

# UC San Diego

## UC San Diego Previously Published Works

### Title

Curating aphasia: Pierre Paul Broca's Museological Science

### Permalink

<https://escholarship.org/uc/item/303646g7>

### Journal

Interdisciplinary Science Reviews, 38(3)

### ISSN

0308-0188

### Author

Gere, Cathy

### Publication Date

2013-09-01

### DOI

10.1179/0308018813z.00000000047

Peer reviewed

# Curating aphasia: Pierre Paul Broca's Museological Science

CATHY GERE

*University of California, San Diego, USA*

The importance is assessed of Pierre Paul Broca's curatorial activities in securing his achievement in the localization of the function of speech, which was a watershed moment in the history of neuroscience. Historians have debated why Broca succeeded where others had failed, citing cultural, political and personal influences, but what has been overlooked in these previous discussions is the importance of Broca's depositing the brains of his aphasic patients in a museum of pathological anatomy. Broca's success is thus attributed to him being a faithful practitioner of the so-called 'museological' medicine developed by his revolutionary predecessors in the hospitals of Paris.

1 KEYWORDS museological science, Pierre Paul Broca, brain function, speech loss, neuroscience history

## Introduction

The modern neurosciences began with an act of curation. On April 18th 1861, a surgeon named Pierre Paul Broca performed an autopsy on one of his patients. He sawed through the skull, cut through the pathologically thick dura mater, examined some pus under the microscope, peeled off the delicate pia mater, and cut out the brain entire. A few hours later he showed the brain to the assembled savants at the Society of Anthropology. Immediately after the meeting he placed it in an alcohol solution. With regular changes of fluid, the specimen began to harden, and after a few months it was ready for deposit in a museum of pathological anatomy, the Musée Dupuytren, where it can still be viewed today.

The patient in question had lost the ability to speak; a large lesion in the third frontal convolution of the left hemisphere is still clearly visible. By this act of preservation and display, Broca brought the principle of localization of brain function down from the realms of phrenological speculation to the ground of scientific debate. Others had argued the case for the localization of the function of speech with examples from post-mortem dissections; Broca provided material evidence for his fellow scientists to contemplate and discuss. Because the role of the museum in this important episode in the history of the neurosciences has not been fully appreciated, this study attempts to restore the Musée Dupuytren to its rightful place as the fulcrum of Broca's achievement.

## Museum science

'Broca's Area' was one of the territories conquered by the French Revolution. The political upheavals of the 1790s inaugurated, formalized, and institutionalized a new kind of knowledge practice, which has been dubbed by historians 'museological science' (Pickstone, 1994). This study sets out to show that Pierre Paul Broca, although working many decades later during the conservative Second Empire, was firmly in the museological tradition of his revolutionary forebears. Indeed, the identification of the third left frontal convolution of the human brain as the area subserving speech was one of museological science's most significant and enduring achievements.

Consider how abrupt the transformation of the key intellectual institutions of Paris was after the 1793 regicide of Louis XVI. All the collections that had belonged to the monarchy and the church came abruptly under the jurisdiction of the Revolutionary state and were rededicated to the people of France. The royal art collection became the Louvre Museum; the animals of the Versailles menagerie were turned over to a republic of professors at the new the Museum of Natural History; a deserted priory housed a new museum of science and technology. The treasures of the *ancien régime* were now in the trust of the state, and were reorganized in the name of the intellectual ideals of the Enlightenment. From elite diversions, these collections became systematic orderings of phenomena, with a view to universal and definitive knowledge of the human and non-human worlds (Pickstone, 1994, 8). Museological science involved collection, classification, comparison, and analysis. In natural history, to take one example, the methods of the museum quickly bore fruit in the form of passionate philosophical debates about the transmutation of species.

