Frederik Ruysch's Fascination with Urolithiasis

14

Introduction

"*Mortuus, arte Tua, Ruyschi,*
vivit, docet, infans,
Elinguis loquitur, mors timet
Ipsa sibi" [1]

—Denis Papin

"*Trough thy art, O Ruysch, a dead infant lives and teaches and, though speechless, still speaks. Even death itself is afraid.*" The history of urolithiasis consists of many eras of varying scientific interest both medically and surgically. Along the pathway to our modern understanding of this disease lie the flotsam and jetsam of some various curious practitioners. People have made names for themselves as specialists in lithotomy in order to promote their fame (and increase their fees). Others have donned religious attire and monikers in order to increase their trustworthiness. One other practice, typified by itinerant lithotomists, was to collect stones from patients and carry them about, demonstrate them, in order to show the prowess of the practitioner. Perhaps the most macabre use of human stones was by the famed anatomist and surgeon of the seventeenth- and early eighteenth-century Amsterdam, Frederik Ruysch (1638–1731). This is a historical review of what we know about Ruysch to better understand his utilization of human stones as adornments, decorations if you'd prefer to his elaborate menageries. Ruysch was by all accounts a stellar medical practitioner, a gifted surgeon, a good lithotomist, and an outstanding father [2]. His legacy was both his written works but more significantly his outstanding anatomical and amazing artistic creations utilizing natural materials to make ethereal displays that remain hauntingly striking into our modern era.

He practiced mostly in Amsterdam during the golden era of the Dutch Republic. Rene Descartes (1596–1650) had matriculated to the more tolerant Dutch society out of fear for his opinions regarding science from the Catholic France and in the wake of Galileo's persecution in Italy. He had published his profoundly influential *Discourse on Method* in 1637 [3]. Descartes' theories of man as a machine, the notion that animals lacked souls, and his notion that all theories could be checked by study led to the rise of experimental work throughout the lowlands and the rise of vivisection and experimental anatomy especially at Leiden (Fig. 14.1a). Most of Holland had removed the shackles of the Catholic faith and had switched to Protestantism, especially the Calvinist type. Ruysch would use his special talents for anatomical preparation and display to moralize as well as teach.

Ruysch's Life and Times

"*Homo sum: humani nil a me alienum puto.*" [4]

—Terence

"*I am a man, and nothing human is alien to me*" said the Roman playwright Terence [4]. This is a fitting introduction to a master anatomist and creator of anatomical museums of the seventeenth

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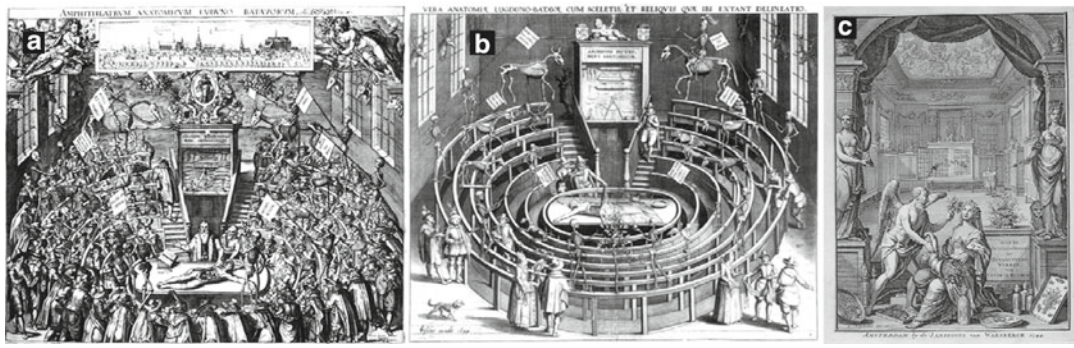

Fig. 14.1 (**a**) The famous anatomical theater at Leiden. (**b**) The same without all of the spectators to show more detail of anatomical displays. (**c**) Ruysch's museum in Amsterdam from the frontispiece of Ruysch, Alle de Werken [42]

