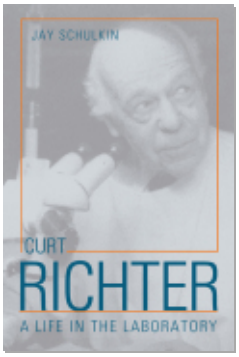
6. An Artisan in the Laboratory



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CHAPTER 6

An Artisan in the Laboratory

There are traditions of inquiry that radically separate thought from the activities of the artisan and theory from the mundane work of the laboratory. In these traditions, the knower is on one side and the artificer on the other. This view has been criticized by many (e.g., Dewey 1934/1958; Hollinger 1994), and I believe it is a misleading way of understanding much of science. A scientist more at home at the level of invention of instruments may be simultaneously embedded in theory and invested in experiment (Galison 1988).

Curt Richter, though he probably never articulated it, understood the fallacy of this dichotomous view of inquiry. Richter was always involved with the creation of knowledge and the discovery of new facts.

A HANDS-ON APPROACH

Richter found ingenious ways to study phenomena. A quote displayed in Richter's laboratory was attributed to François Magendie, the father of experimental physiology and Bernard's teacher: "Everyone compares himself to something more or less majestic in his own sphere, to Archimedes, Michelangelo, Galileo, Descartes, and so on. Louis XIV compared himself to the sun. I am much more humble. I compare myself to a scavenger; with my book in my hand and my pack on my back, I go about the domain of science, picking up what I can find" (Rozin 1976a, p. xviii).

Richter was a scientific scavenger-entrepreneur. The experiment dominated his conception of what it meant to be a psychobiologist. Richter's world was rich in scientific breadth and invention; it was the world of the artisan scientist, the maker of tools. His sensibility can be traced to those of modern experimenters like Robert Boyle, who understood experimentation as vitally

important to understanding science and to the trust that is afforded the things we claim to know (Shapin and Schaffer 1985). Most scientists live in a world in which instruments are shared. As Galison (1987) made clear, the shared instruments link various experiments. Richter loved the invention of new tools and new instruments.

Science does not take place in a vacuum; it requires a culture of inquiry, artifacts, and labor. Peirce wrote elegantly about the community of inquirers, about the way a proposition's meaning is defined by the broad array of experimental and conceptual tests it undergoes, and about investigators having as a normative goal the culmination of their opinions in truth (Peirce 1877, 1878, 1898/1992).

Richter considered existing ideas in physiology and psychobiology and devised ways to study them in the laboratory. Richter did not, for example, invent the concept of wisdom of the body popularized by Cannon; rather, Richter made it a laboratory artifact, something studied or realized in the laboratory. Neither did he invent the idea of biological clocks or of domestication of internal physiology and behavior, but he made them suitable objects for laboratory study.

THE STRUCTURE OF THE LABORATORY

The structure of the laboratory, its organization, its products, and its forces of production make up a subfield of study for the historian of science (see Latour and Woolgar 1979/1986). The laboratory setting, of course, can not be contained within an unequivocal definition. There is no platonic definition of a laboratory, just the common depiction of an investigator instantiating and studying, controlling and understanding an object of study. Richter might have agreed with this description of a laboratory setting: "Laboratories allow natural processes to be 'brought home' " (Cetina 1999, p. 29). Of course, some phenomena brought into the laboratory may become artifacts of the laboratory; by definition, experimental science does not allow for the study of unadulterated nature (see Kohler 2002). For all the analysis that, for example, Latour and Woolgar (1979/1986) provide in their book *Laboratory Life,* they never seem close to capturing a sense of the laboratory in which playfulness, or for that matter, the artisan sensibility (Lynch 1985), is expressed. Richter surely was productive, focused, and driven, but he enjoyed his collaborators, the creation of useful tools for measurement, and the esthetic creations of laboratory life.

NOT ALONE, BUT A LONER

Richter was a loner and eschewed the usual role of an academic, avoiding, for example, academic meetings when at all possible. He never worked in a typical university setting. He had few graduate and undergraduate students, but this does not mean that he worked alone. He maintained long-term relationships with his research staff and with some of his colleagues (e.g., Eliot Stellar).

A laboratory community can have a familial feeling, though certainly this is not always the case. Like families, laboratories differ in the degree to which they are benign or nurturing for their individual members. Richter appears to have engendered a congenial ambiance in which individuals could participate in the culture of science and in a laboratory life devoted to the production of scientific facts, the testing of ideas, and the exploring of biological matters that had an impact on human health.

