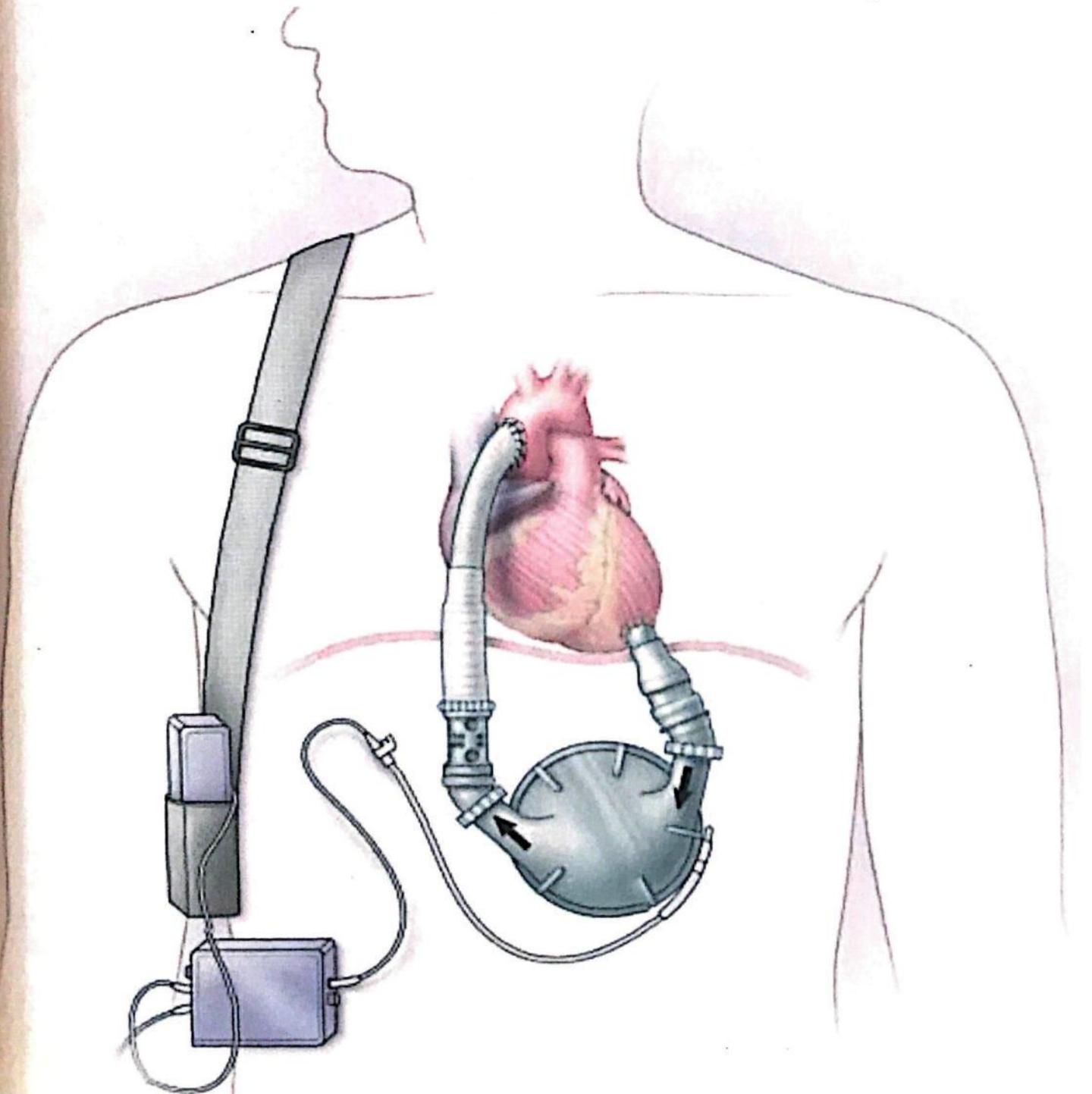


Technological Change in Modern Surgery

Historical Perspectives on Innovation



EDITED BY THOMAS SCHLICH AND CHRISTOPHER CRENNER

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Chapter Two

Inimitable Innovation

Johann Friedrich Dieffenbach and the Renewal of Surgery, 1822–1847

LISA HAUSHOFER

The surgeon Johann Friedrich Dieffenbach is often referred to as one of the most innovative characters in the development of German surgery during the early nineteenth century, particularly in the area of plastic surgery. But for a figure that has become almost emblematic of surgical innovation, Dieffenbach's case also challenges two common assumptions about innovation in surgery. One is that innovation in surgery during the nineteenth century was largely the product of technological change, particularly the introduction of anesthetic and aseptic techniques.¹ The other, that a vital factor in the success of surgical innovations is the degree to which they can be reproduced and diffused.² As for the first, Dieffenbach's work is located in the early part of the nineteenth century, rendering explanations of the growth of surgery based solely on technological determinism problematic, and opening up new questions about the driving forces behind innovation in surgery. With regard to the second, Dieffenbach's brand of innovation was formulated in a way that made it essentially inimitable. Dieffenbach's writings therefore provide an opportunity to reexamine these assumptions and offer alternative explanations.

The flourishing of plastic surgery in the early nineteenth century is a particular puzzle. Why would a technique dedicated to non-life-threatening conditions gain such momentum in the pre-anesthesia world? Many histories

of plastic surgery avoid this question altogether and merely chart the diffusion of plastic surgical techniques, from the moment of the "rediscovery" of a technique for reconstructing the nose developed in India in the late eighteenth century, to the uptake of this and similar techniques by a number of surgeons in the German states and other countries in the early decades of the nineteenth century.³ More analytically oriented works have vaguely relied on a certain spirit of the age for answers. "Innovation was in the air," writes Roy Porter about the introduction of a number of new plastic surgical techniques by the German surgeon Johann Friedrich Dieffenbach.⁴ Other authors have expressed surprise that plastic surgery boomed *in spite of*, not because of, the *Zeitgeist*. "The German enthusiasm for plastic surgery was a puzzling development," observes David Hamilton, "because German-speaking thinkers were the origin of Naturphilosophie and the Romantic movement, whose antiscience stance rejected the scholarly achievements of Enlightenment thinking and substituted a free-floating theorizing and philosophical stance. Somehow," he concludes, "plastic surgery, a fundamentally mechanistic human endeavor without the slightest hint of the mystical, flourished."⁵

Dieffenbach is cited in Porter's chapter on the development of surgery as a particularly ridiculous example of the "craze" of surgical innovations, which seemed to grip surgery in this period.⁶ Indeed, the seemingly eclectic spectrum of Dieffenbach's surgical ventures—ranging from plastic and orthopedic surgical techniques to operations for stuttering and strabismus—have earned him a place in the occasional collection of "strange medicine" or "weird cures."⁷ In histories of the development of the discipline of plastic surgery, Dieffenbach appears instead as a "pioneer,"⁸ "founder,"⁹ or "father"¹⁰ of the field. In these accounts, Dieffenbach's innovativeness is usually told as a series of pragmatic technical additions to surgical procedures and the introduction of new techniques, taking the motivation for these innovations as self-evident. For example, he is credited with "improving" the Indian method of rhinoplasty, a technique in which a skin flap was mobilized from the forehead and rotated downward to cover the nose.¹¹ Dieffenbach modified the technique by using a larger, slightly differently shaped skin flap. He is also acknowledged for "reducing blood congestion with leeches and reducing the compression of vessels in the pedicle (skin bridge) of the forehead flap by inseting the pedicle."¹² Given that these alterations are arguably minute, some of the foundational narratives of the discipline of plastic surgery struggle to determine in what Dieffenbach's "pioneering" role consisted exactly.¹³

A different approach is taken by Sander Gilman, whose cultural history of aesthetic surgery understands the development of techniques like rhinoplasty in this period as a response to particular social and cultural pressures. According to Gilman, the expansion of plastic surgical procedures must be understood in the context of changing cultural fears surrounding the stigmatized syphilitic nose, and later, the "Jewish" nose.¹⁴ One of the pitfalls of

writing the history of plastic surgery from a cultural perspective has been to assume the existence of a distinct category of "plastic surgery" with particular characteristics and concerns that align astoundingly well with those of contemporary plastic surgery. In this vein, historians have associated Dieffenbach most strongly with the distinction between aesthetic and reconstructive surgery. According to these interpretations, Dieffenbach sought to distinguish a useful reconstructive surgery from a frivolous unnecessary surgery for purely cosmetic purposes.¹⁵ At the same time, Dieffenbach appears as practicing "aesthetic surgery."¹⁶ Yet the distinction between aesthetic and reconstructive operations does not appear as a prominent concern in Dieffenbach's writings. Instead, the *plastic* of Dieffenbach's surgery, I suggest, reflected contemporary *Naturphilosophie*-inflected thinking about processes of growth and change in living beings. If there is a distinction Dieffenbach was concerned with, it is not one between cosmetic and reconstructive operations, but one that delineates a *physiological* surgery based on those principles of life formation from a *mechanistic* surgery that treats the body as lifeless material. Dieffenbach sought to create a new approach to surgery in its entirety, a *plastic* surgery.

While Hamilton's surprise at the development of plastic surgery in a period rife with *Naturphilosophie*-inspired thinking is understandable, I suggest it is exactly this intersection that should serve as the point of departure for understanding the particular brand of innovation Dieffenbach was championing. Dieffenbach sought innovation not through the development and naming of new surgical techniques or through the modification of existing ones. Instead, his goal was a renewal of the surgical approach in its entirety. Drawing on debates among his contemporaries about medical education and the role of the university, Dieffenbach envisioned surgery as based entirely on the principles of physiology, oriented toward the restoration of bodily forms and functions rather than their destruction or removal. Plastic surgery offered a particularly apt platform to formulate these larger goals, as it was governed by general physiological principles, while at the same time it demanded consideration of idiosyncracies and tested surgical ingenuity. However, this made Dieffenbach's surgical innovations essentially inimitable, a characteristic generally thought incompatible with "successful" innovations. Solving the paradox of Dieffenbach's "inimitable innovation" is only possible, I suggest, when considered within the professional and institutional context of early nineteenth-century Prussian university medicine.