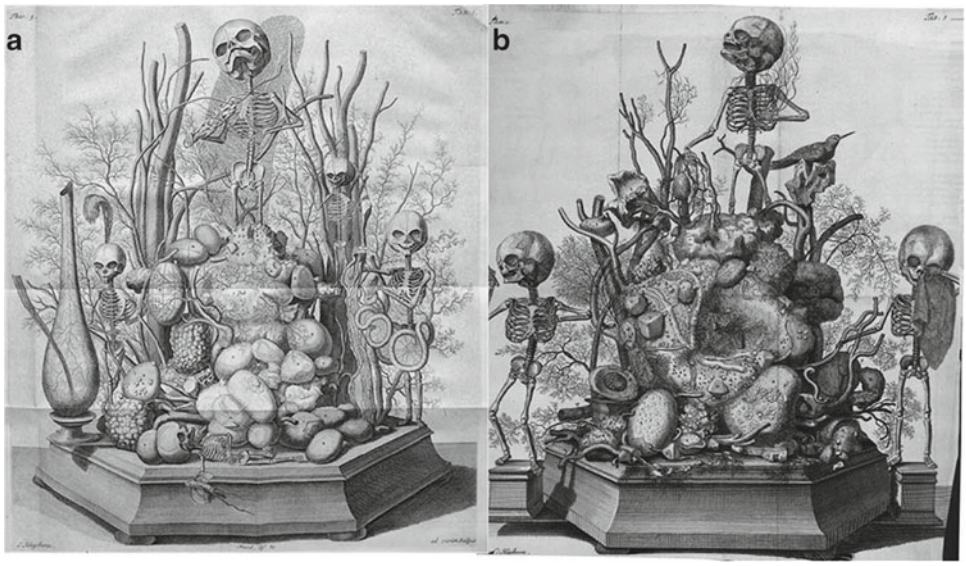

Fig. 14.2 (**a**) This is one of Ruysch's uses of human uroliths [3]. The illustrations were drawn by C.H. Huyberts. This is the musical "*Allegory of Death*." (**b**) Another vanitas utilizing human stones and assundried human membranes and vasculature

and eighteenth centuries, often called the Baroque period of art and music. This was the time of Handel and Bach in music. The sculpture of Bernini in Rome and the Golden Age of painting in the Netherlands with Peter Paul Rubens and Rembrandt were artistic examples of baroque styles in sculpture and painting [5]. The term formally started at the Council of Trent in 1600, and the notion was in part responding to needs for internal reform and implies "*a rough and imperfect pearl*" (OED). This same ideal could easily be applied to anatomy and the anatomist's art as we shall see. Review of published works of Frederik Ruysch included Dutch archival materials of biographical nature and his published catalogues of his anatomical collection [6, 7]. In 1691, Ruysch began to publish a catalogue of his collection of anatomical works entitled "*Frederici Ruyschii Thesaurus Anatomicus*" with illustrations by C.H. Huyberts [7]. This work is now available in an online electronic version for close scrutiny of the anatomical specimens. Of the works most pertinent to this writing, the human stones, there are no surviving specimens. The illustrations by Huyberts are the only remaining primary source of his utilization of human uroliths (Fig. 14.2). Descriptions

by Ruysch and others suffice for this historical review. Particular attention was given to his illustrations and description utilizing human stones for artistic reality.

Frederik Ruysch was born on March 23, 1638, in The Hague. His father Henry Ruysch was secretary to the States General but died in 1654 [8]. Frederik's mother, Anne van Berghem, had to look after six children, and Frederik had to become apprenticed to an apothecary named Uylhoorn. He matriculated to the renowned University of Leiden and studied medicine from 1661 to 1664. He apparently was fascinated by anatomy and anatomical research and probably became very well acquainted with the famed anatomical vanitas, or anatomical demonstrations (Fig. 14.1b). Johannes van Horne (1621–1670) was the famous anatomist during his tenure. In addition, during his student years he was in a class of future superstars that included Jan Swammerdam (1637–1680), Niels Stensen (1638–1686), and Regnier de Graaf (1641–1673). De Graaf became a close friend of Ruysch and they subsequently spent a great deal of time together working on pathologic specimens [8]. De Graaf has been immortalized by naming the ovarian follicles after him. Professor van Horne was most impressed with Ruysch and he was very highly regarded in the medical school. His graduate thesis was entitled *De Pleuritide* on pleurisy. In addition, during his postgraduate period van Horne approached Ruysch to tackle a complex debate regarding the lymphatics and the liver. His injection methods of demonstration ultimately proved that the lymphatics indeed had valves [9]. Upon his graduation in 1664, Ruysch married the daughter of famed architect in Amsterdam, securing an influential circle of friends. In 1665, Ruysch became the praelector of the Amsterdam surgeon's guild following in the luminous pathway of Tulp and others. This appointment allowed him legal access to dissection of corpses. His skill and renown were enough to secure his being named as the professor of botany at the Athenaeum Illustre in 1666. His pathway to success continued with being named the chief instructor to midwives in 1668 and forensic advisor to Amsterdam's courts in 1679.