Of course, Richter made the most of his staff's allegiance and loyalty in order to produce well-conducted research. Research takes place in a social context, with individuals who have different interests and levels of commitment. But always Richter was the man in charge, the leader of his laboratory.

STUDENTS AND COLLABORATORS

Richter had very few Ph.D. students, but he did have a cadre of medical students who worked on projects with him in his laboratory. He also had a few colleagues who began their careers working with him and remained with him for long periods.

Several of the medical students who worked in Richter's laboratory were Henry Strong Denison scholars at Hopkins. Many of the papers Richter wrote were coauthored with these medical students. Indeed, medical students, together with key technicians, were staples of his laboratory (Keiner 1996).

Particularly important colleagues included Sally Dieke, who earned a Ph.D. in chemistry, and Katherine Rice, who received her M.D. from Hopkins. Rice worked with Richter principally on the specific hungers and was an active member of his laboratory intermittently from 1941 to 1957, while she worked as a practicing psychiatrist.

During the most productive periods in Richter's laboratory (from the end of the 1930s through the 1940s), Bruno Barelare and John Eckert, who each earned an M.D. and worked on the specific hungers, stood out as particularly

productive coauthors. Several individuals who worked in the Psychobiology Laboratory as research associates had Ph.D.s (e.g., Wang, Kinder, Dieke, and M. Hines). Other noteworthy colleagues were E. Holt, M.D. (a professor of pediatrics), and O. Langworthy, M.D. (a professor of neurology).

It is unclear from Richter's work which ideas were his and which belonged to his colleagues and students. It is clear that they helped him and that he had long-term relationships with several key laboratory colleagues. In some instances they lent a technical hand; in others, they tested an idea in which Richter was particularly interested.

In his autobiography (Richter 1985), Richter included the following acknowledgments: "Over the past sixty years, many medical students and members of the hospital and medical school staffs collaborated in these researches: Katherine Rice, Sally Dieke, Carl Hartman, Bruno Barelare, John Eckert, Douglas Hawkes, E. Schmidt, Emmett Holt, and David Mosier" (Richter 1985).

Several key colleagues at the beginning of his career were essential to his initial successes, and a long list of influential individuals held Richter in high regard. Those who worked with him seemed quite devoted to him.

David Mosier worked with Richter on the contrast between wild and domestic rats (on end-organ systems) over several summers in the late 1940s and early 1950s. Mosier worked with Richter at Hopkins while he was a medical student and then again when he returned as a resident in endocrinology (1955–57). Mosier described Richter in this way: "He seemed to go on in that third-floor laboratory as if it was given to him by God. He exuded so much confidence. But then again, perhaps he was given the laboratory by God" (D. Mosier, pers. comm., February 2003).

Mosier described Richter as unpretentious and helpful to the medical students who worked in his laboratory, offering them gentle criticism and encouragement. Mosier also remarked that toward the end of his life, the tired Richter perked up when he learned of Mosier's involvement with a large primate facility, responding, "My God, David, that is fantastic." Richter was always excited by the prospect of research, even at the end, and he extended that enthusiasm to others.

LABORATORY STAFF

Richter also formed long-lasting relationships with the technical workers in his laboratory. Technical support was vital for Richter's investigations, as it is for many investigators (see Shapin 1989). Many of his technical helpers

worked with him for years, and when I interviewed several of them, including Ardis O'Connor and Barbara Carberry Cross, they expressed their devotion to Richter and talked about how they kept the laboratory going and felt that they were part of a great enterprise. Richter would never have been as productive as he was without the laboratory staff he cultivated over a long period. Individuals like O'Connor, Cross, and Agnes Molloy kept the laboratory alive and working, and many saw their careers as defined by being part of the Richter laboratory.

Richter trained the members of his laboratory staff to serve in a variety of functions. For example, Peg Brunner and Ardis O'Connor helped with activity charts. Several technicians, including Ardis O'Connor and M. Eckman, developed a level of competence that allowed them to participate in surgical procedures. These people had such a sense of commitment to Richter that, even in his last years, those who had gone on to other positions still helped and remained loyal to him (A. O'Connor and B. Carberry Cross, pers. comm., June 2003).