Knowledge, Practice, and Medical Education

Of the numerous developments that brought profound transformations for the German-speaking territories at the turn from the eighteenth to the

nineteenth century, the most significant was perhaps the indignity of the defeat of Prussia's undefeatable army. In the wake of this symbolic humiliation, Prussian state officials grew more attentive to calls from education reformers whose vision of a nonutilitarian university dedicated wholly to *Bildung* and *Wissenschaft* promised to reaffirm Prussia's leading role in a politically fragmented yet culturally consonant Germany united by a critical "public sphere."¹⁷ However, when put into practice in the form of the University of Berlin in 1810, and later the university of Bonn in 1818, these ideals remained contested, and just how much a university should serve the purposes of the state by providing professional training, or form the individual into a truth-seeking, autonomous, free citizen by encouraging research, remained a point of contention. In medicine, the debate over useful versus pure knowledge materialized in the form of recurring tensions between theory and practice as the supreme goals of a university medical education.¹⁸

One of the most promising fields to bridge the gap between medical knowledge and its application was the science of physiology. At the end of the eighteenth and the early nineteenth century, physiology was understood as a theoretical and reflective science that served to uncover the fundamental principles and laws of life. This theoretical orientation distinguished it from its sister discipline, anatomy (or morphology), which was an investigative and often experimental discipline, and provided the empirical phenomena that physiology interpreted and synthesized. It was, in the words of Andrew Cunningham, a science performed with the pen, and not with the hand or scalpel (or sword, as Cunningham poetically suggests).¹⁹ The physiology of the period was profoundly shaped by German Naturphilosophie-inspired thinkers such as Johann Friedrich Blumenbach and Johann Wolfgang von Goethe, who sought to explain the phenomena of human life as manifestations of universal natural principles and forces.²⁰ Physiology was a true philosophy of nature, a "Wissenschaft par excellence," and as such it had been able to claim a position for the study of life at the German universities.²¹

Efforts to emphasize the *Wissenschafts* character of the study of life had prompted a response by physicians who instead stressed the connection between physiology and pathology, and therefore the practical importance of a medical education steeped in the *Wissenschaft* of physiology.²² One such physician was Dieffenbach's teacher Karl Friedrich Burdach, who saw in physiology the key to understanding clinical pathology. Only an acquaintance with the fundamental formational properties of life could provide insight into their dysfunction. According to Burdach, physiology was "the basis for the art of preserving the present normal state in its integrity, and bringing it closer to its ideal." It was also fundamental for therapeutics, or the "art of returning the abnormal state of life to normality."²³ Physiology had the potential of mediating between medicine's scientific aspirations and its imperative for use.

Whereas reconciling the goals of science and application produced a number of productive strategies in medical faculties, the situation looked bleaker for surgery. The military and civil needs of the state had long ensured that high-quality surgical education was available to medical practitioners, university educated or otherwise, at military and governmental training schools, and surgery had become firmly established as a university discipline at nearly all German medical faculties by the end of the eighteenth century.²⁴ Yet the delineation between surgery and medicine remained clearly defined professionally and socially. The Prussian state distinguished between several classes of practitioners on the basis of different kinds of professional training and varying areas of practice, ranking graduate physicians and graduates with both medical and surgical training, practical surgeons, military physicians, specialists such as midwives and dentists, and apothecaries.²⁵

What was more, although surgery seemed to approach equality with university medicine institutionally, it was by no means considered on a par with it conceptually. The linguistic separation between "medicinal" and "operative" surgery was still in use, and occasionally calls were voiced for its translation into practice, even by practicing surgeons themselves. Reflecting on ways to optimize medical teaching, Ferdinand von Ritgen, professor of medicine and obstetrics at the university of Giessen, confessed that he saw benefits in a separate instruction of the nature of surgical diseases on the one hand, and of their surgical treatment on the other. Medical surgery, the doctrine of disturbances of organic tissues in processes of external formation, was to be distinguished from mechanical and chemical modes of their cure, as this would greatly facilitate the task of gaining a comprehensive overview of surgical pathology, he believed. Shrugging off the discussion of surgical diseases in a mere one and a half pages, Ritgen went on to elaborate on medical surgery for the remainder of his fifty-five-page article.²⁶ Across the Elbe, the physician and first director of the medical faculty at the University of Berlin, Christoph Wilhelm Hufeland, added a theoretical distinction to Ritgen's practical argument for a separation of two different kinds of surgeries. As much as the "business of healing" in its "foundational principles" was "one," Hufeland argued, it was true that the treatment of internal and external woes required a different "orientation of the mind" (*Richtung des Geistes*). "Inner curing," an activity that dealt with invisible ailments, required a propensity to envision the invisible, a capability for "abstraction, for profound research and reflection." Curing external afflictions, by contrast, challenged the practitioner to sensual perception (*sinnliche Wahrnehmung*) and to a culture of sensibility (*Kultur der Sinnlichkeit*); it required the comprehension of external objects (*Auffassen äußerer Gegenstände*) and manual dexterity. Even within surgery, a distinction was to be made between a kind of surgery that did not require any science of healing (*Wissenschaft der Heilkunde*), merely a mechanical craftsmanship, and a surgery that was informed by the principles

of medicine as taught by the university faculties. These two different kinds of surgery, according to Hufeland, should find expression in different forms of surgical careers: surgeons, educated in surgical training schools and performing a broad range of duties mainly in the countryside, and barbers, performing only menial manual tasks.²⁷

Johann Friedrich Dieffenbach: A New Method of Surgery against Surgical Methods

It is within this turbulent historical context, shaped by profound political and structural transformations, by debates about the organization of the medical profession and state healthcare, about the balance of theory and practice, *Wissenschaft* and utilitarianism, and about the place of surgery within medicine, that Dieffenbach's career and writings must be placed. Dieffenbach was born in 1792 in the Prussian town of Königsberg. Because of the early death of his father, Dieffenbach grew up in limited financial circumstances and was dependent on financial benefactors during his education and much of his life, especially after the death of his mother in 1814. Like many German physicians of the period, Dieffenbach joined the wars of liberation against Napoleon's troops. After his dismissal, Dieffenbach took up studying medicine, first at the University of Königsberg, then at the newly founded University of Bonn. During this time, Dieffenbach is said to have worked as a physician at duels, a common yet illegal practice at the time.²⁸ The majority of his years were spent in Berlin, where Dieffenbach worked as a practical physician from 1823 and 1829, and then as director of the surgical department of the Charité hospital. In 1832, Dieffenbach was promoted to Extraordinary Professor before he finally became a full professor and director of the university surgical clinic in 1840. Dieffenbach died unexpectedly in 1847 at the age of fifty-five.²⁹

While he was in Berlin, Dieffenbach had worked under the auspices of Carl Ferdinand von Graefe, a surgeon who had himself gained considerable notoriety for introducing the recently rediscovered method of rhinoplasty to the German speaking world in 1817. Graefe had merged the so-called Indian method, in which the nose was reconstructed through rotation of a skin flap taken from the forehead, with the so-called Italian method, a technique that used a skin flap attached to the forearm to cover the nose defect. Graefe's technique used skin from the forearm, but in contrast to the Italian method, the flap was immediately attached to the nose after separation, so that the time during which the arm needed to stay attached to the nose was considerably shortened. He called this method the "German method." Graefe also placed great emphasis on the formation of the nose, and demanded that the surgeon study the exact features of the patient's face and calculate the size and form of the nose accordingly.³⁰

If Graefe had sought to obtain notoriety by creating a new method of operation and giving it a name, Dieffenbach was not going to follow his example. He reserved only ridicule for such practices. If every surgeon was to "name a surgical method invented by him, or even merely slightly modified by him, after his country of origin," what were his successors to do? "Resort to names of provinces or towns?"³¹ Dieffenbach's contempt for methods was not limited to their patriotic nomenclature, however. In the general section of his multivolume work on plastic surgery, *Surgical Experiences, in Particular about the Restitution of Destroyed Parts of the Body according to New Methods*, he dismissed the current use of "methods" in plastic surgery, despite the prominent position of the term, and his promise to produce new ones, in the title of his book. Methods alone were not sufficient, he cautioned, instead the aspiring plastic surgeon had to "study the peculiar self-formation (*eigenthümliche Selbstgestaltung*) of the new body part, and draw from it the doctrine of organic formation (*Lehre der organischen Formbildung*)."³² The sentiment expressed in this passage is at the heart of Dieffenbach's ambitions for surgery and holds the key to understanding the seeming paradox of a surgeon advocating new methods in surgery while distancing himself from a method-based surgery.

Physiology: A New Surgical Epistemology

Dieffenbach's critique of Graefe's method of rhinoplasty may have been a petty professional sneer in part, but it was also rooted in a fundamental disagreement about how surgical knowledge ought to be obtained and how new surgical procedures ought to be devised. For Dieffenbach, the guiding principle for the innovative surgeon was the study of physiology, both as a deductive discipline concerned with the laws of nature and as an experimental enterprise investigating its idiosyncracies.

In his doctoral dissertation, composed in 1822, Dieffenbach had been examining the general principles of tissue formation and regeneration, while also investigating their individual manifestations in the body. The reason for all regeneration of tissue, Dieffenbach wrote, was what Johann Friedrich Blumenbach had described as the "formative drive" (*nisus formativus* or *Bildungstrieb*).³³ In Dieffenbach's words, this "drive of all organized bodies to retain their proper form, and to substitute and restitute lost lesions"³⁴ was a regular and predictable force, whose lawlike character could help anticipate and control the behavior of tissues. Among its characteristics was a gradient in potency from "less perfect" organisms to greater perfection, a scale that in turn corresponded to the degree of sophistication of the nervous system. This ordering principle of the animal kingdom could also be applied to different parts of the human body. Just as lower, less perfect

animals regenerated more completely, so did less differentiated, less innervated parts of the body exhibit a tendency to more complete regeneration, such as the nails, hair, teeth, and skin.³⁵ Dieffenbach distinguished between two variants of the formative drive, the “ordinary regenerative force,” which was at play in regular regeneration processes of the body, such as in the regular regeneration of the feathers of birds and the skin, nails, and hair of humans, and the “extraordinary, healing” regenerative force, which acted after injuries to the integument.³⁶ Quoting Goethe, Dieffenbach emphasized the role of the external layer or “envelope” of organic matter, the skin of humans, in effecting this healing force.³⁷ A surgeon relying on the properties of the skin to regenerate and form healing bonds thus had to know the general laws of this process in order to operate in accordance with the body’s mechanism to heal itself.