Most importantly for the history of neuroscience, medicine was also revolutionized along museological lines. In 1794, the hospitals of Paris were turned over to a cadre of radical physicians, to become warehouses for the systematic study of disease. Under the *ancien régime*, the functions of the prison, madhouse, orphanage and workhouse had all shared the same space in Paris's vast hospitals. After the revolution, the philanthropic and punitive dimensions of these institutions were separated from the medical functions; many new specialist hospitals were established; the wards were organized by disease type, and one patient per bed was made the goal of a newly centralized hospital administration. This was not so much with a view to improving patient care as for the sake of creating a new science of medicine, for which the tens of thousands of poor people in the hospitals of Paris would provide the raw material (Ackerknecht, 1967).

In accord with the empiricist leanings of the new generation of physicians, the Paris hospitals became centres of medical teaching. Before the revolution, medical education consisted of lectures in Latin based on ancient Greek or Arabic texts; physical examinations of the patients were cursory and superficial; dissections were vanishingly rare. Afterwards, students were trained on the hospital wards, making detailed examinations of the patients under the guidance of salaried professors of medicine, many of whom were military surgeons from the Revolutionary Wars. In keeping with the urgent exigencies of the battlefield, the emphasis was on hands-on experience: 'Little reading, much seeing and much doing will be the foundation of the new teaching', the report of the committee charged with the reforms declared (Ackerknecht, 1967, 32). Before the revolution, bodies for dissection had been in short supply. Afterwards, every patient who died in the hospital walls — and there were many — underwent an autopsy. 500 cadavers were at the

disposal of the Paris School of Medicine in its first year of operation, all compunction about dissecting human remains swept away by the new revolutionary order. This resource alone was sufficient to make Paris the world's leading city for medical education (33).

From dumping grounds for the insane, criminals, prostitutes and homeless of Paris's streets, urban hospitals became the birthplace of a revolutionary diagnostics, based on close physical examination, recording of symptoms, and autopsy. The key to the new approach was to correlate symptoms in the living with visible lesions on the internal organs of the cadaver after death. The paradigm disease, very common among the poor of the city, was tuberculosis. In 1816, René Laennec, a physician at the Necker Hospital invented an instrument for listening to his patients' thoracic cavity, which he called the stethoscope. In his textbook instructing students the new technique, he proposed a taxonomy of different chest sounds, which was juxtaposed with drawings of the tubercular lesions in the lungs revealed at autopsy. Training physicians to grasp the link between the sounds of the living breath and the post-mortem appearance of the lungs was the core of the museological analysis of TB.

## Musée dupuytren

In the 1830s, French museological medicine finally found expression in an actual museum, named for its benefactor, Guillaume Dupuytren, one of the most brilliant and celebrated of the first generation of surgeons to graduate from the revolutionary *École de Médecine* in Paris. Born into genteel poverty in 1777, Dupuytren was twelve years old when the Bastille was stormed, fifteen when the reformed School of Medicine was founded and only eighteen when he obtained — by competitive examination — the post of 'prosector of anatomy' at the school, charged with preparing the corpses for dissection. His thesis, published in 1803, asserted that pathological anatomy was the 'essential factor' in medical progress, underscoring the centrality of the post-mortem appearance of the bodies of the sick. Ambitious and quarrelsome, he worked his way up the hierarchy with steady determination, and by the age of 36 he had reached the pinnacle of the hospital administration, as chair of surgical medicine (Wylock, 2010).

In 1835, before reaching the age of 60, Dupuytren died. Originally, he had amended his will to leave some 20 000 francs to the Faculty of Medicine to create a chair of pathological anatomy in his name, but he was persuaded on his deathbed to change the terms of the bequest to the creation of a museum of pathological anatomy (Orfila, 1842). The museum was installed in the old refectory of the Cordelier Convent, where it brought together various collections that had been dispersed throughout the faculty of medicine. It grew rapidly: the first catalogue, compiled between 1836 and 1842, listed about a thousand specimens; by the late 1870s the museum contained over six thousand pieces (Abelanet and Saint-Maur, 1991).