Ardis O'Connor worked with Richter for more than thirty years, from 1944 to 1978, and she and Richter performed countless surgical operations together (A. O'Connor, pers. comm., June 2003). Richter said of O'Connor: "For nearly thirty-three years, Mrs. O'Connor had complete responsibility for the maintenance of standard conditions in all of my experiments and also was in charge of my colony of Norway rats" (Richter 1985, p. 386). Like many successful scientists, Richter engendered commitment and devotion from a variety of individuals involved in the scientific enterprise.

RICHTER'S LABORATORY IN CONTEXT

The importance of inventing methods, though now obvious, once needed to be stated by scientists such as Bernard and Pavlov, who celebrated the laboratory methods that moved the science of physiology beyond simple observation (Holmes 1974; Todes 2002). Richter was very much in this tradition but lacked the public demeanor Bernard and Pavlov had. He was happy to be sequestered in the laboratory, to enjoy the sweet success of an accomplished scientist, and to relish the cultural life of the Baltimore elite class.

Richter's laboratory was less structured than Pavlov's, which was characterized by Daniel Todes, a scientific historian, as a behavioral or physiological factory. In a fairly positive and detailed depiction of the workings of Pavlov's laboratory, Todes documented the production of scientific facts that emerged from the structure of that laboratory.

Pavlov is well known in the scientific community and was a Nobel laureate. Richter, in contrast, was not as distinguished an intellectual figure as was Pavlov, Cannon, or even Karl Lashley. He was much less famous and had far fewer students and colleagues working in his laboratory. He was, however, very much appreciated by core individuals, was seen as a serious investigator, and had gathered the major trimmings of scientific success.

And Richter was playful. His mode of inquiry reflected that fact. Discovery and invention and the free rein of exploration predominated. He could be jovial and stubborn at the same time. Whereas Pavlov was on a crusade through his science, Richter was a playful laboratory artisan. Although he was the leader of his laboratory, by all accounts his manner had a light touch. The little boy who tinkered on the floor of his mother's factory never really departed. Pavlov would not have handed out greeting cards of rats ingesting sucrose (see fig. 3.5). Consider the title of Richter's autobiographical reminiscences: "It's a Long Way to Tipperary, the Land of My Genes" (Richter 1985). Would Pavlov ever have used such a title? Surely not! Despite his playfulness in the laboratory, however, Richter was always serious and disciplined about his work.

Richter remained an engineer/experimentalist to the core. Entering his laboratory, one experienced the vitality and creativity that permeated the space. The master craftsman was revealed through the elegance of his laboratory, his adroit use of space, and the placement of his charts and surgical tools. Richter's artisan sensibilities were apparent.

AN UNFINISHED PROJECT: THE RICHTER-MALONE BOOK

Just as Richter often depended on others to keep his laboratory going and lend him their hands and minds, he teamed up with a particular laboratory artisan to work out his surgical depictions. Richter's collaboration with Paul Malone was an important one. Malone was a medical illustrator who had studied with Max Brödel, assisting the great illustrator on drawings of the inner ear (Brödel 1946; Crosby and Cody 1991), and he eventually became the director of medical illustration at the Lahey Clinic Foundation in Boston.

Max Brödel worked with many people at Hopkins, including William Stewart Halsted and Harvey Cushing, both noted surgeons who greatly influenced Richter (the work of Halsted on surgical parathyroidectomy is one example; see Crowe 1957). An artist who had trained in Leipzig with the physiologist Carl Ludwig, Brödel was a legendary figure at Hopkins. He arrived at Hopkins from Germany in 1894, and by 1911 he had created the Department of Art as

Applied to Medicine (Schultheiss and Jonas 1999), where he would serve as director for nearly thirty years (Cullen 1945). Brödel stated his position clearly: "A medical picture, correctly planned and accurately and artistically executed, is an integral part of the medical literature" (Brödel 1941, p. 668). In fact, anatomical art had been established centuries earlier as an integral part of the medical sciences. The notebooks of Leonardo da Vinci are full of drawings of conceptual possibilities (flying machines), realistic medical dissections, and glorious art tied to a philosophy of exploration and experimentation (da Vinci 1980). Da Vinci's emphasis was on art, on simulation, on the building of things. In his day, there was no separation between art and practicality; the everyday utility an artisan created through perspective and ingenuity was appreciated (Dewey 1934/1958). Art was central to medical depiction.