While emphasizing the general laws underlying the regeneration of tissue, Dieffenbach also insisted on the individual conditions acting on the potency of the regenerative force. To a degree, individual variations were themselves the result of general principles. For instance, the regenerative force varied “according to different life stages,” and so was regularly found more active in young people than in older generations.³⁸ Similarly, the principle of greater regenerative drive in less differentiated and externally located tissues dictated that particular body parts, such as the skin, and in particular, the nose, were more prone to perfect regeneration than other body parts.

But Dieffenbach also sought to explore the multiple variations of the regenerative force’s manifestation in individuals. To this purpose, he complemented his analysis of Naturphilosophical physiological texts with a number of experiments in animals and even humans. Dieffenbach had performed experiments since his medical studies under Burdach and Karl Unger in Königsberg, specifically on the question of the transplantability of feathers and hairs between animals.³⁹ For his dissertation, he used a variety of animals (doves, chickens, dogs) to transplant feathers, hairs, and pieces of skin into skin wounds of the same animal or an animal of a different species.⁴⁰ He also performed several transplantation experiments on himself.⁴¹ During his time as practical physician in Berlin, Dieffenbach continued his transplantation experiments on animals, publishing some of his results in the *Journal der Chirurgie und Augenheilkunde* in 1824.⁴² Once he was established at the Charité, Dieffenbach had easy access to animals through the Royal Veterinary School of Berlin, which also provided him with experimental space.⁴³ He also performed skin transplantations on a forty-year-old woman who was suffering from anesthesia on one side of her body. Dieffenbach reasoned that since the therapy for anesthesia was to set “irritations” (*Reize*) for the spinal chord, transplantation experiments on the woman’s skin would not only be interesting to himself but also benefit the patient. Seeking to

investigate the potential for survival of a piece of skin in which the "life potential had been artificially heightened" by rubbing the skin into a less "vital" (*lebenskräftig*) skin area, and vice versa, Dieffenbach excised two pieces of skin in the patient's forearm and inserted them into the respective other wound. The result showed good healing in the rubbed skin and partial healing in the other skin area.⁴⁴ In the same article, Dieffenbach reported the successful reattachment of a piece of skin from the cheek of a young man that had been separated from his face in a duel.⁴⁵

Dieffenbach combined his insights gained through the study of physiological texts and experiments into a summary of the general phenomena of skin transplantations, from which followed a series of principles for plastic surgery, rooted entirely in physiology. These were hinted at in Dieffenbach's dissertation and described in detail in his *Surgical Experiences*, as well as in his textbook on surgery, *Die Operative Chirurgie*. To begin with, physiology had made clear that transplanting skin was possible, not only when a connecting bridge of tissue existed between the separated part and the remaining skin, but also in those cases where the flap had been separated completely from the body's surface. The latter issue was by no means undisputed. It hinged on the question of whether the vitality of the skin depended on its connection with the organism or whether there was vitality within body parts irrespective of their ties to the body. In essence this was a question about the precise nature and localization of the vital force: was vitality a function of the organization of the body, a mechanical force that was conducted, or was it an inherent component of matter? Although Dieffenbach had observed that transplantation of not entirely separated skin flaps was by far more successful than that of completely separated parts, he attributed this success not merely to the connecting bridge and its function as a "conductor" of blood and innervation. Instead, the flap retained "in and of itself a high degree of vitality and autonomy."⁴⁶

In his experiments, Dieffenbach had also observed a number of striking phenomena regarding the color of the flap and its blood flow, which ought to guide the precise moment the surgeon chose to reunite the separated skin. Immediately after separation, the skin flap revealed a striking pallor, which was occasioned, in Dieffenbach's opinion, by the "spastic" contraction of blood vessels, not because of the blood loss occasioned by the cut. A short time after, blood was flowing from the skin flap as a result of an active "contractive force" of the venous blood vessels in the flap.⁴⁷ Both of these phenomena hindered the insertion of the flap, however; contracted, spastic blood vessels were incapable of establishing new connections with surrounding tissue, and the venous blood expulsion formed a "membrane" that hindered the merging of tissue mechanically. Hence the surgeon had to let the flap rest for a few minutes before joining it to the surrounding tissue.⁴⁸ From these observations resulted another important principle for plastic

operations. Whereas previous surgeons had attributed the pallor of the skin flap to a loss of vitality within the separated tissue, and had attempted to reawaken the vital power of the flap through "spirituous unctions, tapping, rubbing," or through "camphor," Dieffenbach recommended the use of leeches and the application of coldness in order to reduce blood flow and lower vessel spasticity.⁴⁹ Finally, Dieffenbach's observations on regenerative processes of the skin had revealed a number of characteristic changes in the flap's shape immediately after its removal. Typical was a contraction, reeling, and reduction of the flap's form, followed by the formation of a rounded elevation in its center.⁵⁰

Yet although plastic operations could be based on these general physiological principles, surgeons also had to take into account the idiosyncracies of these lawful manifestations in the individual. With regard to the color of the flap, Dieffenbach did not specify a length of time that would indicate when the flap was ready to be transplanted. Instead, the surgeon had to observe the precise transformations of the color of the flap to allow him to determine the onset of a more "passive state" and hence the stop of blood expulsion and vessel contractility. This was the "right condition for union."⁵¹ Similarly, although the changes in shape could be predicted by general laws, the precise manifestation of form phenomena depended "solely on the consistency of the skin of the individuum,"⁵² with stronger contractility "in young strong individuals," and slighter form changes in persons with "loose, delicate, blond skin."⁵³ The general and individual characteristics of skin formation made the "incredibly careful preparation of a nose model,"⁵⁴ as recommended so insistently by Graefe, futile. The skin followed its own laws of formation and would defy efforts to press it into a desired form. Instead, the surgeon had to learn to form the skin in accordance with the peculiarities of living matter.

Dieffenbach's approach to physiology is peculiar and deserves a brief discussion. The period of Dieffenbach's activity saw a profound transformation not only with regard to the meaning of physiology itself, but also with regard to the relationship between physiology and experiment. Historians have argued that it was during the last decades of the eighteenth and the first decades of the nineteenth century that the "old physiology," with its experiments or *experiences* that demonstrated observable manifestations of general laws, was gradually replaced by "experimental physiology." This self-conscious new approach, proclaimed famously by François Magendie, and later Claude Bernard, centered on the experimental phenomena first, and inducted conclusions later. Experiments were performed in controlled conditions with repetitions and slight variations, leading to idiosyncratic conclusions about the nature of life phenomena.⁵⁵ Historians of surgery have argued that this new experimental physiology became the basis of a "physiological surgery" that looked to experimentation as an epistemic rationale

as well as a form of applied surgery toward the late nineteenth century.⁵⁶ Dieffenbach's call for a surgery based on physiology could be interpreted as an anticipation of that later trend. On the other hand, the work of Mary Terrall has recently suggested that eighteenth-century naturalist experimental culture was much more interventionist than previously assumed.⁵⁷ In this sense Dieffenbach's conception of physiology and of physiological experimentation might be seen as continuing an already established eighteenth-century tradition of experimentation.

But rather than seeing Dieffenbach merely as continuing eighteenth-century experimental traditions or anticipating nineteenth-century experimental physiology, or being exemplary of a kind of "stage of transition," I suggest that his surgical epistemology reflects a variety of seemingly competing but often overlapping approaches to physiology as a *Wissenschaft* that reigned at the turn of the eighteenth and nineteenth centuries in the German medical context. Passages engaging with Blumenbach's *Bildungstrieb* and Goethe's *Morphologie* reveal a desire typical of *Naturphilosophie* to grasp and describe the fundamental laws underlying the formation of organic structures.⁵⁸ This version of physiology as *Wissenschaft* is accompanied by a number of observations of the manifestations of these laws in nature, and a number of experiments (partly undertaken by Dieffenbach himself, partly summarized from other authors' accounts) that demonstrated the validity of the principle of organic regeneration in different animals. In the description of his experiments forming the basis of his *Surgical Experiences*, Dieffenbach assured his readers that he had sought to act "merely in an observing capacity, describing nature."⁵⁹ This variation of physiology-as-science evokes Cunningham's "old physiology" and a deductive experimental approach. But it is also reminiscent of Dieffenbach's teacher and lifelong friend Burdach's attempt to integrate experience and science, creating a conception of physiology as *Erfahrungswissenschaft*.⁶⁰ On the other hand, Dieffenbach's use of experimental variation, and the idiosyncratic conclusions that could be induced by them, is also characteristic of the principles of the new experimental physiology, which Dieffenbach had studied under Magendie during his stay in Paris in 1821.⁶¹ For instance, resecting parts of the ear of dogs and rabbits, and then reattaching them, Dieffenbach varied the instrument he was using (scissors or knife), the form and size of the tissue piece, the location of removal on the ear, and the kinds of sutures and dressings he used to close the wound.⁶² In the preface to his book on blood transfusion, Dieffenbach elaborated on his experimental technique, emphasizing that few physiologists paid sufficient attention to minimizing the pain of the experimental animal. The animal's muscular contractions during the experiment as well as his state of shock and dismay once the procedure had been performed were likely to influence the result of the experiment, and ought therefore to be minimized.⁶³ Dieffenbach was clearly concerned with the idiosyncratic

variables determining the results of an experiment and took great care to vary the circumstances of the experiment to account for these. But Dieffenbach's experiments and his emphasis on the idiosyncracies of the properties of organic tissues also bring to mind a current in late eighteenth- and early nineteenth-century medical thought, which under the intellectual leadership of Christoph Hufeland and others reacted against the abstract tendencies of *Naturphilosophie* and sought to reestablish a science of medical practice centered around direct observation, empiricism, and the individuality of the patient.⁶⁴ By adopting an eclectic conception of physiology, Dieffenbach managed to mediate a tension between physiology as a pure science and an applied science, between the need to establish general rules of "natural" processes on the one hand, and to account for their idiosyncracies on the other. This conception also pervades his approach to the practice of plastic surgery, where it proved to be highly productive.

The seemingly minute changes Dieffenbach made to the technique of rhinoplasty appear in a new light when viewed through the physiological principles Dieffenbach advocated. The larger size of the forehead triangle ought to be made in recognition of the peculiar contractive properties of separated skin. The slight transposition of the incisions of the bridge followed Dieffenbach's observation of the importance of reducing vessel contractility in the flap and enabling maximum contact between the surfaces of the two wounds. Finally, his instructions on the timing of the flap insertion, and on the intraoperative and postoperative cooling of the flap, reflected his insight into the phasic phenomena of increase and decrease of contractive activity in the tissue. Yet while recognizing these isolated technical improvements as part of an integrative system of physiological thought is certainly illuminating, it only inadequately characterizes the kind of innovation Dieffenbach had in mind. The role of physiology was not merely to improve individual techniques, but to challenge notions of how surgery should be done and what it meant to be a surgeon. The task of demonstrating this new vision of surgery would fall to plastic surgery.

