

## Michelangelo: Art, anatomy, and the kidney

GARABED EKNOYAN

Section of Nephrology, Department of Medicine, Baylor College of Medicine, Houston, Texas, USA

**Michelangelo: Art, anatomy, and the kidney.** Michelangelo (1475–1564) had a life-long interest in anatomy that began with his participation in public dissections in his early teens, when he joined the court of Lorenzo de' Medici and was exposed to its physician-philosopher members. By the age of 18, he began to perform his own dissections. His early anatomic interests were revived later in life when he aspired to publish a book on anatomy for artists and to collaborate in the illustration of a medical anatomy text that was being prepared by the Paduan anatomist Realdo Colombo (1516–1559). His relationship with Colombo likely began when Colombo diagnosed and treated him for nephrolithiasis in 1549. He seems to have developed gouty arthritis in 1555, making the possibility of uric acid stones a distinct probability. Recurrent urinary stones until the end of his life are well documented in his correspondence, and available documents imply that he may have suffered from nephrolithiasis earlier in life. His terminal illness with symptoms of fluid overload suggests that he may have sustained obstructive nephropathy. That this may account for his interest in kidney function is evident in his poetry and drawings. Most impressive in this regard is the mantle of the Creator in his painting of the *Separation of Land and Water* in the Sistine Ceiling, which is in the shape of a bisected right kidney. His use of the renal outline in a scene representing the separation of solids (Land) from liquid (Water) suggests that Michelangelo was likely familiar with the anatomy and function of the kidney as it was understood at the time.

Where do we come from? How did it all get started? These two difficult questions constitute the basis of much current scientific research, but have preoccupied humans from time immemorial. While the final scientific solutions may well remain elusive, the human mind has provided answers that are generally accepted. Explanations begun as fireside stories of ancient shamans have evolved over time into recorded mythology, provided for the budding of early philosophy, and ultimately become dogmatized into firm religious beliefs. The latter are probably most succinctly summarized in the first chapter of

---

**Key words:** Michelangelo, anatomical dissection, Sistine Ceiling, gout, obstructive nephropathy, kidney.

Received for publication July 16, 1999  
and in revised form September 29, 1999

Accepted for publication October 12, 1999

© 2000 by the International Society of Nephrology

the book of Genesis in the Bible. Of all the visual renderings of the complex story of primordial origins told in Genesis, none equals in scale, impact, and elemental force its portrayal by Michelangelo (1475–1564) in the ceiling of the Sistine Chapel, which, since its completion in 1512, has become a shibboleth attracting a tribute that equals, if not surpasses, the very words that inspired it. Continuously analyzed, criticized, reproduced and parodied, its images have found a place in popular culture throughout the world [1–4].

### MICHELANGELO AND ART

In his art, Michelangelo changed how we see many things, but none more so than how we visualize Creation. By the time he began preparations to paint the Sistine Ceiling in May of 1508, his reputation was well established. The Sistine Ceiling was his first attempt at fresco. He began painting during the winter of 1508 and finished in October 1512. Michelangelo started near the entrance of the chapel and progressed toward the altar end. The central unit of the ceiling contains nine main scenes rendered alternatively in four large and five small panels. The story they tell unfolds chronologically in the opposite order of their painting, from the altar end of the chapel toward its entrance, and falls into three groups of three panels each [1–5]. The first group represents the creation of the world, the second the story of Adam and Eve, and the third the legend of Noah. The chronology of Michelangelo's work on the Sistine Ceiling has been the subject of much scholarly concern [4–8]. While the precise dates are debated, it is clear that between 1508 and 1512, Michelangelo worked on the ceiling in different stages, related principally to the erection of the scaffolding and reimbursement for expenses, but also included interruptions caused by illness. There is an evident change in style and technique as he progressed, even as he moved from one panel to the next. The most radical change occurs in the last four panels, resumed after a six-month pause with renewed vigor and fresh inspiration in the winter of 1511, which show a dramatic increase in the power and scale of their figures [1–7].

The prehuman creation, represented in the last three

scenes, has a single protagonist in the figure of the Creator, shown in the glory and magnificence of His creative powers. The cycle begins and ends with a small panel. In the one nearest the altar, Michelangelo painted *The Separation of Light and Darkness* (Genesis 1:3–5) followed by that of *The Creation of the Sun and Moon* (Genesis 1:14–19). There is some confusion in the identification of the particular biblical events depicted in the triad's final bay. The generally used title of *The Separation of Land and Waters* (Genesis 1 : 9–10) is controversial. Michelangelo's first biographer, Giorgio Vasari (1511–1574), describes it as “*the moment when God divides the waters from the earth*” [9]. On the other hand, his second biographer, Ascanio Condivi (1525–1574), describes it as when “. . . *the great God appears in the heavens, again with angels, and gazes upon the waters, commanding them to bring forth all kinds of creatures that are nourished by that element . . .*,” abbreviated subsequently as the *Creation of Fish* (Genesis 1:20–23) [10]. These apparently disparate descriptions have been combined as representing two separate days of the Creation and titled *Separation of Water from Firmament* and *Water Brings Forth Life* by some and variously termed the *Separation of Heaven from the Waters* or more plainly, by others, the *Congregation of the Waters* and *God Hovering Over the Waters* [1–7, 11].