When Richter and Malone set out to publish a book on rat surgery, W. B. Saunders Publishing Company expressed interest. In 1972, Malone wrote to Richter that "[Saunders] agree we write a book if you can finish it up in 6 months" (Richter files, Chesney Archives, June 23, 1972). Malone noted in the same letter that "you and I both know that circumstances are such that we cannot continue to add drawings." Some five years later, Malone wrote to a colleague that "we hope to publish the rat surgery eventually." Richter noted that "surgery has always given me particular pleasure. I still do all the operating on my animals and all autopsies. Ordinarily I spend almost half my time operating—am still able to perform almost every operation on a rat that can be done on dogs or man, with the exception of those on blood vessels. I am hoping shortly to publish (with P. D. Malone, a medical artist) a full description of all of these operations in a book on 'Experimental Surgery of the Rat' " (Richter files, Chesney Archives).

The next several figures are examples of Richter's and Malone's surgical/anatomical drawings. Richter and his colleagues conducted a number of their behavioral studies with an emphasis on the importance of the oral cavity (fig. 6.1) and the gustatory nerves, including several of the cranial nerves (fig. 6.2). Figures 6.3 and 6.4 depict two of Richter's experimental techniques: the removal of the pituitary gland and a retinal implant in a rat, respectively.

Richter described his work with Malone as follows:

> This great collection of drawings of surgical operations and maneuvers on the Norway rat resulted from many happy years of collaboration with Mr. P. D. Malone, now one of the leading medical illustrators in this country. There never has been anything to equal these drawings—lovely to look at even without any knowledge

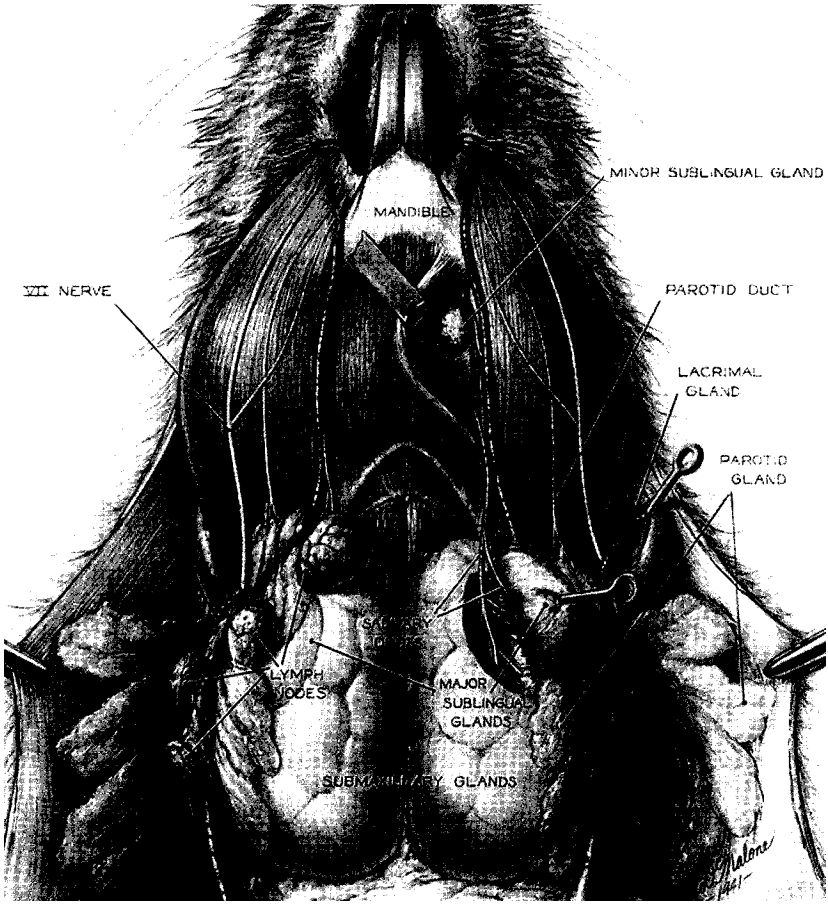

FIG. 6.1. Glands associated with the oral cavity. *Source:* Alan Mason Chesney Medical Archives, Johns Hopkins Medical Institutions

or main interest. My contribution was minor. I merely designed the operations needed for the various experiments and did the operations. In preparation for making the drawings, Mr. Malone and I worked very closely together, constantly checking and re-checking each other's versions until finally we felt satisfied that the drawings gave an accurate and complete account of each operation.