A New Kind of Surgery

If this chapter has so far used the term "plastic surgery" for pragmatic purposes, it is important to point out that this term did not hold the same meaning then as it does today, charged with the associations of the aesthetic-reconstructive binary. Neither was it the only term used to describe the same group of operations or even the most commonly used one.⁶⁵ The demarcation of the field was not based on the result or motivation of the procedures (improving or neutralizing appearance) but on the approach that characterized this branch of surgery. Graefe had first used the word "rhinoplasty"

(*Rhinoplastik*), drawing on the Greek word for *forming* in his 1818 description of a successful operation. The emphasis placed on the constructive element of the procedure compared a surgery that removed parts of the body in order to heal, often disfiguring the body, with a surgery that instead “substituted organic loss organically.”⁶⁶ Like Graefe, Dieffenbach emphasized the “reconstructive” character (*Wiederherstellen*) of plastic surgery, and contrasted the compensative, replacing nature (*wiederersetzend*) of the “organic plastic” with the mutilating effect of regular surgery (*verstümmelnde Operationen*).⁶⁷ The title of his major 1829 work *Surgical Experiences, in Particular about the Restitution of Destroyed Parts of the Body according to New Methods*, which deals with plastic operations, reflects this emphasis. Whereas “*Chirurgia curtorum*,” the title Dieffenbach chose for a chapter on plastic operations in Rust’s *Handbook of Surgery*, had emphasized the “mutilated parts” (lat. *Curta*) as the object of the procedures, the reprint of the same article, titled “On Organic Substitution” (*Über den organischen Ersatz*), foregrounded the reconstructive and physiologically informed approach Dieffenbach was advocating.⁶⁸ Organic substitution, organic plastic, and finally plastic surgery were Dieffenbach’s preferred categories in later years.⁶⁹

The range of operations discussed in Dieffenbach’s *Surgical Experiences*—including, for example, injuries to the urethra and perineal tears—equally suggests that Dieffenbach sought to classify the procedures he was describing according to their common methodology—a reconstructive rather than a destructive approach—and not according to the ability of the operations to restore appearance or function.⁷⁰ The same distinction makes it possible to see the seemingly arbitrary range of Dieffenbach’s career in a new light. Operations like the surgical cure for stuttering through incisions of the tongue, or the various separations of tendons for limb deformities, can be understood as variations of the same principle: to base surgical interventions on the physiological laws of nature, be they the regenerative forces of tissues or the contractive properties of muscles.⁷¹

In addition to being a constructive rather than a destructive form of surgery, plastic surgery also stood out as the branch of surgery that was most closely modeled on a *Naturphilosophie*-based physiology, and thus dealt with the properties of the living body. The term “plastic force” (*Plastische Kraft*) was sometimes used as a synonym for Blumenbach’s formative drive (*Bildungstrieb*) to describe the processes by which living bodies acquired their characteristic *organized* form.⁷² More specifically, Hufeland used the term “plastic force” to describe one of the subcomponents of the *formative drive*, that part which “regulates the binding, development, and formation of already organized parts according to certain purposes and forms.” This included the “ongoing regeneration during life and finally the new reproduction in a pathological state.”⁷³ A surgery that was truly *plastic* promised to act analogous to the plastic force of *living* nature by creating new

forms, and by settling on the terms *Organische Plastik* and *Plastische Chirurgie*, Dieffenbach emphasized the centrality of physiological insight into the plastic formation of the living body in guiding his surgical approach.⁷⁴

The term "plastic" therefore also evoked a stark contrast to a surgery that had based its insights on the study of the *dead* body, a surgery rooted in morbid anatomy. Surgical approaches derived from the handling of dead matter in cadavers were inferior, according to Dieffenbach, to those plastic operations that required that surgeons master the dynamic behavior of living matter. "Such a surgery," Dieffenbach told his students in one of his clinical lectures, "has physiology as its basis, it adjusts its steps according to the laws of the eternal, natural healing processes, which older surgery was unaware of, since it was based only on mechanics, and created its operational methods using cadavers."⁷⁵ The rhetorical contrast between the automated, mechanic nature of cadaver-based surgery, and the flexible, organic character of physiology-based plastic surgery not only satisfied the criticism voiced by Hufeland about the different intellectual abilities required to do different kinds of surgery, one a "science of healing," the other a mere "mechanical craftsmanship."⁷⁶ It also elevated the "raw, craft-like" character of regular surgery to the state of a "*Wissenschaft*"⁷⁷ that was capable of development. "A surgery based on mechanics," Dieffenbach warned, "is a rider on a wooden horse: it remains in one place and would be immutable if worms would not gnaw away at it. A surgery based on physiology, by contrast, flies through deserts like an Arabian horse."⁷⁸ Plastic surgery, as a truly physiological approach, was the key to true innovation in surgery.

A New Kind of Surgeon

The new kind of surgery Dieffenbach was advocating demanded a new kind of surgeon.⁷⁹ The special position plastic surgery occupied within the realm of surgery, and its close connection to physiology, meant that it was not sufficient to simply transfer principles and skills acquired from other areas of surgery to the domain of plastic operations. "From the observation of the physiological phenomena of transplanted skin parts," Dieffenbach claimed, "results the necessity for a very specific surgical method (*Verfahren*) for plastic operations in general. Very little is to be gathered from the other, more familiar areas of surgery. Here, the finding and assembling of completely different principles is needed, which are only to be found by way of physiology."⁸⁰ Neither was it sufficient to simply follow the recipe-like instructions so common in the description of new surgical techniques, such as rhinoplasty. "Surgery teaches how incisions are to be made in general, and rhinoplasty in particular specifies how one is to proceed when excising the flap of the arm or forehead, it even prescribes to measure the lines that the knife

should draw on the skin, but will not the main part, that which is not draw-able in lines, remain to be done?"⁸¹

It is important at this point to distinguish between two different uses of the word "method" in Dieffenbach's writings. On the one hand, method is used to describe the instructions for a single operative technique, such as the method of rhinoplasty. As pointed out earlier, Dieffenbach occasionally ridiculed the practice of inventing new methods and naming them. He used the second meaning of method in order to draw a contrast between this, an approach overly reliant on specific instructions, and a comprehensive, systematic approach to operations in general, based on the principles of the regenerative properties of matter. Innovating surgery based on *a multitude* of recipe-like methods was an inferior form of innovation, as it required future surgeons to merely follow instructions. Reforming surgery on the basis of an entirely new and systematic approach, *a new method*, would demand that the surgeon use those capacities of intellect previously reserved for nonsurgical physicians the likes of Hufeland: a capability for "abstraction, profound research, and reflection."⁸²

Hence a surgeon could not merely learn the "method" for rhinoplasty and think that he could now perform rhinoplastic operations. The idiosyncracies of skin physiology required him to first learn the physiological laws governing the behavior of organic matter, and then adjust his technique according to the specific circumstances of each individual case. Exactly what enabled the surgeon to go beyond his learned repertoire of techniques and rules, and apply them skillfully in individual cases, remained obscure in Dieffenbach's writings, but it was clear that there was ample room for interpretation. On several occasions Dieffenbach stressed the interplay of general rules based on physiology, and the need for situational interpretations of these principles. In a chapter titled "General Surgical Principles for Plastic Operations," Dieffenbach explained that the skin flap used in transplant operations could be "sometimes small, sometimes big, sometimes short, sometimes long, round, oval, triangular, or lobed with a small appendix. It consists sometimes of thin skin, which is transplanted into thick skin, or vice versa. It is made to heal in a flat or arched way, either entirely or in part." In addition, the surgeon had to decide on the position of insertion ("into the skin, or above, or below"), the thickness of the layer ("single or double"), and even the method of removal ("through extraction, stretching, pulling, and auxiliary cuts").⁸³ Although Dieffenbach prefaced the large series of cases in his *Surgical Experiences* with the step-by-step description of a new rhinoplastic method, and a brief synopsis of alternative techniques introduced by other surgeons, the case descriptions themselves often illustrate the necessity to deviate from this established principle. Describing the case of an eighteen-year-old girl with "scrofular deformities of the nose," Dieffenbach recalls that, "at first glance, the idea that this case was ideally

sued for a reconstruction of the missing nose fragment from the arm had to suggest itself to every physician. . . . Then she asked my advice, and after I had made myself aware precisely of everything that was still there, and everything that was missing from the nose, I recognized the possibility of reconstructing the nose wing from the depth, enlarge it through additions from neighboring parts, and re-create the face in such a way that one was hardly able to discern anything alien in it."⁸⁴ Sometimes Dieffenbach even chose to deviate from what he had acknowledged to have been the indicated procedure for the individual case based on the general principles of plastic surgery. Introducing the case histories of two young male patients who had experienced injuries of the nose in a duel, Dieffenbach declared that "the mutilation of both individuals presented itself in such a manner that according to the general established principles of rhinoplasty, the reconstruction of the missing nose fragments should have been performed using the skin of the arm." Instead, both cases were operated using a variation of the Indian method.⁸⁵ Students who, intending to learn and emulate rhinoplasty and other techniques in plastic surgery, looked to Dieffenbach's writings for instruction, were constantly reminded of the limitations of this way of learning.