Ruysch made many significant scientific contributions to anatomy in particular, because of the freedom he was allowed as the praelector. He described the valves in lymphatics and wrote a paper on the vomeronasal organs of snakes. Frederik also demonstrated the bronchial circulation and the first good case description of rectal carcinoma. He became particularly interested in the preservation of anatomical specimens and developed a secret *liquor balsamicum* that could keep specially prepared anatomical curiosities lifelike, in order to demonstrate to students. He used a combination of wax, resin, talcum, oil of lavender, cinnabar, and colored pigments to both preserve his specimens and overcome the offensive odor of necrosis. In June of 1666 English admiral William Berkeley was killed in a battle with the Dutch fleet. Ruysch was called upon to preserve the body in the height of summer, an almost impossible task prior to his injection of preservatives. But the British compensated Ruysch for his amazing anatomical preservation of Berkeley [10]. As praelector of anatomy for the surgical guild, Ruysch utilized his skills in both dissection and preservation of specimens in public demonstrations of anatomy. As a result, his collection of anatomical specimens began to attract increasing attention to his demonstrations. Ruysch began to take a more artistic interest in his specimen presentation, and the collection increased in fame [11]. He was mandated by the guild to perform at least one anatomical dissection annually open to the public. By 1670, Ruysch had achieved significant renown that the Amsterdam surgeon's guild had the famed artist Adriaen Backer paint him in an "*Anatomy Lesson*" much as Rembrandt had done for Dr. Tulp, another anatomist from the guild (Fig. 14.3a). Ruysch though would go one better, sitting again in 1683 for a second anatomical portrait, this one by Jan van Neck (Fig. 14.3b) [12].

Ruysch's success allowed him to involve his family into his business. His son, Frederik, became an able anatomical demonstrator and would in turn become a physician. His daughter, Rachel, became an illustrator and collaborator upon the artistic nature of his menagerie and she became a famous painter [13]. Rachel in fact might have been the child who is holding the skeleton in the 1683 van Neck painting. She certainly helped create his artistic renditions of anatomical specimens. She became a still life

Fig. 14.3 (**a**) This is the first commissioned painting of Ruysch by the Surgeon's Guild in 1670 (Backer), Amsterdam's Historisch Museum. (**b**) This is the second commissioned painting of Ruysch by the Surgeon's Guild in 1683 (van Neck). His son (Frederik would have been aged 20 at this time) is shown demonstrating a fetal skeleton (or is it his daughter, Rachel?)

painter of outstanding merit in her own right; her paintings would become worth more money than Rembrandt's in their lifetime [13]. Frederik had become Holland's premier anatomist and dissector. He is known to have given at least 31 public dissections, continuing up until his death at age 92. He was also known as a surgeon and obstetrician. His interests are clearly reflected in his anatomical demonstrations. He was much interested in the kidney and dissected it and illustrated the anatomy in several of his written works. The anatomical theater in Amsterdam became Ruysch's own "*Rariteiten-kabinetten*" or "cabinet of rarities or curiosities" [11]. He often worked alone with his son and daughter improving his secret preservative by minimizing the odor of the dead, improving the water retention of the specimens so that they did not look shriveled, and added color to make them more spectacular [14]. His published catalogue in 1691 entitled "*Frederici Ruyschii Thesaurus Anatomicus*" or *anatomical treasures* was lavishly illustrated by famed artist C.H. Huyberts. He brought these volumes out between 1638–1731 in ten volumes. Ruysch by this time had begun to add human kidney stones to his animations in order to improve their artistic presentation [8]. Many of the collections animated classical poetry; in all he made more than a dozen tableaux utilizing human kidney and gallstones. Some of his poetic renditions included *Vita humana lusus* (Man's life is but a game) and *Vita quid est*? *Fumus fugiens et bulla caduca* (What is life? A transient smoke and a fragile bubble). Frederik Ruysch became an intriguing historical figure, worthy of some attention at kidney stone meetings, precisely because he chose these concretions to serve as one of the "finishing elements" in several of his collections [4].

