THE SEMINAL CONTRIBUTIONS OF JOHANN-CHRISTIAN REIL TO ANATOMY, PHYSIOLOGY, AND PSYCHIATRY

JOHANN-CHRISTIAN REIL (1759–1813) was a prominent German physician, anatomist, physiologist and a professor at the Universities of Halle and Berlin. Anatomic features named after him include the island of Reil (insula), Beau-Reil cross furrows, Reil’s finger, the fillet of Reil, and Reil’s triangle. In 1795, he founded the first German journal of physiology, Archiv für die Physiologie. Later, he would also be considered the founder of German psychiatry (the “German Pinel”) and coined the term “psychiatry.” In addition, he was a private confidante and physician to Johann Wolfgang von Goethe. Reil died in 1813 from typhus while treating soldiers wounded in the Battle of the Nations at Leipzig during the Napoleonic Wars.

KEY WORDS: Goethe, Insula, Island of Reil, Physiology, Psychiatry

It is a remarkable experience to step from the whirl of a large city into its madhouse. One finds here repeated still the same scenes, though as in a vaudeville performance; yet, in this fool’s system, there exists a kind of easy genius in the whole. The madhouse has its usurers, tyrants, slaves, criminals, and defenseless martyrs, fools who laugh without cause, and fools who torture themselves without cause. Pride of ancestry, egoism, vanity, greed, and all the other idols of human weakness guide the rudder in this maelstrom, just as in the ocean of the large world.

—Johann-Christian Reil, Rhapsodien über die Anwendung der psychischen Curnmethode auf Geisteszerrüttungen (Reflections on the Application of the Psychological Method of Treatment for Mental Illnesses, 1803)

Johann-Christian Reil (Fig. 1) was born on February 20, 1759 in Rhaude (East Frisia). The first of five children, he was the son of the Lutheran pastor Johann Julius Friedrich Reil (1716–1780) and his wife Anna Jansen-Streng (1731–1802) (1, 14). After early education in Norden, a small North Sea town, he began studying medicine in Göttingen in 1779. He was dissatisfied in Göttingen and transferred to the University of Halle in 1780, graduating with a dissertation on biliary disease, Tractatus de polycholia, in 1782. At Halle, 20 miles northwest of Leipzig in the modern German state of Saxony-Anhalt, he was influenced by two important teachers: the surgeon Phillipp Friedrich Theodor Meckel (1756–1803), whose father had described “Meckel’s cave” in 1748 and whose son would describe “Meckel’s diverticulum” in 1809, and Professor of Pathology and Therapy Johann Friedrich Gottlieb Goldhagen (1742–1788), founder of the Schola clinica, an outpatient clinical institute in Halle (9, 11).

In 1782 and 1783, Reil traveled to Berlin for an obligatory Cursus anatomicus in Berlin, which was required for certification as a doctor in Prussia. During that time, he lived in the household of the physician and philosopher Marcus Herz (1747–1803), whose father had described “Meckel’s cave” in 1748 and whose son would describe “Meckel’s diverticulum” in 1809, and Professor of Pathology and Therapy Johann Friedrich Gottlieb Goldhagen (1742–1788), founder of the Schola clinica, an outpatient clinical institute in Halle (9, 11).

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In October 1788, he married Johanna Wilhelmine Levaux, daughter of a wealthy and respectable Halle family, a union that eventually resulted in two sons and four daughters. Nevertheless, Reil kept up a busy private practice and wide-ranging lecture schedule, and the Schola clinica attracted many patients to Halle. In 1789, Reil was named municipal medical officer. He was also made director of a local hospital, where he could intensify teaching rounds with his medical students (10). He continued to promote Halle throughout his career, in one case as a center for balneotherapy (the use of baths to treat various ailments), and many leading citizens clamored to have him as their treating physician.