The Musée Dupuytren was far from the first medical museum in existence. These institutions had begun to spring up in European cities in the mid eighteenth century, mostly associated with private schools of anatomy, and consisting of heterogeneous collections of wax models, anatomical specimens, herbaria, minerals, coins, works of art, and other sundry marvels (Alberti, 2011). The human specimens in these collections, however, were intended to display the characteristics of normal anatomy, and pathology had little-to-no

analytical part in this system. Writing in 1784, only a few short years before the French Revolution, anatomist William Hunter characterized the pathological specimens in his famous medical museum as a species of curiosity, grouped with 'rarities of every kind; such as, parts that are uncommonly formed; parts that are diseased; the parts of the pregnant uterus and its contents' (Hunter, 1784, 57). It was only after Paris medicine turned museological that this changed. Among the first museums of pathological anatomy was the collection at Guy's Hospital in London, assembled by the Quaker physician Thomas Hodgkin, who brought Laennec's stethoscope to Britain in 1822 and began to proselytize for Paris clinical medicine. When Hodgkin was appointed as the first lecturer in morbid anatomy and museum curator at Guy's in 1826, he instituted the Parisian method of clinical observation followed by post mortem dissection, extending it to the preservation and display of pathological specimens in the hospital museum (Alberti, 2011, 136–139).

At the Musée Dupuytren, which opened its doors less than a decade later, pathological appearances were also put at the centre of the analytical display. Each specimen was arranged under one of nine heading corresponding to an anatomical system, such as the bones, the nervous system, or the skin. Within each of these primary divisions, the collection was divided up into various types of pathology. The exhibits were labelled with the case history of the patient, followed by a detailed description of the signs of pathology to be seen in the specimen (Houel, 1878). The labels and the specimens exemplified the clinical method of correlating living symptoms and post-mortem appearance, and the Musée Dupuytren became the material embodiment of everything that Paris had come to stand for in medical education and practice.

## Pierre Paul Broca

Most of the labels under the specimens at the Musée Dupuytren identify the physician who performed the autopsy and wrote up the case. Among the roster of famous names is that of Pierre Paul Broca (known as Paul), a physician at the Bicêtre, a men's hospital in the southern suburbs of Paris. Broca was born in 1824, during the restoration of France's Bourbon monarchy, 'an Indian Summer . . . for ultra-reactionary feudal Europe' (Schiller, 1979, 11). He proved to be a confident and talented student and, despite harbouring ambitions to be an engineer, he was persuaded by his country physician father to take up medicine as a career. At the age of seventeen, he entered the School of Medicine and embarked on a rigorous curriculum in subjects such as anatomy, medical chemistry, and surgical pathology, as well as daily clinical rounds at one of the city's hospitals. After scoring well in the final examinations, he secured his position at the Bicêtre, about which he wrote in a letter home: 'a visit to the insane is like a descent to hell of the ancient epic poets. A man's insanity is not only an immense and hopeless misery of the present; it is also a whole tragedy lying in the past. . .' (29).

Broca may have grown up under the Bourbons, but his father instilled in him a steady commitment to republican ideals. In the 1840s, he became a contributor to a monthly sheet which boasted the old slogan 'liberty, equality, fraternity' across the title page; in 1848, he was swept up in the revolutionary ardour of the short-lived Second Republic; in 1851, he was bitterly disappointed by the *coup-d'état* of Louis Napoleon and the repressive

conservatism of the Second Empire. In his last examination in medical school, he displayed his loyalty to the first generation of revolutionary physicians by defending the view 'that there is no disease without a lesion. . .' (Schiller, 1979, 78). His adherence to this cherished axiom of pathological anatomy would turn out to be the conceptual foundation of his most famous discovery.