Mr. Malone started his career with Max Brödel, the first medical illustrator in this country, and became an expert in the use of the Brödel technique. Brödel took a keen and active interest in the drawings that Mr. Malone made for my experiments and offered many helpful criticisms and suggestions. Mr. Malone's drawings gave Brödel much pleasure and satisfaction. (Richter files, Chesney Archives)

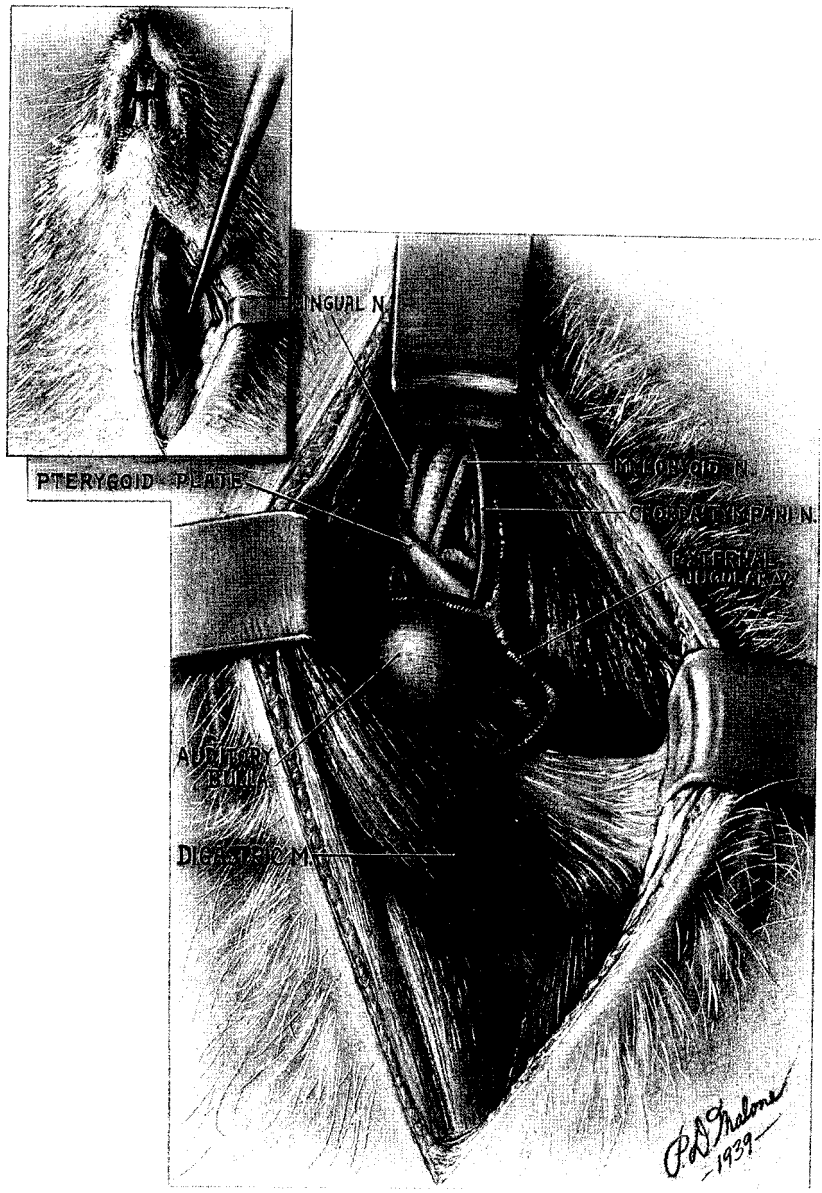

FIG. 6.2. Parts of the cranial nerves that underlie gustation. *Source:* Richter 1956