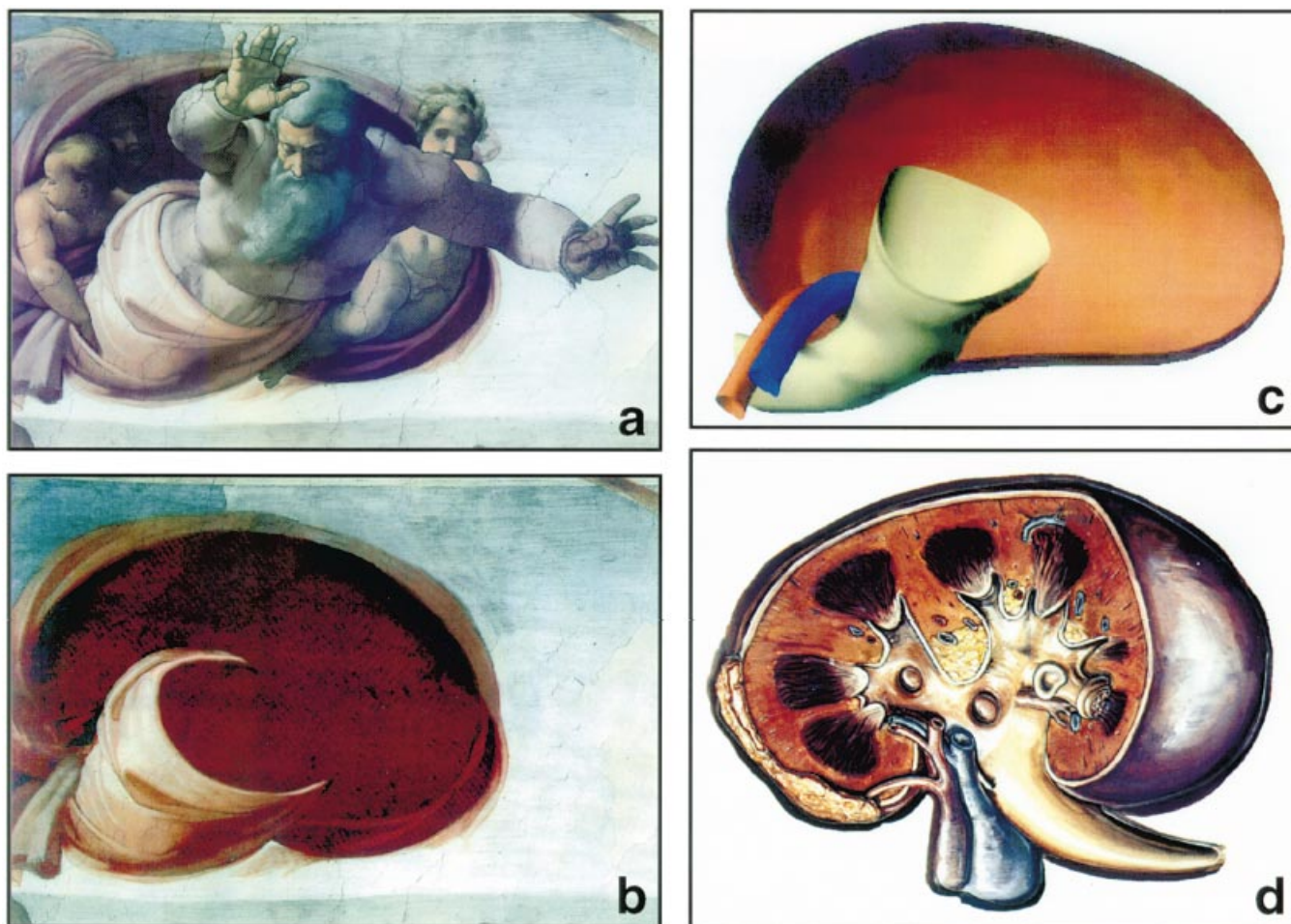
The unifying component of the various titles proposed is that of water; for in this scene, the figure of the Creator is shown coming forth above a strip of water (Fig. 1a). As in the other two creation scenes, God is shown in a billowing mantle with outstretched arms directing in this scene the separation of land from water, with His image taking “*on a yet more concentrated shape*” than that of its other representations. Comfortably tucked in the mantle are three plump cherubims watching the massive cosmic movements unfolding where the viewer stands. The shape of the mantle has been described as “*a kind of synthesis of the egg and the shell, oval in outline and shell-like in its protective roof*” [7]. Computer-assisted removal of the figure of God and the cherubims reveals the tunic to be actually in the shape of a bisected right kidney, with the renal pelvis, the site from which the figure of God was “*emerging in a turbulent spiral movement,*” and the renal pyramids, where the cherubims were located (Fig. 1b). The color of the mantle, which is darker than those in the preceding two panels, is a near-real rendering of that of the normal renal parenchyma. The distinctly different lighter silvery lilac shade of the focal point where the Creator's tunic is pulled together into the rosy robe from which He emerges is less than a real-life coloring of the ureter, renal artery, and renal vein as they leave and enter the renal parenchyma. Coloring the figure more conventionally further highlights the shape of a kidney, with the vessels entering the kidney below the renal pelvis, as they would be