## Scientific phrenology

In 1859, Broca manufactured an outlet for his subversive opinions by founding a 'Society for Anthropology' devoted to the study of humanity from a biological perspective. The application to the government for a licence to meet was granted only on the condition that a plainclothes officer of the Imperial Police was allowed to be present at every session. The Society's discussions of the human species turned out to be politically anodyne enough, however, circling around some of the usual preoccupations of the historical sciences emerging in the mid-nineteenth century: language, race and head shape. In the spring of 1861, these threads all came together in a discussion of the relationship between brain size and intelligence. This quickly devolved into a general consideration of the doctrine of localization of brain function, still debated under the moniker of 'phrenology', the craniological system correlating mental faculties with the contours of the skull developed and popularized by Franz Joseph Gall and Johann Spurzheim at the end of the eighteenth century.

Among the Society of Anthropology members, the most passionate defender of the phrenological position was one Ernest Auburtin, the protégé, son-in-law and, on this occasion, faithful mouthpiece of Jean-Baptiste Bouillaud. Bouillaud was a rabble-rousing leftist physician who had served as Dean of the Paris Faculty of Medicine during the heady days of the 1848 Revolution. Like many fellow progressives and atheists, he had been drawn to phrenology as part of his commitment to a materialist view of the human condition. In the reactionary years after the fall of Napoleon I, phrenology had been systematically demolished by believers in the unity and indivisibility of the individual human spirit, an important plank of counter-revolutionary ideology (Goldstein, 2005). Bouillaud continued to champion the phrenological cause, however, especially in relation to the faculty of speech, which Gall and Spurzheim had located in the frontal lobes.

Bouillaud made three attempts to convince his colleagues of the localization of the function of speech. In 1825, he presented clinical evidence, combed through the casebooks of neuropathology coming out of the Paris hospitals and showing how often loss of speech and frontal lobe lesions were correlated. In 1839, he offered some experimental evidence in the form of a man who had shot himself in the head with a pistol and had a large gash over the frontal lobes, which when pressed caused speech to 'die on his lips'. In 1848, repeating his assertion that all cases of loss of speech that he had ever come across were found to have lesions in the frontal lobes, he offered a 500 franc prize to anyone who could disprove it (Schiller, 1979, 171–174).

Over and over again Bouillaud pointed out how often loss of function in the patients in the hospitals of Paris was decomposable into separate abilities. This was relatively uncontroversial when it came to basic motor functions. When only one limb of a neurological patient was paralyzed, for example, it was accepted that this meant each part of the body was controlled by a discrete section of the brain in the opposite hemisphere. But Bouillaud argued



that localization of brain function was true of 'intellectual' functions as well as physical. Even when it came to something as complex as the production of speech, 'the tongue and its congeneric organs can be separately paralyzed in the act of speaking. . .' (173). In the screed in which he offered the 500 franc prize he announced that '[a]t this very moment there is a patient at Bicêtre who has all the freedom of his intelligence and movements, but he cannot speak' (174).

It may have been this very patient, mentioned in passing by Bouillaud in 1848, who gained a place in the history books when he came under Broca's care in 1861. Monsieur Leborgne had been epileptic since birth, but despite disabling seizures had managed to get work as a shoemaker or, more specifically, the person who carved the lasts for the clients of a cobbler (Domanski, 2013). At the age of thirty, however, his disease had progressed, and he lost the ability to speak. A couple of months later, he was admitted to the Bicêtre, normal in every respect, except that '[w]hatever question one addressed to him, he always answered *'tan, tan'*, accompanied by varied gestures, by which he succeeded in expressing most of his ideas' (Broca, 1861, 61). He spent the remaining twenty-one years of his life at the Bicêtre. After ten years, he experienced weakening of the right side of his body, which progressed to full hemiplegia. For the last seven years of his life he was bedridden, and gradually lost his vision. When Broca first examined him he was suffering from the gangrene that would kill him a few days later.