Reil and Physiology

Reil’s academic work contributed significantly to a changed view of the human body, illustrated by his seminal contributions to the theory and practice of physiology, anatomy, and psychiatry (12). In 1795, Reil founded the first physiology journal in Germany, Archiv für die Physiologie. This represented his attempt to make physiology the scientific foundation of medicine (20). The lead article in the new journal was his landmark treatise Von der Lebenskraft (“On the vital force”). Influenced by Immanuel Kant and Marcus Herz (4), this was a critique of the “vitalist” concept that living matter is distinguished from inanimate matter by vague “vital forces.” Instead, Reil argued that animate and inanimate objects are distinguished only by properties of their constituent matter:

Force [Kraft] is a subjective concept, the form according to which we think the connection between cause and effect. If it were possible for us to think clearly of each body as it is—simultaneously of the nature of its constituent elements and their connection, of their composition [Mischung] and structure [Form], then we would not find the concept of force necessary, a concept that produces so many erroneous conclusions (17, p 46).

This inherently modern, materialist, and empiricist approach had practical medical benefits as well: Reil explicitly stated that analyzing the properties and mechanics of tissue organization in organs could lead to a new understanding of disease. In his later work, Über die Erkenntniss und Cur der Fieber (“On the Understanding and Treatment of Fever”), published in Halle in five volumes between 1799 and 1815, he continued to pursue the connection between theoretical physiology and practical medical action. The fourth volume was dedicated to nervous diseases, in which he postulated the intrinsic connection of all organs, with the brain as the central coordinating influence and the location of individuality and personality (12).

Reil and the Development of German Psychiatry

In addition to his work in physiology and anatomy, Reil was a leading psychiatrist of his time. Indeed, in 1803 Reil published Rhapsodien über die Anwendung der psychischen Curmethode auf Geisteszerrüttungen (“Reflections on the Application of the Psychological Method of Treatment for Mental Illnesses”) (Fig. 2) (18). This treatise called for the reform of the treatment of the insane and led to the establishment of psychiatry in Germany (5). Indeed, in 1808 Reil himself invented the name “Psychiaterie” to describe the discipline he established (20). Ultimately, his reform of psychiatry and mental hospitals led to his epithet the “German Pinel,” after Philippe Pinel (1745–1826) who had just recently reformed the Parisian mental asylums (1).

In the Rhapsodien, Reil described and elaborated categories of treatment for mental illness, including physical (including balneotherapy), sensual (sight/hearing/touch), and mental (what we would now call “talk therapy”) (5). For example, Reil wrote that “music quiets the storm of the soul, chases away the cloud of gloom, and for a while dampens the uncontrolled tumult of frenzy” (18, p 207).

Based on his reading of the Romantic philosophy of Kant and Schelling, Reil formed new concepts of the mechanics of mental illness (20). He regarded insanity as a disruption or fragmentation of the self. He distinguished three chief forces, the disruption of which could produce mental illness: self-consciousness (Selbstbewuβtsein), awareness (Besonnenheit), and attention (Aufmerksamkeit) (20). Treatment regimens were then naturally directed towards restoring these forces (18, 19). Reil also presented a classification scheme for mental illnesses, including the following conditions: paranoia (Wahnsinn), restless insanity (Tobsucht), and “oddness” (Narrheit) (7). In these well-elaborated schemes, Reil suggested that normal mental life was held together by a force of nervous integration, and that dissolution of such integration would produce mental illness. Thus, Reil brought a logical scheme to the mechanics of mental illness. Importantly, he went beyond mere conceptualization to suggest specific treatment regimens and, in so doing, became the most important German psychiatrist until Sigmund Freud.
Reil’s seminal contributions to German psychiatry continued. In 1805, he founded the first German psychiatric journal, *Magazin für die psychische Heilkunde* (Journal of Psychiatric Medicine). In 1808 and 1812, together with his colleague Johann Christoph Hoffbauer, Reil published the first and second volumes of *Beiträge zur Beförderung einer Kurmethode auf psychischem Wege* (Contributions to the Advancement of a Psychiatric Treatment Method). In these, as well as previous essays, he elaborated the concept of the *Gemein-Gefühl*, a “common sense” or central psyche that binds experience into a single unit. Thus, he was again able to conceptualize disintegration of the *Gemein-Gefühl* as the cause of certain mental diseases, in which there was a loss of binding together of psychic dynamics. He distinguished a minor form with loosening of control and a major form with complete loss of control and lack of coordination of mental functions. As Harms (6, 7) points out, Reil’s conceptualizations predated Kraepelin and Bleuler’s *dementia praecox* and may represent the earliest full descriptions of the symptomatolology of schizophrenia.