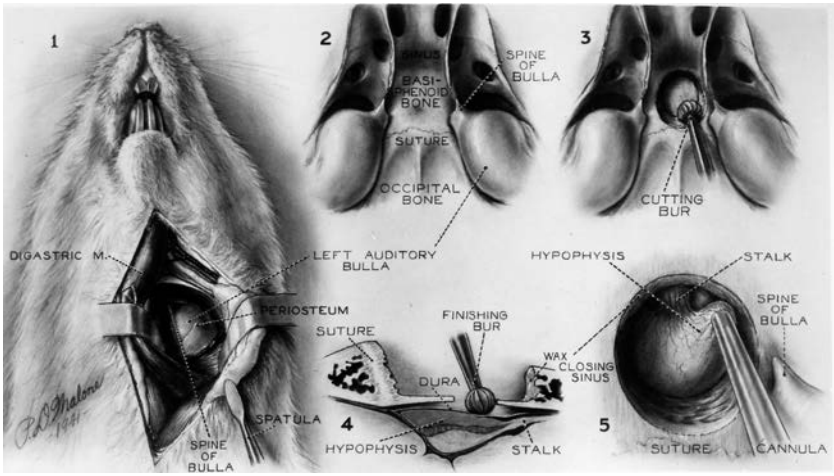

FIG. 6.3. Steps in removing the pituitary gland of a rat. *Source:* Alan Mason Chesney Medical Archives, Johns Hopkins Medical Institutions

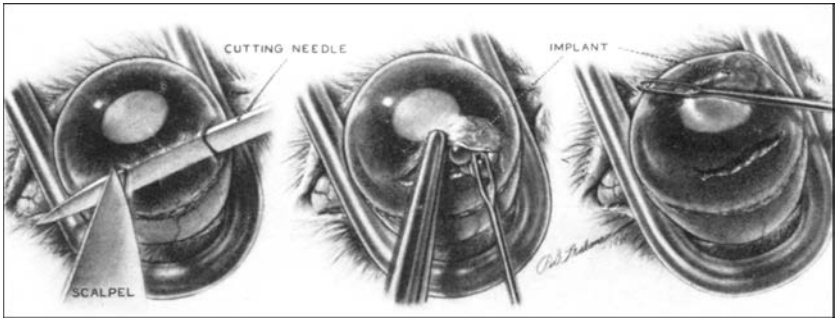

FIG. 6.4. The surgical techniques used to implant tissue in the anterior chamber of the eye. *Source:* Richter 1956

Richter and Malone envisioned many possible chapters for their book. Table 6.1 lists suggested illustrations (Richter files, Chesney Archives). Unfortunately, the work was never published, for unknown reasons, perhaps a waning interest on the part of the publisher. The illustrations remain in the Richter files at the Chesney Archives, perhaps to be rediscovered and used one day by others.

Richter's heart as a scientist, his pride as the artisan scientist, and his long-term relationships are evident in his work on the illustrations. He loved this aspect of the science; he enjoyed building, describing, and diagramming a

TABLE 6.1. Partial List of Illustrations in Richter and Malone's Unpublished Book Proposal

Surgical Anatomy of the Rat: Illustrations of Operations or Dissections

1. Exposure of all the Endocrine Glands (Photographs, Drawings)
2. Removal of Kidney Capsules, Adrenals and Accessory Adrenal Nodules
3. Accessory Adrenal Nodule
4. Sagittal Section of the Brain Showing Location of Stab Wound Near Hypothalamus
5. Removal of the Pituitary
6. Method of Holding Mouth Open for Insertion of Tracheal Cannula
7. Bands in Rat's Throat in Preparation for Insertion of Cannula
8. Blood Vessel Supply to All Lobes of Pancreas
9. Four Steps Involved in the Total Removal of the Pancreas
10. Distention of Cecum in Pancreatectomized Rat
11. Condition of Cornea in Pancreatectomized Diabetic Rat
12. Removal of the Parathyroid Glands
13. Three Steps Involved in Implanting Tissue in the Anterior Chamber of the Eye
14. Three of the First Steps Involved in the Panhysterectomy
15. Last Three Steps of the Panhysterectomy
16. Lobes of Liver, Stomach, Duodenum, Pancreas, Colon
17. Hepatectomy
18. Greatly Distended Lymph Vessels following Tube Feeding with Olive Oil
19. Distention of Lymphatic Ducts following Injection of Animal with Milk
20. Thoratic-Lymphatic Ducts
21. Peyer's Patch on Intestine of Domestic Norway Rats
22. Removal of the Lung
23. Pneumenectomy
24. Dissection of the Taste Nerves
25. Further Dissection of Taste Nerves
26. Cross-Sections of Taste Bud and Papillae and Tongue Surface
27. Circumvalate Papillae
28. Sectioning of Optic Nerve
29. Various Neck Glands
30. Salivary Glands
31. Skull and Brain Stem Stub
32. Operating Stand
33. Removal of Superior Cervical Ganglion
34. Tube Feeding
35. Brain of Rats, Chipmunk, etc.
36. Cancer Eating
37. Pituitary Tumor
38. Bile Duct
39. Holding Rat for Abdominal Injection
40. Nest Building
41. Activity and Brain Operations
42. Parathyroidectomy and Brain Operations
43. Gastrectomy
44. Ovarian Transplant
45. Seminal Vesicles and Prostate
46. Thymus

useful experimental product, in this case anatomical and surgical drawings. Epistemological advances, for Richter, often were based on the practical, artisan side of science.