Ruysch's Use of Kidney Stones: Exhibits

Ruysch eventually began to use prosected animal specimens in jars of preservative as even more elaborate displays [14–16]. His most morbidly fascinating exhibits had fetuses dressed in a variety of costumes. Frederik Ruysch combined his skills as a dissector with an obvious natural artistic talent to make some of the most unusual anatomical displays, often utilizing a growing collection of human stone material. He would sift through his collection of calculi in order to obtain particular shapes that added to the scene he had imagined [4]. The haunting character of the C.H. Huyberts drawings are sadly all that remain of these curiosities. He found a purposeful use for stones extracted from patients in Amsterdam as scenery for his whimsical renderings. By 1697, the fame of his collection had reached Peter the Great who came to visit him and his collection. His "*repository of curiosities*" included infant

and fetal skeletons placed in landscapes accented by human pathology and animal body parts. Human kidney stones were a common decorative item in these displays. Ruysch spent hours meticulously preparing his specimens for presentation. He involved the artistic talents of his daughter, Rachel. He wrote to Boerhaave in 1722 "*Never does that sun rise too early for me, and nightfall always comes sooner than I could wish*" [16]. Ruysch became fascinated with the anatomical museums while a student at Leiden. Ruysch represents the epitome of the Dutch Golden Age of Anatomy. The Flemish nobleman Lodewijk de Bils first hit upon a formula for preservation of human organs. He utilized a liquor which bathed the specimens, and he also injected the vessels with waxlike colored materials to enhance the image [10]. These preserved specimens could be viewed repeatedly and did not rapidly decay. The Leiden anatomical theater was a literal museum of such displays and these fascinated young Ruysch who developed his own secret method of preservation.

Some of the most dramatic illustrations utilizing human stones for effect were his moralizing vanitas. A vanitas was a type of symbolic art form that became a fad in both Flanders and the Netherlands [17]. It derives from the Latin root meaning vanity. Death was a common subject as was the transient nature of life and skulls were particularly popular adornments to this type of art. The stones would give the vanitas a sense of naturalism. The two most famous stone relief vanitas were both illustrated in his third *Thesaurus Anatomicus* of which there are no surviving originals. The first is *The Allegory of Death* (Fig. 14.3a). The central skeleton has an osteomyelitic sequester and a dried artery for a violin to play a lament for life's miseries [18]. The meter of the music is kept by a skeleton with a baton set with kidney stones (center right). On the far right is a skeleton holding a spear made from vas deferens and coils of sheep's intestines. The feathered skeleton on the far left holds a stone from the lung and is standing next to a fixed human testicle complete with all of its tunics. In the foreground is a reclining skeleton holding the evanescent mayfly which completes this depiction of the brevity of life. He particularly liked to use fetal skeletons because it highlighted the uncomfortableness of the topic he chose to represent. He would use mottos for these vanitas typically taken from Latin poets like "*Vita quid est? Fumus fugiens et bulla caduca- What is life? A transient smoke and a fragile bubble*" [4] (Fig. 14.3b).

Ruysch did train the German physician and anatomist Bernhard Siegfried Weiss (1697–1770) (Latinized to Albinus) who would later become the great anatomist at Leiden. Albinus also worked with his great rival Bidloo and also with Rau. It appears that Albinus never joined into the anatomical disputes with his former anatomical mentor from Amsterdam. Albinus also developed his own methods of preservation and injection and much of his work survives at the Boerhaave Anatomical Museum at Leiden [19]. He also became famous as the person who tried to teach Cheselden Rau's technique of the lateral lithotomy, but Rau had secretly hidden key portions of the surgery from his pupil Albinus as well. Cheselden was forced into investigating the anatomy and surgical approaches for the lateral lithotomy on his own and subsequently taught this approach to all who were interested in this surgery [20].