Clearly realizing that this could be an important case to his anthropological colleagues, Broca interrogated the patients, faculty and staff of the hospital to get a fuller account of the progression of Leborgne's disease. He discovered that his patient — known as *'Tan'* after the one syllable that had to stand in for his whole vocabulary — was not a popular man, 'an egoist, vindictive and objectionable'. Broca, apparently moved by the poor man's predicament, speculated that these character defects might be 'due largely to his cerebral lesion' (Broca, 1861, 61). Importantly, because of his manifest intelligence, Tan was never considered insane, and was held responsible for his actions until the day of his death. Indeed, his untimely end may have been hastened by the relative intactness of his sanity: because he never soiled his bed, the sheets were changed only once a week, and the orderlies therefore failed notice the diffuse cellulitis for which, on April 11th, 1861, he was transferred from the chronic ward to the infirmary (Schiller, 1979, 183–184).

Reluctant to 'torment him by long interviews', Broca conducted a standard physical examination on M. Leborgne, testing his sensation and his movement, noting his poor eyesight, and his difficulty swallowing (Broca, 1861, 62). After this preliminary investigation, he attempted to ascertain the state of the patient's intelligence. As Tan had only his left hand with which to communicate, Broca asked him a series of questions with numerical answers. The patient correctly indicated the number of years spent at the Bicêtre by opening his hand four times and then holding up one additional finger. He also comprehended a complicated question about the sequence of his paralysis: '[h]e first made with his left index finger a short horizontal gesture which meant he had understood, then he showed successively his tongue, his right arm, and his right leg. This was perfectly correct. . .' (63). Overall, Broca found him to be intellectually somewhat impaired, but to have 'much more intelligence than it is necessary to talk' (64).

Leborgne died on April 17th 1861 and the autopsy was performed within 24 hours. The brain was atrophied, weighing only two thirds of the fifty-year-old male average. On the left side, a large elongated crater was filled with

fluid. This ‘long cavity about as large as a hen’s egg . . . reached backwards as far as the sulcus of Rolando. . .’ (66). Although the lesion itself was extensive, and the whole hemisphere was affected by diffuse atrophy, Broca reasoned that the symptom exhibited by the patient — loss of speech — must be associated with the area destroyed in the greatest depth, i.e. the third frontal convolution. In other words, his primary symptom was associated with the primary anatomical lesion. The progression of his functional losses — first the paralysis of his right arm, then his right leg, then the loss of sight and weakening of his intelligence — could be attributed to the progressive ‘softening’ of larger and larger areas of the left hemisphere.

Here, in plain sight, was the lesion that every good revolutionary clinician looked for to account for disease. This was museological medicine at its most philosophically profound, in which absence — the lesion and the aphasia — stood for presence — the intact brain and the faculty of speech — allowing the pathological to elucidate the deepest mysteries of normal function. The patient’s loss of speech indicated that his disease had eroded the part of the brain responsible for the very faculty that separated man from beast: language. Importantly for our present purposes, Broca did not cut into the brain itself, declaring: ‘I have not studied the deeper parts in order not to destroy the piece, which I thought should be deposited in the Museum’ (69).

A few short months later, Broca encountered a second patient, Monsieur Lelong, who had suffered a stroke one year before. This 84-year-old patient could say only five words, ‘oui’ (‘yes’), ‘non’ (‘no’), ‘tois’ (a mispronunciation of ‘trois’ (‘three’) which he used to represent any number), ‘toujours’ (‘always’) and ‘Lelo’ (a mispronunciation of his own name) (Dronkers *et al.*, 2007). At autopsy, Lelong was also found to have a lesion in the same region of the frontal lobe as that of the unfortunate Tan. Broca reported this to the Anatomical Society with an emotional flourish: ‘I will not deny my surprise bordering on stupefaction when I found that in my second patient the lesion was rigorously occupying the same site as in my first . . .’ (Schiller, 1979, 187). Such, however, was Broca’s scientific caution, that he attributed ‘to pure coincidence the absolute identity in the sites of the two lesions. . .’ (187). Carefully, he deposited Lelong’s brain alongside Leborgne’s at the Musée Dupuytren.