Reil the Anatomist and His Eponyms

Reil used his *Archiv für die Physiologie* as a vehicle for many publications about the anatomy of the eye and brain, including his own description of the *macula lutea*, the “yellow spot” in the retina named in 1791 by Samuel Thomas von Sömmering. In 1796, he separately published the 32-page Latin treatise *Exercitationum anatomicarum fasciculus primus de structura nervorum* (First Volume of Anatomical Practice: On the Structure of Nerves) (Fig. 3) (16). This work was primarily related to the structure of nerves, yet also contains his description of the insula, later *insula Reili* or island of Reil. Interestingly, the insula was only mentioned in the text; the figures were primarily devoted to the structure of cranial and spinal nerves and plexi (Fig. 4). Reil’s discovery of the insula was immortalized in many editions of Henry Gray’s *Gray’s Anatomy* from the first edition published in 1858 through the current 39th edition (Fig. 5). Modern views of the insula demonstrate its spectacular sulcal and vascular anatomy (22, 23).

Two other neuroanatomic and two non-neuroanatomic eponyms became associated with Reil. The fillet of Reil is that portion of the lateral lemniscus (upward projection of the central pathway for hearing) that lies lateral to the reticular formation, and the lemniscal trigone, a triangular area on the lateral surface of the caudal half of the mesencephalon, is also termed “Reil’s triangle.” Beau-Reil cross furrows are transverse grooves seen in the fingernails that appear after a period of disruption in nail matrix formation (15). These are more commonly called “Beau’s lines,” associated with the French physician Joseph Honoré Simon Beau...
(1806–1865). They have been described in systemic diseases and toxic metabolic conditions but also for transient severe physiological stresses, including Himalayan expeditions (“Everest nails”) (2) and deep saturation dives (21). The lines are visible until the affected area of the nail has grown out and been trimmed away. Lastly, Reil’s finger (digitus mortuus, or “dead finger”), refers to pale skin discoloration due to impaired vascular filling (e.g. in Raynaud’s syndrome).

Reil and Goethe

The polymath Johann Wolfgang von Goethe (1749–1832) (Fig. 6), author of The Sorrows of Young Werther, Faust, and Theory of Colors, among other masterpieces, visited Reil in Halle between 1802 and 1805. On his visits to Halle, Goethe used the opportunity for scientific conversations with leading figures as well as consultations regarding his own medical state. Among other conditions, Goethe experienced recurrent bouts of renal colic, the worst episode of which occurred in February 1805 and was associated with fever and possible urosepsis (3). At the time, he was being treated by Johann Christian Stark, Sr. (1735–1811), professor of medicine in Jena. On the advice of his physicians, Goethe took a cure in the health resort Lauchstädt in July and August. At that time, Goethe also consulted Reil, who observed him for a number of weeks. Interestingly, Reil then submitted a report that remained undiscovered until 1937. In this report, he described classic symptoms of flank pain radiating to the groin and “bloody red color of the urine,” suggesting hematuria, and diagnosed urolithiasis. His recommended treatment regimen included balneological (bathing) therapy and application of medicines and medicinal herbs, including seed oil of Hyoscyamus niger (as an antispasmodic) and uva ursi (as a diuretic and antilithogenic). Nevertheless, Goethe continued to have recurrent painful attacks of colic thereafter (3).

Final Years

The medical program Reil established at the University of Halle, derived from the metaphysics of Friedrich Schelling’s Naturphilosophie (4), aimed to unify scientific physiology with its applications in medicine. He also sought to reform medical education and, particularly, to bring the education of surgeons and physicians together. According to one of his students, Ludwig Börne, Reil would “begin and intermix his lectures on therapy and diseases of the eye with poetry from Schiller and Goethe, so that the delicious fruits of his research were hidden among flowers” (20, p 277). He was also one of the first to recognize the need for “medical auxiliaries,” or physician extenders, to provide primary care in rural and poor areas that had limited access to doctors (8).