Peter the Great

Peter the Great (1672–1725) was born on May 30, 1672, the son of Tsar Alexis and his second wife Natalya Naryshkina [21]. He was a vigorous individual and has been described as a "*chimerical monarch*." In 1697 he embarked upon "*The Great Embassy*" to learn about the western world when he was only 25 years old. For eighteen months he and his entourage of 20 nobleman and 25 young Russian volunteers dispersed throughout Europe to learn about the West and particularly the art of shipbuilding and warships themselves. He was incognito as Peter Mikhailov so that he personally could visit shipyards and discuss nautical science with the carpenters and builders. He became particularly enthralled with Holland which was at its zenith culturally. In Amsterdam, Peter actually worked as a carpenter himself in the dockyards of the Dutch East India

Company. Peter was greatly interested in medicine and science. He is known to have traveled to Delft to visit with Anton van Leeuwenhoek (1632–1723). He also went to Leiden to visit Boerhaave. But singularly the most important interaction for the young emperor was his interactions with Frederik Ruysch. "*This great figure of world anatomy impressed the emperor and inspired his love for anatomy and surgery*" [22].

Peter and Dr. Ruysch clearly interacted more significantly than any other individual during his *Great Embassy*. "*Several times, Peter left the shipyard to visit the lecture hall and dissecting room of Professor Ruysch, the renowned professor of anatomy. Ruysch was famous throughout Europe for his ability to preserve parts of the human body and even whole corpses by injection of chemicals. His magnificent laboratory was considered one of the marvels of Holland…Peter became so interested in surgery that he had difficulty leaving the laboratory; he wanted to stay and observe more. He dined with Ruysch, who advised him on his choice of surgeons to take back to Russia for service in his army and fleet. He was intrigued by anatomy and thereafter considered himself qualified as a surgeon. After all, he was able to ask, how many others in Russia had studied with the famous Ruysch?*" [21]. The emperor would not forget his anatomy teacher or the master's anatomical museum, as we shall see.

In 1717 Peter the Great returned to Amsterdam and purchased Ruysch's museum for the astronomical sum of 30,000 guilders putting Ruysch and his family in the wealthiest class in Amsterdam during its Golden Age. In addition, he purchased Ruysch's secret preservation techniques for an additional 5,000 guilders [22]. This was quite the coup for the aging anatomist. But he went right back to work on another series of specimens and anatomical preparations; he was only 79 years old. Ruysch's nemesis and sparring partner in pamphlets regarding anatomical battles was Govard Bidloo (1649–1713) [23]. Bidloo had died vacating his anatomy chair at Leiden for the rising lithotomist, Johannes Rau. Bidloo's famous anatomical museum fetched at auction barely 177 guilders. His library fared far better raising about 3,000 guilders for his widow Hendrickje Dircksz [10]. In addition, the publisher of his magnum opus *Anatomia humani* corporis published in 1685 sold the beautiful illustrative plates to the anatomical instructor of William Cheselden, Cowper who utilized them in his own textbook of anatomy without any deference to Bidloo [10].

Anatomical Controversy and Surgical Upheaval

Ruysch was a firm believer that his anatomical preparations were lessons in anatomy of themselves. He strove to create the illusion of life with his wet preparations, injecting color to create the illusion that his specimens were fresh and lifelike. The anatomists at Leiden were apposed to this realism, let alone the surrealism that some of tableaux engendered. "*The study of medical museums, then, sits at the historical confluence of some very interesting streams of thought- medicine, collecting, the body- which then flow into contemporary debates about display and use of human remains*" [2]. His successes anatomically were not allowed without some attacks by those who could not duplicate his delicate preparations. Most notably was the gifted anatomist Govard Bidloo. For almost one decade during most of the 1690s, these two highly skilled anatomists dueled with one another over the best methods of presenting and teaching anatomy. The maliciousness of these attacks is notable from the pains that Bidloo went to count how often Ruysch used the word "*mirum*" and its cognates in his work *Epistolae* and *Observationum centuriae* (Bidloo counted 96 times) [10]. Bidloo spent most of his time creating his surgical atlas with superior illustrations on paper for his book [24]. Ruysch, on the other hand, spent all of his time making anatomical preparations and criticizing the work of Bidloo the flaws of illustration. In the end Bidloo's *Anatomia humani corporis* did not sell well and the publisher ended up selling his anatomical plates to William Cowper (1666–1709) who unjustly did not credit Bidloo's work when he published his far more popular work,

The Anatomy of Humane Bodies in 1698 (13 years after Bidloo's work was printed) [25].