After Broca’s curation of these first two brains, he and his colleagues on the medical faculty began routinely to deposit the brains of aphasic patients in the museum. It is a testament to the number of indigent patients in the hospitals of Paris that by 1863 Broca mentioned fifteen aphasics who had been autopsied during the past two years and as many as twenty-five still alive (Schiller, 1979, 190). At this point, a novel phenomenon became apparent: in all the cases where damage to the third frontal convolution was correlated with aphasia, the lesion was only found on the *left* side. The existence of the collection — the persistence of the specimens through time, and the ability to compare them physically — revealed a pattern that went against all the commonly held assumption that the two hemispheres of the brain were as functionally symmetrical as the head that housed them (with its two eyes, two ears, two nostrils, etc.) (Harrington, 1987). Broca himself was taken aback by this strange phenomenon, calling the idea that the two halves of the brain do not have the same attributes ‘quite a revolution in the physiology of nervous centers’ (Schiller, 1979, 192).

In 1878, the curator Charles Nicolas Houel catalogued the entire collection of the Musée Dupuytren. His survey of the museum’s ‘*Lesions du Cerveau*’ amounted to a summary of the debate about localization at that point in time:



Nine pieces . . . are examples of lesions of the left third frontal convolution, and in all cases . . . aphasia has been observed. For one piece, number 71, where softening of the left sphenoidal and parietal lobes can be observed, there was a pseudo-aphasia. . . . Number 61 is an example of a lesion of the right third frontal convolution, in which aphasia was absent (Houel, 1878, 269).

By the late 1870s, the search was on for lesions corresponding to fine distinctions between spoken, written and sign language. This 'classificatory imperative', as the historian of neurology Stephen Jacyna has called it, (Jacyna, 2000, 94) is exemplified by catalogue entries such as the one describing the precise nature of the language deficit of the 'twenty-five year old brigadier of the 12 Cavaliers wounded by a sabre-blow to the head at the Battle of Buzancy on August 28<sup>th</sup> 1870'.

Interrogated, the patient understood the questions put to him, he seemed to want to respond, and, after some seconds of hesitation, made it understood by a sign that, despite wanting and trying, he could not speak. It was only with difficulty that he was able to add to his expressive gestures the syllables *oui* and *non*. Reading to himself and reading aloud were equally impossible; he signalled that he could not understand anything of the text which we put before his eyes. While he was able to copy the words nearly correctly, he copied them letter by letter (Houel, 1878, 271).

The punch line is provided by the description of the specimen: 'all the cerebral substance is perfectly healthy, except at the level of the third frontal convolution where a vast abscess can be observed' (271). In this one museum label, we can see classical pathological anatomy in action: the patient's symptoms are juxtaposed with a description of the visible lesion, a presentation faithful in every respect to the highest scientific goals of the Musée Dupuytren.

## Conclusion

For localization of the function of speech, the museum was an essential technology of investigation. The display and comparison of neurological specimens was eminently suited to the nature of the problem, precisely because the symptoms were not determined by the *type* of pathology, but by the *location* of the damage wrought. As Broca himself had noted in the paper on Leborgne, the manifest symptoms 'did not depend upon the nature of the disease but only on its seat, because the lesion was sometimes a softening, sometimes an apoplexia, sometimes an abscess or a tumour' (Broca, 1861, 55). Visual display of the gross morphology of the specimens was the ideal medium for making this principle apparent.

By the 1860s, this type of clinical medicine — based on careful observation of the living followed by meticulous dissection of the dead — had fallen from its pre-eminent place at the forefront of medical science. The laboratory had edged out the museum as the site where new medical knowledge was produced, Germany had usurped France as the preeminent nation for physiological investigation, and the scientific *avant garde* were engaged in the practice of animal vivisection. Spoken language, in all its complexity and controversy, however, was never going to be elucidated by means of animal experimentation. Since symbolic language was above all a human trait, and even the most zealous advocates of animal experimentation drew the line at 'human vivisection', localization of the function of speech was a puzzle that could only be approached by clinical and museological methods.