Recurring insistence on the limitations of imitation, and on the inadequacy of a one-size-fits-all approach to plastic surgery, also appears in Dieffenbach's clinical teachings. Dieffenbach's student Karl Theodor Meier had recorded Dieffenbach's clinical surgical lessons in the Charité hospital from May to August 1840. Addressing his students on the first day of class, Dieffenbach dismissed the reliance of some surgeons on fancy instruments and empirical methods. "The instrument," he frowned, "is only the pen with which the surgeon charts down his thoughts; he forms and creates not according to an old, established method, but he improvises the method according to the individuality of the case."⁸⁶ He warned his students, therefore, not to expect to be given precise methods that they could simply follow. "I will not," he insisted, "dictate hundreds of recipe formulas into your wallets, with which you can cure for the rest of your life. In doing so I would cut off your own thoughts for the future. I have no recipe formulas, just as I have no formulas for letters."⁸⁷

In order to navigate such precarious dichotomies as science versus empiricism, knowledge versus expertise, acquired skill versus talent, Dieffenbach drew on nuanced variations of familiar metaphors from the realm of arts and crafts.⁸⁸ Emphasizing the difference between the mechanical manipulation of dead matter and the challenging task of forming live body parts, he insisted: "The skin is very different from wax, it forms itself idiosyncratically during the healing process, shrinks here and dies off, proliferates there, and so . . . the artist needs the talent to repair the damage happily. The surgeon is so-to-speak a sculptor, who has to be able to calculate exactly form and

relationship of the parts, on their own as well as in relation to their surrounding parts."⁸⁹ If a combination of knowledge and artistry was required for the calculated and creative formation of tissue, it was only the artist's individual ingenuity that would distinguish the true artist from the skilled craftsman. "The painter learns to draw thoroughly, and to mix and apply colors, to copy correctly—then he paints from within (*aus sich selber*), he paints his thoughts, his fantasies. One can learn how to build verses, but not how to write poetry, it is an innate ability of the poet. One can learn how to cut, but often one has to cut differently from what has been learnt. That is operative surgery."⁹⁰

Resonating within these statements was a conception of the acquisition of surgical learning and skill as a path to self-expression and self-realization, an ideal that was also at the heart of the German notion of *Bildung*. Thomas Broman has pointed out that the ideal of *Bildung*, meaning the attainment of true freedom through the cultivation of the character of an individual, had replaced older notions of "learnedness" by the late eighteenth century, and had also mediated the debates around the nature of creative genius.⁹¹ A surgical education according to Dieffenbach's vision was not a mere apprenticeship, nor was it a form of utilitarian, practical instruction in the vein of the surgical training schools. It promised to allow the talented and physiologically schooled surgeon to unfold his full potential. Once he had abandoned the methods and instruments of old surgery, he would be able to attain true "surgical freedom."⁹² Studying plastic surgery was therefore no easy path, and the beginner was discouraged from venturing into the field too soon; indeed, he might even find it frustrating. Only once he had become acquainted "through many other operations with the plastic processes of nature, her strengths, her weaknesses, and her own will to take shape in particular forms" would he "find in the organic plastic a higher form of inner satisfaction."⁹³

But he may also have been discouraged for another reason. Dieffenbach's use of artistic metaphors evoked those notions of the innate, creative genius so paramount to the literary movements of the period.⁹⁴ Central to this debate was the dualism between imitation (*Nachahmung*) and creation (*Schöpfung*). The literary movement of *Sturm und Drang* heralded a shift from representations of nature as expressions of rule and reason to a creative conception of the natural world.⁹⁵ Dieffenbach's surgical instructions express a similar preference for a creative rather than a rule-bound approach to the natural material he handled. Whereas *Bildung* had contributed to democratize the access to medical education to an extent,⁹⁶ plastic surgery would serve to exclude those without creative ability. Even if the surgeon had mastered the rules of plastic surgery, each individual case demanded that he combine his scientific knowledge of the laws of nature with a more intangible quality: ingenuity. "Though general rules for plastic operations can be

given," Dieffenbach cautioned in his surgical textbook, "it will always be left to the talent and judgment of the surgeon which method he chooses in one or the other case."⁹⁷ A plastic surgeon thus needed both, a profound knowledge of physiology and the ability to judge how it should be applied, as well as a capacity for improvisation and creativity.⁹⁸ "Without a certain natural gift (*Anlage*) for the discipline," Dieffenbach warned, "whoever studies it will always remain a beginner. May he have studied all branches of the healing sciences thoroughly, may he know all surgical operations according to their acts and masters, and be able to perform them on the cadaver and on the living body, he will always remain inadequate in his actions." A true surgeon, by contrast, knew and mastered "even that which is not written," and was able to "again and again create something new"—a true "innovative (*erfindungsreicher*) Ulysses."⁹⁹

Inimitability

Both the variability and unpredictability of Dieffenbach's physiological approach to operations and his insistence on the centrality of surgical ingenuity introduced an element of inimitability into Dieffenbach's writings and clinical teaching. This seems counterintuitive. Should not an easily reproducible method have been more conducive to the "diffusion" and therefore to the "success" of the technique? In order to solve this seeming paradox, it is necessary to understand the notion of "success" in relation to Dieffenbach's career and the broader context of university medicine in early nineteenth-century Germany.

In their struggle to regain cultural preeminence in the aftermath of the defeat and symbolic humiliation of Prussia through Napoleonic troupes, Prussian universities were crucially aware of the importance of attracting illustrious faculty. Thus cultivating a reputation was a central imperative for obtaining and retaining a university position in medicine.¹⁰⁰ Dieffenbach himself was very preoccupied with the hiring and firing landscape of German universities, in fact, it is one of the major recurring themes in a majority of his letters to friends and colleagues. With his correspondent and friend Karl Ernst von Baer, for instance, Dieffenbach speculated about the possible candidates for a position in Berlin, discussed the attempts of one of his colleagues to find a position, and updated von Baer about his own professional situation.¹⁰¹ Similar concerns appear frequently in Dieffenbach's correspondence with Georg Stromeyer.¹⁰² Attracting a large number of medical students was one way of increasing one's notoriety. But student numbers also directly impacted the livelihood of a university employee in the Prussian medical system. University professors, who depending on their rank were not always paid for the general public lectures they were expected to give,

could significantly increase their income and reputation if they could offer so-called *Privatissima*—small-sized private clinical teaching sessions that were often highly valued by students as they tended to emphasize hands-on experience.¹⁰³ Dieffenbach had been Extraordinary Professor of Medicine for four years before he was able to teach his first *Privatissimum* on operative doctrine (*Operationslehre*) in the winter semester 1835/36.¹⁰⁴ A year later, he managed to offer a *Privatissimum* on organic plastic.¹⁰⁵

Given the importance of creating a reputation and attracting students to private courses (two factors that were also mutually enforcing), a “successful” form of innovation, from Dieffenbach’s point of view, would have been one that amplified the role of the surgeon and attracted many students to his private lessons. The new plastic operations he promoted, with their emphasis on the inadequacy of methods and book learning, and on the centrality of the operator, fit the bill.

Dieffenbach’s biographers have at times been puzzled by what they perceived to be a lack of clarity in Dieffenbach’s writings, especially in his descriptions of operations. Richard Lampe, a surgeon himself, confessed that, even with the “greatest attentiveness” and “vivid use of the imagination,” he had often been unable to follow Dieffenbach’s descriptions.¹⁰⁶ Dieffenbach’s contemporary and friend Eduard Zeis commented that Dieffenbach’s writings on plastic surgery “contained many attractive descriptions of individual cases, while his descriptions of operations often lacked the necessary clarity.”¹⁰⁷ Lampe attributed this lack of clarity to a shortcoming of Dieffenbach’s writing abilities, and suggested that Dieffenbach could have increased the intelligibility of his communications had he only divided his operative descriptions into acts and included illustrations.¹⁰⁸ Yet there is some evidence that the intelligibility of his descriptions is not a shortcoming, but the result of a deliberate effort, and must be understood in the context of the potential benefits of inimitability. Dieffenbach explicitly expressed his contempt for divisions of operations into acts, a sentiment that he articulated using the same metaphor he had used to voice his dislike of methods. “I have a peculiar aversion against all acts within surgery,” he lamented. “They tear apart the subject (*Gegenstand*), and transform a living body into the bones of a skeleton.”¹⁰⁹ Dieffenbach also claimed to use the potential incomprehensibility of his writings in order to sift out lesser able surgeons, whom he advised not to imitate his procedures. In fact the first exposition of his own “method” for rhinoplasty is followed by the caveat, “I did not find it necessary to be more elaborate in the descriptions of the particulars of the operation. Whoever finds the description of the procedure not to be cumbersome enough, and who cannot imagine the rest that automatically results from it, should best not attempt the operation.”¹¹⁰ The paucity of images in Dieffenbach’s publications may in part have been due to editorial constraints, at least Dieffenbach expressed the wish that he had

been able to provide “copper or wood cuts” instead of case histories.¹¹¹ But more striking than the lack of illustrations is the choice of images when images were added to his works. The twenty-six plates appended to the four volumes of Dieffenbach’s *Surgical Experiences* contain almost exclusively images of patients before and after the operation. Details about the operative procedures themselves are rare, and if they are featured, they tend to emphasize a stage within the operation, without specifying how the result was obtained. The illustrations are therefore not a visual tool meant to facilitate emulation of procedures, but serve to document the favorable results of Dieffenbach’s operations. In other words, images, like the texts to which they were attached, confirmed and performed the talent of the operator.

Compared with other surgical texts at the time, the peculiarity of Dieffenbach’s inimitable style is even more striking. Herrmann Fritze’s and O. Reich’s 1845 work on plastic surgery, for instance, contains a large number of images, including detailed colored visualizations of operative steps, which are referred to at the relevant stages in the description of the operative method.¹¹² Fritze and Reich also regularly used exact measurements in their operative instructions.¹¹³ Dieffenbach’s contempt for measurements and acts may have been most explicitly directed at Graefe, whose text on rhinoplasty made copious use of acts and contained several pages of instructions on measurements,¹¹⁴ but many surgical textbooks at the time used the division of surgical techniques into acts, and specified measurements.¹¹⁵