We will discuss in the surgical historical section regarding lithotomist Jacques Beaulieu (1651–1714) who was an unheralded military surgeon who developed a novel method of performing the ancient operation of perineal lithotomy [26]. He daringly came to Paris to demonstrate his new method of lithotomy and gained both powerful allies and enemies. Eventually he was driven out of the surgical capital of the world by Marechal who was one of the best lithotomists in Paris. He traveled to the lowlands of the north, and the King of Holland sponsored his entrance for demonstrating his new surgical methods. He appears to have been welcomed by Frederik Ruysch, and all of the Amsterdam surgeons came to watch his method of lithotomy. Johann Jacob Rau was a struggling surgeon in Amsterdam at the time who watched and knew that he could improve the method due to his extensive knowledge of anatomy. There was considerable tension between Ruysch and Rau that would continue for the remainder of Rau's life; in fact he would become Ruysch's major antagonist when Bidloo moved to England. Rau would be invited to Leiden to become Bidloo's successor as professor of anatomy. Rau adopted Beaulieu's method of lithotomy and became the most successful lithotomist in all of Holland at the same time becoming the most vociferous detractor of Jacque's methods. Frère Jacques was recalled to Paris by his friends but again things did not go well and he returned to Amsterdam in 1704. "*Rau, whose rare talents and incomparable meanness of disposition kept an almost equal pace, so that we know not whether most to admire or detest the man, published like Mery, his daily scandals, dissected Frère Jacques out of the capital, yet stole the very operation which he affected to condemn*" [27]. Rau was clearly responsible for his early departure during this second sojourn and he traveled on to Brussels [28]. The Dutch senate gave Jacques a medal with the inscription "*Ob cives servatos,*" and he was encouraged to return again, which was never again to happen. He did write to his friends in Amsterdam, "*Why should I return when you have already a man so much above me as Rau?*" [29] It has been estimated that Jacques removed over 4,500 stones with surgery and that Rau performed possibly 1,500 as well. It had been estimated that bladder stone disease had the highest prevalence in the Netherlands accounting for Ruysch's ready access to them for his vanitas. It was van Beverwijck who was the first to note the high prevalence rate of stone disease in the Low Countries in 1638 [29].

We know little about Frère Jacques' interactions with Ruysch. Ruysch certainly did not get along with Rau but there is mysterious silence about this potential situation. Even de Vries noted "*Professor Joh. Jacques Rau a lithotomist and bitter rival, who pursued Frère Jacques with such a fierce criticism that he decided to leave Amsterdam. Rau's behaviour was not without self-interest since he used the lateral method of lithotomy extensively after a few adaptations for the rest of his active life in Leyden*" [29]. Jacques only said negative things about Rau and never mentioned Frederik Ruysch. That Rau could not be trusted was certainly the case, for he always hid his methods from even his most trusted pupil and heir, Albinus. Albinus who was asked to write the memorial dissertation regarding Rau was never shown by his mentor the secret of his successful lithotomy technique—this had to be worked out independently by Cheselden on England [30]. In this funeral oration by Albinus, he states that Rau claimed to have operated upon 1547 bladder stones during his career. The specific cause of Rau's great secrecy was his greed for money; it has been noted that he charged "*200 Rijksdaalder for students and visiting colleagues to enroll in his teaching program. This amounted to an average year's salary of a master surgeon in a smaller town*" [29]. In addition, Rau was not above charging as much as 1000 or more florins for a successful operation [29].

Discussion

"*All movables of wonder, from all parts,*
Are here- Albinos, painted Indians, Dwarfs,
The Horse of knowledge, and the learned Pig.
The Stone-eater, the man that swallows fire,

Giants, Ventriloquists, the Invisible Girl,
The Bust that speaks and moves its goggling eyes,
The Wax-work, Clock-work, all the marvelous craft
Of modern Merlins, Wild Beasts, Puppet-shows,
All out-o'-the-way, far-fetched, perverted things.
All freaks of nature, all Promethean thoughts
Of man, his dullness, madness, and their feats
All jumbled up together, to compose
A Parliament of Monsters." [31]

William Wordsworth's autobiographical poem that conjured up the macabre image of the Parliament of Monsters became the introductory chapter to a textbook on the history of pathology museums. Wordsworth was commenting on the bizarre spectacle that he observed attending the Bartholomew Fair in Smithfield, London [32]. This could be easily applied to the anatomical theaters that had arisen with the rise of human dissection. At Padua, Benedetti's creation of the first anatomical theater built in 1594 led to a permanent structure that was carefully constructed for almost theatrical production [33]. The great professor of anatomy Fabricius dissected in front of 200–300 spectators carefully arrayed in concentric galleries around the central anatomy table which could be raised into the theater. Great anatomical theaters were constructed at Padua, Bologna, Leiden, and Monkwell Street in London for the barber-surgeons in 1636. Anatomists were increasingly fascinated by the average person's enthrallment with the morbid subject of anatomy. At some point, the anatomists realized that they could translate this spectacle of anatomical dissection into a more durable art form. That is what Frederik Ruysch really vaulted into the stratosphere of public acclaim. His anatomies and allegorical themes were aided by his deft use of human concretions to form visual art, aided of course by his daughter Rachel.