The fact that Broca was able to secure acceptance of the doctrine of localization despite the accumulation of much prior evidence both for and against has presented a puzzle for historians. Harvard historian of science Anne Harrington has speculated that ‘the triumph of localization theory under Broca probably cannot be understood by reference to the excellence of his clinical work alone, but must take into account a range of wider philosophical and sociocultural factors’ (Harrington, 1991, 208–9). In another place, she calls the acceptance of localization theory ‘a rich source of grist for the sociologist’s mill’ (Harrington, 1987, 49). Broca’s biographer, Francis Schiller, has attributed the failure of Jean-Baptiste Bouillaud to get a hearing for localization of speech to his ‘boiling indignation with so much lack of understanding, his rash wager, and the impassive sarcasm of his adversaries’. (Schiller, 1979, 174) Accordingly, Schiller credits Broca’s success to his cooler emotional temperature: ‘[w]hat had merely been a quixotic hobby-horse of Bouillaud’s suddenly became an entity, well defined both clinically and anatomically, by a man known for his cool thoroughness. . .’ (190). Historian of the neurosciences Stanley Finger has enumerated four factors ensuring that Broca would get a hearing: the detail in the written report, Broca’s scientific reputation, the fact that the third frontal convolution was not exactly where phrenology would locate the speech centre, and the ‘*Zeitgeist*’ (Finger, 1994, 38). Neurologists who have revisited the case more recently have faithfully followed Finger in this assessment (Pearce, 2009; Selnes and Hillis, 2000). Another recent neuroscientific text on aphasia follows Harrington in attributing Broca’s success to ‘greater political liberalization in France’ (Nadeau *et al.*, 2000, 9).

I want to suggest that these political, sociological, rhetorical, characterological, and cultural factors were outweighed by the persuasive power of a more straightforward development: Broca was the first player in this controversy to preserve and display his specimens in a museum, enabling his critics and his supporters alike to view for themselves the evidence for his claims. Moreover, Broca’s curatorial prescience has ensured that the debate about these particular cases continues to this day. At the beginning of the twentieth century, a former intern of Broca’s, a physician named Pierre Marie, launched an attack on the localization of speech based on a reexamination of the brains of Leborgne and Lelong; in 1984, the brains were subjected to computer-aided tomography scanning; in 2007, they were scanned using magnetic resonance imaging. This latest round of reexamination allowed the neuroscientists to digitally reconstruct ‘slices’ of both brains — a hi-tech version of the dissection that Broca had denied himself a century and half ago for the sake of posterity. They noted that the damage extended further into the brains of the two patients than Broca had realized, suggesting a revision of the nomenclature of ‘Broca’s aphasia’. The brains of these two individuals are still contributing to the basic neuroscience of speech disorders to this day. Congratulating Broca on his ‘great foresight’ in preserving the specimens entire, the twenty-first century team of neuroscientists concludes, somewhat poignantly, that the aphasics ‘Leborgne and Lelong can speak to us more eloquently now than they could over 140 years ago’ (Dronkers *et al.*, 2007).

## Bibliography

Abelanet, R. and P. P. de Saint-Maur. 1991. Le Musée Dupuytren, passé et présent. *Histoire Des Sciences Médicales* 25(2): 127–131.