If Dieffenbach’s rhetoric and choices emphasized and showcased instances of inimitability, this does not mean that his writings were useless compilations of incomprehensible, obfuscated prose. There are many moments where the attempt to be clear and intelligible is visible, where Dieffenbach formulates distinct “methods” of operations and structures them, if not in explicit acts, then at least in discernible stages. But the distribution of these moments of clarity is significant and underscores the importance of the professional context in which he wrote. First, there is a development throughout his career: Dieffenbach’s writings are more explicitly clear and easier to emulate toward the later stages of his professional life when he was already an Ordinary Professor at Berlin University and less dependent on private teaching. Where earlier writings emphasize the individual variations and idiosyncracies of rhinoplastic operations, Dieffenbach’s 1845 textbook on Operative Surgery contains a crystallized, singular rhinoplastic method, of which he claims ownership. Second, detailed explanations appear more frequently in Dieffenbach’s clinical lessons than in his published writings. Although Dieffenbach still emphasized the need to adjust the physiological principles underlying plastic procedures in each individual case, he demonstrated variations in his clinical teachings more clearly, and most importantly, he specified the reasons for having chosen a particular variation. Demonstrating the rhinoplastic reconstruction of the nose of a

sixteen-year-old girl in front of his students, for example, he described in detail the sequence of cuts he undertook and elaborated on the relationship between his choices ("I must separate the skin of the nose a few lines away from the bone") and the underlying considerations ("in order to obtain enough room for the reception of the nourishing bridge").¹¹⁶ This discrepancy in pedagogical effort between his published writings and his clinical teachings is not surprising considering that plagiarism, both from published works and clinical lectures, was not an uncommon practice in the competitive culture of the medical university. In the preface to his work on nutrition, Friedrich Tiedemann lamented the widespread practice of copying a professor's lectures and then publishing them as a book without the professor's knowledge and profit. This "unexpected honor" had also been bestowed on his own lectures, he lamented sarcastically.¹¹⁷ The surgeon Ernst Blasius even hastened the publication of his *Lehrbuch der Akiurgie* because a certain Dr. Eulenburg, who had already acquired notoriety for having published someone else's clinical lectures, had recently published a surgical manual that was almost entirely an "excerpt" of Blasius's earlier surgical works.¹¹⁸ Dieffenbach himself complained that the "miserable Blandin" had "almost copied" his *Surgical Experiences*, and acknowledged Dieffenbach only insignificantly.¹¹⁹

The discrepancy between Dieffenbach's written works and his clinical lectures might also have been a product of the pressure on university educators to make their courses attractive for students. If a textbook was too comprehensive, or a clinical lesson not different enough from the published writings of that faculty member, students might choose not to attend lessons at all. Nicolai Pirogow, who wrote a detailed account of his medical studies as a traveling student in a number of German universities, claimed that he had meant to visit a physiology lecture with Johannes Müller, but had decided not to, not only because it clashed with his clinical lectures but also because he would be able to read everything in Müller's textbook, with the exception of the demonstrations with animals and with the microscope.¹²⁰ Pirogow also experienced one of Dieffenbach's *Privatissima*. His report is illuminating. Although it was very expensive, Pirogow found the experience mostly not worth his expense, not least because Dieffenbach "spoke very muffled and uttered individual words with apparent unwillingness." But Pirogow was still content to have had the opportunity to watch Dieffenbach perform "a number of remarkable and, at the time, new plastic operations." "In fact," he wrote, "with regard to plastic operations, he was practically an original genius. Dieffenbach's inventive spirit in this surgical specialty was infinite. Each of his plastic operations stood out through something new and improvised."¹²¹ If Dieffenbach had meant to perform his own ingenuity without revealing too many imitable surgical techniques, he had certainly succeeded with Pirogow.

Conclusion

"*Nomen, omen!*" (it's all in the name) announced Dieffenbach's first biographer Rohlfs in the opening sentences of his eulogy on Dieffenbach's life and career in 1883. Translating the word Dieffenbach (*tiefer Bach*) as "profound creek," Rohlfs sought to locate Dieffenbach's significant and transformative effect on the development of German surgery in his name. The discipline had needed Dieffenbach, the profound creek, in order to grow into "a majestic stream." His name, Rohlfs continued, was "so intimately connected to German surgery that he felt justified in declaring Dieffenbach "the first German surgeon."¹²² Though Rohlfs may have been exceptional in his euphoria, his portrayal is nevertheless telling as to the extent to which Dieffenbach was successful in conjuring a vision of a new kind of surgeon, one that would provide a form of identification not only for future plastic surgeons but for surgeons of all disciplines.

The factors shaping the intense period of innovation in surgery prior to the advent of anesthesia are multiple and complex, and cannot possibly be adequately exhausted by this chapter. Developments such as urbanization, the transformation of the political landscape after the Napoleonic Wars, and the establishment of the research university certainly contributed to the growth and rapid development of surgical practice. Cultural and social influences like the framing of disfiguring diseases and the growing popularity of physiognomy may also have played a role in promoting the development of plastic surgery in particular. The case of Dieffenbach and plastic surgery invites historians to consider more seriously the impact of physiology, of professional pressures, and of theoretical debates about the function of medicine as major driving forces in the development of new surgical approaches in this period.

In a context in which surgery's place within medicine, as well as the relationship between medicine and *Wissenschaft* itself, were precarious, and where the meaning of physiology was unstable, Dieffenbach championed a new approach to surgery. By promoting truly *plastic* operations, that is, surgical approaches based on physiological laws of the living body and their idiosyncratic manifestations, he was able to emphasize surgery's basis in scientific, Naturphilosophical principles, and stressed its healing potential rather than its mutilating character. Yet the same context also gave Dieffenbach's innovation a peculiar form, one that seemingly contradicted one of the most fundamental conditions for an innovation's diffusion or success: its potential to be learned and emulated by others. This *inimitability* of Dieffenbach's brand of innovation was a crucial component of the form of success he sought to achieve, as it had the potential to accommodate the particular professional exigencies of the early nineteenth-century Prussian university context. Dieffenbach's case reminds historians of innovation to historicize not only the social and cultural conditions that produce the

needs for certain new techniques, but also the expectations of what constitutes a successful innovation at a given point in time.

Notes

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1. For examples of recent histories of surgery that combine a notion of “technological determinism” with a sense of advancement through self-evident progress (against resistance), see Harold Ellis, *A History of Surgery* (Cambridge: Cambridge University Press, 2001); Leo Zimmerman and Ilza Veith, *Great Ideas in the History of Surgery* (San Francisco: Norman Publishing, 1993). Histories of plastic surgery written in this manner include Paolo Santoni-Rugiu and Philip Sykes, *A History of Plastic Surgery* (New York: Springer, 2007); David Hamilton, *A History of Organ Transplantation* (Pittsburgh, PA: University of Pittsburgh Press, 2012). These narratives are reproduced in cultural studies approaches to plastic surgery, for example, Kathy Davis, *Dubious Equalities and Embodied Differences: Cultural Studies on Cosmetic Surgery* (Oxford: Rowman & Littlefield, 2003), 24.

2. For example, Royal College of Surgeons, *From Innovation to Adoption: Successfully Spreading Surgical Innovation* (London: Royal College of Surgeons, 2014).

3. For a detailed yet largely descriptive history of plastic surgery, see, for example, Santoni-Rugiu and Sykes, *History of Plastic Surgery*.

4. Roy Porter, *The Greatest Benefit to Mankind: A Medical History of Humanity* (New York: W. W. Norton, 1999), 362.

5. Hamilton, *History of Organ Transplantation*, 59.

6. Porter, *Greatest Benefit to Mankind*, 362–63.

7. Nathan Belofsky, *Strange Medicine: A Shocking History of Real Medical Practices through the Ages* (New York: Penguin, 2013), 113; Joel Fram and Sandra Salmans, *Weird Cures: The Most Hilarious, Disgusting and Downright Dangerous Medical Treatments Ever* (Philadelphia: Running Press, 2006), 53.

8. A. Mau and Edgar Biemer, “Johann-Friedrich Dieffenbach: The Pioneer of Plastic Surgery,” *Annals of Plastic Surgery* 33, no. 1 (1994): 112–15; discussion 115–16; Wibke Knoener and Dirk Schultheiss, “Johann Friedrich Dieffenbach (1792–1847) Pioneer in Oral Maxillofacial Surgery,” *Journal of the History of Dentistry* 50, no. 3 (2002): 117–21, quotation 302.

9. Dirk Schultheiss et al., “Johann Friedrich Dieffenbach (1792–1847) als Begründer der Plastischen Chirurgie,” *Mund-, Kiefer- Und Gesichtschirurgie* 2, no. 6 (1998): 309–15.

10. U. Ulrich and C. Lauritzen, "Johann Friedrich Dieffenbach (1792–1847): 'Vater der Plastischen Chirurgie' in Deutschland," *Deutsche Medizinische Wochenschrift* 117, no. 30 (1992): 1165–67.

11. "Verbesserte": Schultheiss et al., "Johann Friedrich Dieffenbach," 312.

12. Deborah Sullivan, *Cosmetic Surgery: The Cutting Edge of Commercial Medicine in America* (New Brunswick, NJ: Rutgers University Press, 2001), 38.

13. In a dissertation discussing Dieffenbach's influence on modern medicine, Patricia Hellerström concluded that Dieffenbach had contributed new "insights, theories and methods" to the field, and was therefore rightly called a pioneer, even if many of his operative techniques were no longer in use in contemporary plastic surgery. Patricia Hellerström, "Johann Friedrich Dieffenbach: Leben und Wirken und sein Einfluß auf die moderne Medizin," Freie Universität Berlin, 1997, 75, 77, 85–86, 111–12. Wolfgang Genschorek acknowledges that "the surgery of [Dieffenbach's] main creative period consisted less in new epochal achievements than in the broadening of the experiential treasure trove, and in the perfection of operative technique." Wolfgang Genschorek, *Wegbereiter der Chirurgie: Johann Friedrich Dieffenbach, Theodor Billroth* (Leipzig: S. Hirzel, 1983), 10.

14. Sander Gilman, *Making the Body Beautiful: A Cultural History of Aesthetic Surgery* (Princeton, NJ: Princeton University Press, 2001).

15. *Ibid.*, 12–13; Sander Gilman, *Creating Beauty to Cure the Soul: Race and Psychology in the Shaping of Aesthetic Surgery* (Durham, NC: Duke University Press, 1998), 42; Knoener and Schultheiss, "Johann Friedrich Dieffenbach (1792–1847)."

16. Gilman, *Making the Body Beautiful*, 91; Blair Rogers, "The Development of Aesthetic Plastic Surgery: A History," *Aesthetic Plastic Surgery* 1, no. 1 (1976): 3–24; according to Santoni-Rugiu and Sykes, Dieffenbach "recognized the beneficial cosmetic effects done primarily for pathological reasons" (*History of Plastic Surgery*, 308).

17. David Blackburn, *History of Germany, 1780–1918: The Long Nineteenth Century* (Malden, MA: Blackwell, 2002), 37–68; Thomas Broman, *The Transformation of German Academic Medicine, 1750–1820* (New York: Cambridge University Press, 2002), 159–73.

18. Broman, *Transformation*, 180–85; Broman, "University Reform in Medical Thought at the End of the Eighteenth Century," *Osiris*, 2nd ser., 5 (January 1, 1989): 36–53.