"*In old-fashioned museums you can see the unconscious benefactors of mankind, trapped in glass cases: the freaks and monsters of their day, the anomalies, sometimes skeletonised and entire, sometimes cut into parts and labeled. When we look at them, fascination and repulsion uneasily mixed, we bow our heads to their contribution to knowledge, but it is hard to locate their humanity. The thread of empathy has frayed and snapped. They have become objects, more stone than flesh: petrified, post-human*" [34]. Ruysch eventually developed a relationship with Herman Boerhaave at Leiden and continued to do public anatomical demonstrations throughout his very long life. He and Boerhaave developed cordial discussion and significant differences regarding glandular function. Ruysch's fame led to his election to the Leopoldine Imperial Academy in 1705. He became a fellow in the Royal Society of London in 1720 and was chosen to take the vacated seat of Sir Isaac Newton as an associé étranger to the Académie des Sciences in 1727 [4]. Yet Ruysch's fame rested upon his museum and its unusually artistic representations of human anatomy [16]. Lorenz Heister who knew Boerhaave, Rau, Albinus, and Ruysch when he became the professor of surgery and anatomy in Helmstedt stated that Ruysch was the one who contributed most to the growth of anatomical knowledge in 1720.

Ruysch in many ways represents the most extreme showcase for urinary stone disease with his innovative decorative applications within his menagerie. Certainly the Roman Catholic Church had presented relics of saints and upper echelon priests, bishops, cardinals, and popes for centuries. These were mostly bones but occasionally were mummified remains which we'll see again in a later chapter. Wax models were utilized prior to the anatomist development of preservatives and methods of display [35]. Anatomically, he precedes the current anatomical art of Gunther von Hagens' Body Worlds which has been viewed by over 20 million visitors worldwide between 1996 and 2006 [36]. "*Small minds have usually viewed Science and Art as adversarial- at least from Goethe's complaints about narrow-minded naturalists who would not take his anatomical and geological works seriously because he maintained a day job as a poet to C.P. Snow's identification and lament about two non-communicating cultures…But the unifying modes and themes of human creativity surely transcend the admitted differences of subject matter in these two realms of greatest interest and occasional (even frequent) triumph of both heart and mind*" [37]. "*Mortui vivos docebunt* or *the dead shall teach the living*" is the famous motto on many of anatomical laboratories around the world [38].

Two significant giants of anatomical preparation followed in the wake of Ruysch and Albinus: they were Honoré Fragonard (1732–1799) and John Hunter (1728–1799). Both were outstanding anatomists who spent a considerable amount of labor and effort into anatomical teaching and preparation of specimens for display. Fragonard's preparations might be considered the origins of Gunther von Hagens' own modern traveling shows of anatomically plasticized human works. Ruysch utilized human concretions as backdrops in his vanitas but von Hagens' has utilized all modern medias mixing Goethe's contrasting roles even further into realms of religious, philosophical, and even prophetic views of man and nature [39].

Herman Boerhaave (1668–1738) evolved into one of the most important figures in eighteenth-century medicine. He also suffered from gout and urolithiasis later in his life, but he foreshadowed his own suffering, much as Benjamin Franklin did, with his writings on disease, specifically on urolithiasis. He had a ringside seat for the controversies regarding lithotomy and personally saw the rise and successes of the lateral lithotomy developed by Rau using the method of Frère Jacques. It was during this century that the rise of anatomy and surgery began to tabulate and reduce the morbidity and mortality of surgery, but anesthesia and aseptic methods had not yet been introduced. Boerhaave dedicated a chapter in his "*Institutiones medicae*" to the treatment of lithiasis of the urinary tract [40]. His recommendations included an increase in liquid intake, a hot bath in order to induce vasodilation, and exercise. Boerhaave's opinion of lithotomy as a last resort when other approaches failed was "*I think lithotomy is an act of pure faith*" [41].

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