In the later years of his life, Reil’s destiny was tied to the Napoleonic Wars. In the fall of 1806, Napoleon’s armies defeated Prussia near Jena. Napoleon then entered Halle and closed the university. During the 2 years the university remained closed (1806–1808), however, Reil’s research and patient care continued. In 1807 he published in his Archiv a 100-page monograph on the miraculous physiological “trans-substantiation” that occurs in the human uterus during pregnancy (20). The University of Halle reopened in 1808, at which time Reil became dean of the medical school. However, it was a shadow of its former self, and only one-quarter of the students returned. Prussian Halle was now incorporated into “Westphalia,” which was ruled by Napoleon’s brother Jérôme Bonaparte (20). When the new University of Berlin was established in 1810, Reil was invited to become dean of the medical faculty by founder Wilhelm von Humboldt (1767–1835) (5). He saw an opportunity to test his ideas for academic medical school reform and the prospects were better than those in Halle. He accepted the position in Berlin and helped to found the Charité Hospital, which is now the largest hospital in Europe. However, the Napoleonic wars again interrupted his plans.

After the defeat of Napoleon and his army in Russia in the winter of 1812, the war of freedom against Napoleonic oppression in Prussia was reignited. Prussia broke away from France and allied itself with Austria, Russia, and Britain. As an important public figure, Reil felt compelled to take part. He became inspector of all field hospitals east of the river Elbe, as well as director of the hospitals in Leipzig and Halle. In this capacity, he treated patients wounded in many battles in 1813, most notably in the Battle of Leipzig. This battle (October 16–19, 1813), also called the Battle of the Nations, was the largest in world history at that point and remained so until World War I. Approximately 500,000 soldiers were involved on both sides, and there were nearly 100,000 casualties during the fierce 3-day battle. Napoleon’s forces were routed and the battle led to the total defeat of France. The wounded and sick were transported to field hospitals around Leipzig, which were managed directly by Reil. Reil emphasized the terrible conditions in his field hospital, in which up to 800 soldiers died each day from injuries and infections (13).

Reil himself contracted typhus as part of the great epidemic surrounding this war. Reil believed he had been infected before the Battle of Leipzig. Before leaving Berlin, he had visited his friend Karl Grappengiesser (1773–1813), a physician who himself was infected and had embraced Reil (20). In any case, Reil perished from typhus on November 22, 1813 in his sister’s house in Halle at age 54. His wife died 1 month later during childbirth. In 1830, his relatives erected a stately tomb where his villa stood (Fig. 7). This elevated site above the city, Reilberg (“Reil mountain”), has housed the Halle zoo since 1901 and is accessible via Reilstraße, or “Reil Street.”

**FIGURE 6. Johann Wolfgang von Goethe (1749–1832), German novelist, dramatist, poet, scientist, philosopher, and public servant.**
CONCLUSIONS

Johann-Christian Reil was a pioneer of scientific medical physiology, the founder of German psychiatry, and an eminent physician and neuroanatomist (Table 1). In diverse fields, he attempted to categorize and unify: organic and inorganic matter, chemistry and physiology, medicine and surgery, mind and body. In addition, he was a prominent medical educator and administrator. Rather than remembering him as the source of eponyms or as one of Goethe’s physicians, perhaps we should remember him as the true original “quintuple threat:” a renowned physician, clinical teacher, experimentalist, medical administrator, and dedicated public servant.