19. Andrew Cunningham, "The Pen and the Sword: Recovering the Disciplinary Identity of Physiology and Anatomy before 1800—I: Old Physiology—the Pen," *Studies in History and Philosophy of Science* 33, no. 4 (2002): 631–65; Andrew Cunningham, "The Pen and the Sword: Recovering the Disciplinary Identity of Physiology and Anatomy before 1800—II: Old Anatomy—the Sword," *Studies in History and Philosophy of Science* 34, no. 1 (2003): 51–76.

20. Robert Richards, *The Romantic Conception of Life: Science and Philosophy in the Age of Goethe* (Chicago: University of Chicago Press, 2002), 207–37, 434–57.

21. Lynn Nyhart, *Biology Takes Form: Animal Morphology and the German Universities, 1800–1900* (Chicago: University of Chicago Press, 1995), 52–59, quotation 52; Broman, *Transformation*, 73–101.

22. Broman, *Transformation*, 102–27.

23. Karl Friedrich Burdach, *Die Physiologie* (Leipzig: Weidmann, 1810), 6; Nyhart, *Biology Takes Form*, 51–62; Broman, *Transformation*, 180–92.

24. Thomas Neville Bonner, *Becoming a Physician: Medical Education in Great Britain, France, Germany, and the United States, 1750-1945* (New York: Oxford University Press, 1995), 53-58; Broman, *Transformation*, 52-54, 67-68.

25. Bonner, *Becoming a Physician*, 67.

26. Ritgen's conception of "external" is not a designation describing disease location on the surface of the body, but refers to one of two different modes of organization of organic tissue: their interconnectedness through inner composition and their separatedness through external manifestation in "form" (Gestalt). Only the latter is the domain of the surgeon. Ferdinand Ritgen, "Ueber den Begriff und das Gebiet der Chirurgie, und über die Grenzen und die Eintheilung des chirurgischen Lehrvortrags," *Magazin für die gesammte Heilkunde* 4, no. 1 (1829): 3-58.

27. Christoph Wilhelm Hufeland, "Zusätze," *Journal der practischen Heilkunde* 60, no. 1 (1825): 112-26; Hufeland is recalling here an earlier debate with his colleague Johann Christian Reil over the best education of medical personnel in light of the needs and financial means of the Prussian state between 1804 and 1807. The degree to which medical practitioners in different positions should and could be confronted with research and *Wissenschaft*, or with practical skills and clinical teaching, also had implications for how surgery as a science or practice was envisioned and how surgical training could best be implemented. Speaking here in 1825, Hufeland confessed that his views had not changed much since the earlier debate with Reil. Johann Christian Reil, *Pepinieren zum Unterricht ärztlicher Routiniers als Bedürfnisse des Staats nach seiner Lage wie sie ist* (Halle, 1804); Christoph Wilhelm Hufeland, "Ueber Aerzte und Routiniers," *Journal der practischen Heilkunde* 21 (1805); Christoph Wilhelm Hufeland, "Bemerkungen über die Reilsche Schrift: Pepinieren zum Unterricht ärztlicher Routiniers," *Journal der practischen Arneykunde und Wundarzneykunde* 26, no. 1 (1807): 9-57; for a thoughtful summary and analysis of the debate, see Broman, *Transformation*, 119-25.

28. Nicolai Pirogow, *Lebensfragen: Tagebuch eines alten Arztes* (Stuttgart: Cotta, 1894), 396.

29. For biographical accounts of Dieffenbach, see Heinrich Rohlf's, "Johann Friedrich Dieffenbach," *Deutsches Archiv für Geschichte der Medicin und medicinische Geographie* 6 (1883): 452-89, Heinrich Rohlf's, "Johann Friedrich Dieffenbach," *Deutsches Archiv für Geschichte der Medicin und medicinische Geographie* 7 (1884): 44-143; Richard Lampe, *Dieffenbach* (Leipzig: Barth, 1934); Bodo Mros, "Der Arzt Johann Friedrich Dieffenbach (1792-1847) in seiner Zeit" (Humboldt Universität, 1965); Genschorek, *Wegbereiter der Chirurgie*.

30. Carl Ferdinand von Graefe, *Rhinoplastik, oder die Kunst, den Verlust der Nase organisch zu Ersetzen* (Berlin: Realschulbuchhandlung, 1818).

31. Johann Friedrich Dieffenbach, *Chirurgische Erfahrungen, besonders über die Wiederherstellung zerstörter Theile des menschlichen Körpers nach neuen Methoden*, vol. 2 (Berlin: T. C. F. Enslin, 1830), 151.

32. *Ibid.*

33. Johann Friedrich Dieffenbach, *Nonnulla de Regeneratione et Transplantatione* (Würzburg: Richter, 1822), 11.

34. *Ibid.*

35. *Ibid.*, 12-14.

36. *Ibid.*, 14-17.

37. Ibid., 16.
38. Ibid., 13.
39. Rochus Freiherr von Liliencron, Franz X. von Wegele, and Anton Bettelheim, eds., "Johann Friedrich Dieffenbach," in *Allgemeine deutsche Biographie*, vol. 5 (Leipzig: Duncker & Humblot, 1877), 120–26.
40. Dieffenbach, *Nonnulla de Regeneratione et Transplantatione*, 35–42, 48–50.
41. Ibid., 50–52.
42. Johann Friedrich Dieffenbach, "Transplantationsversuche bei Thieren," *Journal der Chirurgie und Augenheilkunde* 6 (1824): 122–35.
43. Lampe, *Dieffenbach*, 116, 196.
44. Johann Friedrich Dieffenbach, "Ueberpflanzung völlig getrennter Hautstücke bei einer Frau, und Wiederanheilung einer grösstentheils abgehauenen Wange," *Journal der Chirurgie und Augenheilkunde* 6 (1824): 482–86.
45. Ibid.
46. Johann-Friedrich Dieffenbach, *Die operative Chirurgie*, vol. 1 (F. A. Brockhaus, 1845), 317.
47. Dieffenbach, *Chirurgische Erfahrungen*, 2:173.
48. These considerations by Dieffenbach about blood and the contraction of blood vessels has been interpreted by his biographers as a prescient recognition of the damaging effect of venous stasis and the "antiphlogistic" principles of surgical wound care. However, these interpretations overlook the conceptual context of vital forces and the physiological laws of tissues amidst which Dieffenbach formulated his recommendations. See, for example, Genschorek, *Wegbereiter der Chirurgie*, 58; Schultheiss et al., "Johann Friedrich Dieffenbach," 309.
49. Dieffenbach, *Chirurgische Erfahrungen*, 2:165, 168.
50. Ibid., 2:175–85.
51. Ibid., 2:162–63, 172–75; Dieffenbach, *Die operative Chirurgie*, 1:317–21.
52. Dieffenbach, *Chirurgische Erfahrungen*, 2:175.
53. Ibid., 2:175–76.
54. Ibid., 2:177.
55. Andrew Cunningham, *The Anatomist Anatomis'd: An Experimental Discipline in Enlightenment Europe* (England: Ashgate Publishing, 2010), 371–79; Cunningham, "Pen and the Sword" (2002); Cunningham, "Pen and the Sword" (2003).
56. Peter C. English, *Shock, Physiological Surgery, and George Washington Crile: Medical Innovation in the Progressive Era* (Westport, CT: Greenwood Press, 1980); Ulrich Tröhler, *Auf dem Weg zur physiologischen Chirurgie: Der Nobelpreisträger Theodor Kocher 1841–1917* (Basel: Birkhäuser, 1984); Thomas Schlich, *The Origins of Organ Transplantation: Surgery and Laboratory Science, 1880–1930* (Rochester, NY: University of Rochester Press, 2010), especially 150–62; Thomas Schlich, "'Physiological Surgery': Laboratory Science as the Epistemic Basis of Modern Surgery (and Neurosurgery)," unpublished manuscript, 2014. Many thanks to the author for making the manuscript available.
57. Mary Terrall, *Catching Nature in the Act: Réaumur and the Practice of Natural History in the Eighteenth Century* (Chicago: University of Chicago Press, 2014).
58. Timothy Lenoir, "Teleology without Regrets: The Transformation of Physiology in Germany: 1790–1847," *Studies in History and Philosophy of Science*, Part A, 12, no. 4 (1981): 293–354; Nyhart, *Biology Takes Form*, 35–47. For the most part the

morphological elements of Dieffenbach's physiological reflections seem to be compatible with Timothy Lenoir's characterization of teleomechanism, an approach that accepted the need for teleology in the formation of organic tissue but found teleology in mechanical and organizational, not strictly vitalistic, properties of matter.

59. Dieffenbach, *Chirurgische Erfahrungen*, 2:174.

60. Nyhart, *Biology Takes Form*, 47–64; Olaf Breidbach, "Karl Friedrich Burdach," in *Naturphilosophie nach Schelling*, ed. Thomas Bach and Olaf Breidbach (Stuttgart: Frommann-Holzboog, 2005), 73–106.

61. Dieffenbach explicitly pondered the challenges of the new experimental approach, in particular the challenges posed by the suffering of the animal, and the need to control for this, in the context of his transfusion experiments. Johann Friedrich Dieffenbach, *Die Transfusion des Blutes* (Berlin, 1828), ix–xii.

62. However, the specific result of all these variations remains unclear in the text. Instead, Dieffenbach seems to have attempted to establish certain generalizable rules resulting from his experiments, for instance that the likelihood of perfect regeneration was greater in tissues with a cartilaginous component (such as the nose) and a high blood flow, or in those with a known large reproductive force (such as the scrotum). Dieffenbach, *Chirurgische Erfahrungen*, 2:164–65, 171.

63. Dieffenbach, *Die Transfusion des Blutes*, ix–x; in fact, Dieffenbach was one of the first enthusiastic users of ether anesthesia when it became available. See Johann Friedrich Dieffenbach, *Der Aether gegen den Schmerz* (Berlin: Hirschwald, 1847).

64. This current is discussed in detail by Thomas Broman. Broman, *Transformation*, 102–27. Though, as Broman himself points out, the boundaries between thought systems were never as clearly drawn, Broman's characterization of the debate is an extremely useful crystallization of the major themes and groups.

65. Regularly discussed were, among others, the terms "Morioplastik," "Organoplastik," "Chirurgia curtorum," and "Transplantation." For a discussion of these terms, see Eduard Zeis, *Handbuch der plastischen Chirurgie* (Berlin: G. Reimer, 1838), 5–7; Friedrich-August von Ammon and Moritz Baumgarten, *Die plastische Chirurgie nach ihren bisherigen Leistungen kritisch dargestellt* (Berlin: G. Reimer, 1842), 3–7.

