a more accessible way. The social and cultural context of some of these debates would enrich this book; we could learn more about the men who committed their entire lives to clinical work (including many hours conducting autopsies). Leblanc could also draw out some of the larger themes from his investigation: how the scientific method was tested by case studies and how competition among physicians affected skepticism or acceptance of a new paradigm about the localization of spoken language. *Fearful Asymmetry* is full of primary sources and a good rendering of secondary literature. The reader will find that Richard Leblanc's endnotes provide a clear trail of evidence. Leblanc has presented us with an important case study in the science of the human brain; the difficult clinical work of these mid-nineteenth-century physicians is now accessible to historians and scientists of the twenty-first-century.

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