- Ackerknecht, Erwin Heinz. 1967. *Medicine at the Paris Hospital, 1794–1848*. Baltimore: Johns Hopkins Press.
- Alberti, Samuel. 2011. *Morbid Curiosities: Medical Museums in Nineteenth-Century Britain*. Oxford: Oxford University Press.
- Broca, P. 1861. 'Remarks on the Seat of the Faculty of Articulate Language' in Bonin, Gerhardt von. 1960. *Some Papers on the Cerebral Cortex. Translated from the French and German*. Springfield, Ill.: Thomas, 49–72.
- Domanski, Cezary. 2013. 'Mysterious "Monsieur Leborgne": The Mystery of the Famous Patient in the History of Neuropsychology is Explained'. *Journal of the History of the Neurosciences* 22(1): 47–52.
- Dronkers, N. F., O. Plaisant, M. T. Iba-Zizen, and E. A. Cabanis. 2007. Paul Broca's Historic Cases: High Resolution MR Imaging of the Brains of Leborgne and Lelong. *Brain* 130(5): 1432–1441.
- Finger, Stanley. 1994. *Origins of Neuroscience: A History of Explorations of Brain Function*. Oxford: Oxford University Press.
- Goldstein, Jan. 2005. *The Post-Revolutionary Self: Politics and Psyche in France, 1750–1850*. Cambridge, MA; London, England: Harvard University Press.
- Harrington, Anne. 1987. *Medicine, Mind, and the Double Brain: A Study in Nineteenth-Century Thought*. Princeton, N.J.: Princeton University Press.
- Harrington, Anne. 1991. Beyond Phrenology: Localization Theory in the Modern Era. In Pietro, C, ed. *The Enchanted Loom: Chapters in the History of Neuroscience*. Oxford, Oxford University Press.
- Houel, Charles. 1878. *Catalogue Des Pièces Du Musée Dupuytren, Vol. III*. Paris: R. Dupont.
- Hunter, William. 1784. *Two Introductory Lectures*. London: J. Johnson.
- Jacyna, L. S. 2000. *Lost Words: Narratives of Language and the Brain, 1825–1926*. Princeton: Princeton University Press.
- Nadeau, Stephen E., Leslie J. Gonzalez Rothi, and Bruce Crosson, eds. 2000. *Aphasia and Language: Theory to Practice*. New York: The Guilford Press.
- Orfila, Joseph. 1842. *Muséum d'anatomie pathologique de la faculté de médecine de Paris, ou Musée Dupuytren*. Paris: Bechet et Labé.
- Pearce, J. 2009. 'Broca's Aphasiacs'. *European Neurology* 61: 183–189.
- Pickstone, John V. 1994. 'Museological Science? The Place of the Analytical/Comparative in Nineteenth-Century Science, Technology and Medicine'. *History of Science* 32: 111–138.
- Schiller, Francis. 1979. *Paul Broca, Founder of French Anthropology, Explorer of the Brain*. Berkeley: University of California Press.
- Selnes, Ola A. and Argye Hillis. 2000. 'Patient Tan Revisited: A Case of Atypical Global Aphasia'. *Journal of the History of the Neurosciences* 9(3): 233–237.
- Teacher, J. H. 1900. *Catalogue of the Anatomical and Pathological Preparations of Dr William Hunter in the Hunterian Museum*. Glasgow: Hunterian Museum.
- Wylock, Paul. 2010. *The Life and Times of Guillaume Dupuytren, 1777–1835*. Brussels: Brussels University Press.

## Notes on contributor

Cathy Gere is Associate Professor of History of Science at the University of California, San Diego. She teaches the histories of medicine, biology, and neuroscience, and has published on a wide range of topics, from brains in vats to early modern demonology, including two books on the history of pre-Hellenic archaeology, *The Tomb of Agammemnon* (Harvard, 2006) and *Knossos and the Prophets of Modernism* (Chicago, 2009). Her current work-in-progress is a history of the sciences of pleasure and pain.

Correspondence to: Cathy Gere, History of Science, University of California, San Diego, e-mail: cgere@ucsd.edu.

# Author Query

Journal title: ISR

Volume and issue: 38-3

Article title: Curating aphasia: Pierre Paul Broca's Museological Science

Author name: Cathy Gere

QUERY NO.	QUERY DETAILS
1	please check keywords
2	please supply full postal address