66. Graefe, *Rhinoplastik*, vi–vii.

67. Johann Friedrich Dieffenbach, *Chirurgische Erfahrungen, besonders über die Wiederherstellung zerstörter Theile des menschlichen Körpers nach neuen Methoden*, vol. 3 (Berlin: T. C. F. Enslin, 1834), v.

68. Johann Friedrich Dieffenbach, "Chirurgia Curtorum," in *Theoretisch-praktisches Handbuch der Chirurgie*, ed. Johann Nepomuk Rust, vol. 4 (Berlin: Enslin, 1831), 496–599; Johann Friedrich Dieffenbach, *Ueber den Organischen Ersatz* (Berlin: Enslin, 1831).

69. The use of different terms at different periods in his career may indicate an increasing crystallization of the kind of surgery Dieffenbach sought to establish, especially his emphasis on the plastic, living properties of the skin. The advantages and disadvantages of different terms were also explicitly debated by other authors, making deliberate choices more plausible. Zeis, *Handbuch*, 5–7; Ammon and Baumgarten, *Plastische Chirurgie*, 3–7.

70. Johann Friedrich Dieffenbach, *Chirurgische Erfahrungen, besonders über die Wiederherstellung zerstörter Theile des menschlichen Körpers nach neuen Methoden*, vol. 1 (Berlin: T. C. F. Enslin, 1829).

71. Johann Friedrich Dieffenbach, *Die Heilung des Stotterns durch eine neue chirurgische Operation* (Berlin: Förstner, 1841); Johann Friedrich Dieffenbach, *Ueber die Durchschneidung der Sehnen und Muskeln* (Berlin: Förstner, 1841).

72. Johann Friedrich Pierer, ed., "Bildungstrieb," in *Medizinisches Realwörterbuch*, vol. 1 (Leipzig: Brockhaus, 1816).

73. Christoph Wilhelm Hufeland, *Ideen über Pathogenie und Einfluss der Lebenskraft auf Entstehung und Form der Krankheiten* (Jena: Academische Buchhandlung, 1795), 65.

74. This meaning of plastic as the potential for the manipulation of living tissue, and its limits due to the unpredictability of the behavior of living matter, is echoed in the notion of "plasticity" that scholars have developed for the twentieth century. See, for example, Hannah Landecker, *Culturing Life: How Cells Became Technologies* (Cambridge, MA: Harvard University Press, 2009), 1–10; Hannah Landecker, "Living Differently in Time: Plasticity, Temporality and Cellular Biotechnologies," in *Technologized Images, Technologized Bodies*, ed. Jeanette Edwards, Penelope Harvey, and Peter Wade (New York; Oxford: Berghahn Books, 2010), 211–36.

75. Karl Theodor Meier, *Vorträge in der chirurgischen Klinik der königlichen Charité zu Berlin gehalten von Dieffenbach* (Berlin: Duncker, 1840), 5.

76. Hufeland, "Zusätze," 115.

77. Dieffenbach, *Chirurgische Erfahrungen*, 2:3.

78. *Ibid.*, 3:vi.

79. For a thoughtful discussion of the historic specificity of certain surgical "styles" and the role of performance and metaphors in fashioning surgical identities, see Thomas Schlich, "The Days of Brilliancy are Past': Skill, Styles and the Changing Rules of Surgical Performance, ca. 1820–1920," unpublished manuscript, 2014. Many thanks to the author for making the manuscript available.

80. Dieffenbach, *Die operative Chirurgie*, 1:324.

81. Dieffenbach, *Chirurgische Erfahrungen*, 1:4–5 This is very likely a stab at Graefe, who insisted on the creation of detailed drawings and models for his rhinoplastic operations.

82. Hufeland, "Zusätze," 115.

83. Dieffenbach, *Die operative Chirurgie*, 1:324–25.

84. Dieffenbach, *Chirurgische Erfahrungen*, 1:18.

85. *Ibid.*, 2:38.

86. Meier, *Vorträge in der chirurgischen Klinik*, 5.

87. *Ibid.*

88. Thomas Schlich has described similar rhetorical strategies for the case of operative fracture care, in which proponents of the practice drew on notions of surgery as a science, and opponents emphasized the status of surgery as an art. Dieffenbach's case is interesting as he uses nuanced variations of familiar metaphors from the realm of the arts in order to argue that surgery was both, a science and an art. Thomas Schlich, "The Art and Science of Surgery: Innovation and Concepts of Medical Practice in Operative Fracture Care, 1960s–1970s," *Science, Technology & Human Values* 32, no. 1 (2007): 65–87.

89. Dieffenbach, *Chirurgische Erfahrungen*, 1:4.

90. Dieffenbach, *Die operative Chirurgie*, 1:1–2.

91. Broman, *Transformation*, 71–72.

92. Dieffenbach, *Die operative Chirurgie*, 1:18.

93. *Ibid.*, 1:390–91.

94. The so-called genius movement (Geniebewegung) of the second half of the eighteenth and early nineteenth centuries, in reaction to the rational tendencies of the Enlightenment, emphasized the notion of a creative, irrational, enthusiastic, godlike genius. Jochen Schmidt, *Die Geschichte des Genie-Gedankens in der deutschen Literatur, Philosophie und Politik, 1750–1945: Von der Aufklärung bis zum Idealismus*, 3rd ed., 2 vols. (Heidelberg: Winter, 2004), vol. 1; Jochen Schmidt, *Die Geschichte des Genie-Gedankens in der deutschen Literatur, Philosophie und Politik, 1750–1945: Von der Romantik bis zum Ende des Dritten Reichs*, 2 vols. (Heidelberg: Winter, 2004), vol. 2; Günter Peters, *Der zerrissene Engel: Genieästhetik und literarische Selbstdarstellung im achtzehnten Jahrhundert* (Stuttgart: Metzler, 1982).

95. Schmidt, *Geschichte des Genie-Gedankens [Von der Aufklärung bis zum Idealismus]*, 1:10–13.

96. Broman, *Transformation*, 71.

97. Dieffenbach, *Die operative Chirurgie*, 1:390–91.

98. Dieffenbach's demand for the surgeon to learn the laws of living tissue and know in each case how they ought to be applied can thus be said to lie at the intersection of a form of "trained judgment" and a more intuitive form of evaluation, leaving it unclear how exactly the surgeon could acquire this kind of judgment. Lorraine Daston and Peter Galison, *Objectivity* (Cambridge: Zone Books, 2007), 309–62.

99. Dieffenbach, *Die operative Chirurgie*, 1:1.

100. Broman, *Transformation*, 168–73.

101. Four letters from Johann Friedrich Dieffenbach to Karl von Baer, Berlin, October 10, 1829–January 1, 1843, call number ADB, 5, 120–26; BLÄ, 2, 262–64, Karl von Baer Fonds, University Library Giessen.

102. Bruno Valentin, ed., *Dieffenbach an Stromeyer: Briefe aus den Jahren 1836–1846* (Leipzig: J. A. Barth, 1934).

103. On professional hierarchies and internal competition in university faculties, see Araham Zloczower, *Career Opportunities and the Growth of Scientific Discovery in Nineteenth-Century Germany* (New York: Arno Press, 1981), 11–38; Nyhart, *Biology Takes Form*, 15; Stefan Brüdermann, *Göttinger Studenten und akademische Gerichtsbarkeit im 18. Jahrhundert* (Göttingen: Vandenhoeck & Ruprecht, 1990), 310–16; Walter Rüegg, *A History of the University in Europe*, vol. 3, *Universities in the Nineteenth and Early Twentieth Centuries (1800–1945)* (Cambridge: Cambridge University Press, 2004), 141; *Privatissima* were sought out explicitly by traveling students like Pirogow: Pirogow, *Lebensfragen*, 383, 388, 390, 396.

104. Friedrich-Wilhelms-Universität Berlin, *Verzeichnis der Vorlesungen WH 1835/36*, 1835. Universitätsbibliothek der Humboldt-Universität zu Berlin, <http://www.digi-hub.de/viewer/resolver?urn=urn:nbn:de:kobv:11-D-1072088>.

105. Friedrich-Wilhelms-Universität Berlin, *Verzeichnis der Vorlesungen WH 1836/37*, 1836. Universitätsbibliothek der Humboldt-Universität zu Berlin, <http://www.digi-hub.de/viewer/image/DE-11-001717043/8/>.

106. Lampe, *Dieffenbach*, 125.

107. Eduard Zeis, *Die Literatur und Geschichte der plastischen Chirurgie* (Leipzig: Engelmann, 1862), 222.

108. Lampe, *Dieffenbach*, 125–26.

109. Dieffenbach, *Chirurgische Erfahrungen*, 1:135.
110. *Ibid.*, 1:14-15.
111. Dieffenbach, *Die operative Chirurgie*, 1:x.
112. Hermann Eduard Fritze and O. F. G. Reich, *Die plastische Chirurgie in ihrem weitesten Umfange dargestellt und durch Abbildungen erläutert* (Berlin: Hirschwald, 1845), for example, 21.
113. *Ibid.*, for example, 23.
114. Graefe, *Rhinoplastik*, esp. 37-45.
115. For example, Ernst Großheim, *Lehrbuch der operativen Chirurgie* (Berlin: Enslin, 1830); Ernst Blasius, *Lehrbuch der Akiurgie* (Halle: Anton, 1835).
116. Meier, *Dieffenbach's Vorträge*, 48.
117. Friedrich Tiedemann, *Untersuchungen über das Nahrungs-Bedürfniss, den Nahrungs-Trieb und die Nahrungs-Mittel des Menschen*, vol. 3 (Darmstadt: Leske, 1836), v-vi.
118. Blasius, *Lehrbuch der Akiurgie*, Vorrede.
119. Philippe Frédéric Blandin had published a book titled *Autoplastie, ou restauration des parties du corps qui ont été détruites etc.* in 1836. Valentin, *Dieffenbach an Stromeyer*, 21. In the letters to Stromeyer, Dieffenbach also complained about having been betrayed by Eduard Zeis, Friedrich Baumgarten, and Friedrich von Ammon, all of whom published works on plastic surgery during Dieffenbach's lifetime.
120. Pirogow, *Lebensfragen*, 392.
121. *Ibid.*, 396.
122. Rohlfs, "Johann Friedrich Dieffenbach" (1883): 455.