REFERENCES


TABLE 1. Chronology of events in the life of Johann-Christian Reil

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>1759</td>
<td>Born in Rhaude, East Frisia</td>
</tr>
<tr>
<td>1779</td>
<td>Begins to study medicine in Göttingen</td>
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<tr>
<td>1782</td>
<td>Graduates from medical school in Halle</td>
</tr>
<tr>
<td>1787</td>
<td>Named “extraordinary” professor of medicine in Halle</td>
</tr>
<tr>
<td>1788</td>
<td>Marries Johanna Wilhelmine Levaux in Halle</td>
</tr>
<tr>
<td>1789</td>
<td>Named Stadtphysikus (city physician) in Halle</td>
</tr>
<tr>
<td>1795</td>
<td>Founded first German journal of physiology (Archiv für die Physiologie)</td>
</tr>
<tr>
<td>1796</td>
<td>Publishes Von der Lebenskraft (“On the vital force”)</td>
</tr>
<tr>
<td>1796</td>
<td>Publishes Exercitationum anatomicarum fasciculus primus de structura nervorum, which contains his description of the insula Reili (island of Reil)</td>
</tr>
<tr>
<td>1802–1805</td>
<td>Meets and treats Johann Wolfgang von Goethe (1749–1832) in Halle</td>
</tr>
<tr>
<td>1803</td>
<td>Publishes Rhapsodieen über die Anwendung der psychischen Curmethode auf Geisteszerrüttungen (“Reflections on the Application of the Psychological Method of Treatment for Mental Illnesses”)</td>
</tr>
<tr>
<td>1805</td>
<td>Founds first psychiatric journal, Magazin für die psychische Heilkunde (Journal of Psychiatric Medicine)</td>
</tr>
<tr>
<td>1806</td>
<td>Halle University closes temporarily due to Napoleonic wars</td>
</tr>
<tr>
<td>1808</td>
<td>Publishes first volume of Beyträge zur Beförderung einer Kurmethode auf psychischem Wege (“Contributions to the Advancement of a Psychiatric Treatment Method”)</td>
</tr>
<tr>
<td>1810</td>
<td>Moves to newly-founded University of Berlin (modern-day Humboldt University)</td>
</tr>
<tr>
<td>1812</td>
<td>Publishes second volume of Beyträge zur Beförderung einer Kurmethode auf psychischem Wege</td>
</tr>
<tr>
<td>1813</td>
<td>Battle of Leipzig (October 16–19)</td>
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FIGURE 7. Reil’s grave, located in what is currently the Halle zoological garden.

Acknowledgments

For their generous assistance in accessing the original Exercitationum anatomicarum (1796) we thank Kellie Binder, R.N., N.P., and Johannes Schramm, M.D., who also provided many helpful comments.

COMMENTS

In the neuroanatomy course in medical school, students learn that the insula is eponymously referred to as “the island of Reil.” However, the most important scientific contribution of J.C. Reil was his role as the founder of modern German psychiatry. The authors mention the activities of his French contemporary, Philippe Pinel, who was reforming Parisian mental asylums. It is noteworthy that progress in this area was not limited to the European continent. In England, in 1796, William Tuke (1732–1822), a Quaker supported by the Society of Friends in York, established the “Retreat,” described as “a place in which the unhappy might obtain a refuge—a quiet haven in which the shattered bark might find the means of reparation or of safety” (1). Ten years after the landmark publication of Reil’s “Rhapsodies,” a book by Tuke’s grandson, Samuel, appeared, titled, “Description of the Retreat, an Institution near York for Insane Persons of the Society of Friends, Containing an Account of the Origin and Progress, the Modes of Treatment and a Statement of Cases (1).”

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Johann-Christian Reil is a name well known to neurosurgeons due to the island of Reil, but beyond that eponym, little has been published on this gentleman in the neurosurgical historical literature. After having read this article, I became most enlightened regarding this earlier giant and his contributions to both anatomy and physiology along with his seminal contributions to psychiatry. It was interesting to read that it is due to Reil that the term “psychiatry” was introduced to the literature. The original monograph dealing with the island of Reil (insula) is rare and one that I have not personally ever seen come up for sale. The authors have also provided an excellent review of Reil’s anatomical contributions beyond the island of Reil. The inside view of Reil’s relationship to Johann Wolfgang von Goethe also made for interesting reading. My compliments to the authors for bringing this wonderful historical figure back to life; this is a delightful piece!

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