CONCLUSION

Richter approached his laboratory life with an artisan sensibility, evident in the instruments he used, in the simplicity of his experimentation, and, of course, in his results. Richter's collaboration with Malone was indicative of the fact that he loved simple inventions, whether an elegant anatomical drawing or an experimental manipulation that translated into interesting data. He was a laboratory scientist who took pleasure in the esthetic aspects of everyday activities. Although Richter and Malone do not equal Leonardo da Vinci, Richter's relationship with Malone resulted in a mutually beneficial and productive partnership. The object to be depicted, in the hands of these two craftsmen, was enhanced by their mutual effort. Richter knew what he wanted, and Malone knew how to produce it.

Richter described his relationship to Malone as follows: "For his years in my laboratory we had a wonderful working relationship. I showed him how I did an operation; he made a drawing; then I checked the drawing; and then we continued this exchange until we felt certain that the drawings gave an accurate picture of all the details. In many instances Mr. Malone not only made the drawings, but gave helpful suggestions for improving the operation" (Richter files, Chesney Archives, February 21, 1978).

A laboratory state of mind is one in which measurement predominates. In the Roe interviews, for example, when asked about his thinking process, Richter tellingly said, "I would say that I think really very little in terms of words. I think largely in terms of moving my hands. I find that I am always about 10 steps behind in my verbalizations." A little later he is quoted as saying, "I have a passion, I suppose, for measuring things" (Roe interview notes, American Philosophical Society Archives, 1952).

Anne Roe commented on her interview with Richter, "At this point we went through his labs and had a look at the rats, wild and domestic, and all of the fancy equipment which he has. It's a staggering place as far as set-up goes—small, tightly organized" (Roe interviews, American Philosophical Society Archives, 1962). His laboratory was a thing of beauty—a place lived fully.

One forgets at times that esthetic sensibility did not evolve first for those most cherished artifacts of our culture such as great paintings; instead, it was

trapped in the trenches of the commonplace, equated with mundane objects like household pottery, for example. In his book *Art as Experience,* Dewey went to great lengths to outline the "fulfillment of an organism in its struggles and achievements" as containing "the promise of that delightful perception which is aesthetic experience" (Dewey 1934/1958, p. 18). Esthetics, in this account, one that I embrace, is tied to our human ability to resolve problems, depict events, invent, and discover. There is no separation between functionality and esthetics in the laboratory, where an anatomical depiction of surgery, a guide for transplants, and a simple tool can all be esthetically pleasing. Esthetics is part of the human experience of invention and discovery.

Richter was lucky to have worked mostly in an age before "big science" would come to undermine what he romanticized as "free science," but in the 1950s the era of big grant writing was at hand. Now, Richter lamented, to get a grant one had to know in advance what one was going to find out (1953f). Exploration and play, he feared, would be lost, and scientific creativity would be compromised.

Richter prided himself on his surgical abilities. He remarked to a number of people who knew him (e.g., Epstein, Stellar, and Wolf) about his surgical prowess. Eliot Vallenstein, a psychobiologist at the University of Michigan, recalled a time when Richter was applying for a grant. He pleaded with the review committee not to let his age (he was in his late seventies) affect their judgment; he needed the money for his assistant who had been with him for many years. Moreover, he said, "my eyes are clear, my hands are steady, and I have performed 784 operations this year" (E. Vallenstein, pers. comm., July 2002).

Although he was never part of mainstream psychology, within the field of psychology Richter is typically associated with the concept of drive. One noted historian of psychology in the United States described Richter as "a persistent and ingenious experimenter" (Hilgard 1987). Individuals such as Neal Miller, who was himself part of mainstream psychology, seem to have been quite impressed with Richter. But Richter rarely interacted with psychologists.