seen in a rear view of the right kidney (Fig. 1c). The resemblance becomes even more evident when compared with that of a medical illustration of the kidney (Fig. 1d). While this similarity may be ascribed to chance alone, it likely represents a willful choice by Michelangelo in the design of the shape and color of the mantle, reflecting knowledge of the structure and function of the kidney. Could Michelangelo have used his inherent inventive powers enriched by his knowledge of anatomy and function in drawing the mantle in the scene of panel three?

## MICHELANGELO AND ANATOMY

In the vast, almost overwhelming, scholarship on Michelangelo, art scholars ponder on his origins as painter, sculptor, architect, and even poet, but other than paying tribute to his anatomical knowledge, they have little to say about his origins as an anatomist. Neglect of this subject has been attributed to its being naturally distasteful to the Romantic temperament of most authors, and “*stands in a kind of inverse relation to the evidence for its importance to Michelangelo himself*” [12]. Actually, Michelangelo had a lifelong anatomical interest that was just as much a reflection of the culture of his times as it was that of his inimitable genius, which made him a better student of anatomy than most. To quote Condivi, “. . . *there is no animal whose anatomy he would not dissect, and he worked on so many human anatomies that those who have spent their lives at it and made it their profession hardly know as much as he does*” [10].

In their endeavor to understand the movements of the human body, 15th and 16th century artists went to great lengths for an opportunity to study its structure. The art of the Renaissance, not satisfied with copying the nudes of antiquity, encouraged its contributors into anatomical dissection to better reproduce the body in their art. With time, traditional courses of instruction for aspiring artists actually included a study of human anatomy, not only for its external features, but also for that of its supporting structures. Nowhere was this practice favored more than in Tuscany. In addition to perspective and geometry, the human proportions were studied assiduously by Florentine painters. In fact, the Florentine Academy of Art was the first to institute an obligatory course in anatomy, in which aspiring artists copied directly from cadavers and skeletons. While some of the more daring artists performed actual dissections, most participated in public anatomies conducted by physicians versed in the art of dissection and accompanied by a reading and interpretation of medical texts by the physician-anatomist [12–14]. In the lengthy introductory section to the *Lives of Artists*, devoted to Technique, Vasari clearly describes the observational role of most artists in stating, “*Again having seen human bodies dissected one knows how the bones*



**Fig. 1.** Panel from Sistine Ceiling showing *God Separating Earth from Waters* (1511) by Michelangelo (a). Computer-assisted removal of the figures showing kidney shaped mantle of the Creator (b). Color highlighted version of (b) to demonstrate the vessels and ureter of the kidney (c). Reproduction of a medical illustration of the normal kidney (d) in which the ureter is shown in its normal course downward from the kidney. In the figure by Michelangelo, it is likely that the ureter is shown extended below the kidney and protruding at the left upper corner beyond the outline of the mantle (a). That would be the position of the empty ureter if the kidney were hurled at the viewer or traversing at high speed through space. Reproduced with permission from the Vatican Museum.

lie, and the muscles and sinews, and all order of conditions of anatomy. . .” [15]. As such, artists were exposed to medical knowledge imparted during public anatomies, and as interest in dissection grew, artists formed part of the Florentine Guild of Physicians and Apothecaries [16]. The general enthusiasm of artists to study corpses subsided in the 17th century when art academies became amply stocked with skeletons and ecorchés, and illustrated anatomical texts became readily available.

Michelangelo likely participated in public dissection early in his youth, probably conducted by one Elia del Medigo, a physician-philosopher who was a member of Lorenzo de’ Medici’s circle, which Michelangelo joined in his midteens [5, 12, 17]. Having become versed in the art of dissection by the age of 18, Michelangelo began to perform his own dissections and demonstrations, as recorded by his two biographers, Vasari and Condivi

[3, 9, 10]. He is said to have made molds of muscles to experiment in their shapes and forms during various body positions, which he was to render so masterfully in his subsequent sculpture and painting. This is clearly evident in the 20 nude slaves (ignudi), seated on blocks above the thrones of the Sibyls and Prophets, that decorate the small panels of the Sistine Ceiling. This subject, which fascinated him all of his life, ultimately came to dominate the more than 300 figures that he painted in the *Last Judgement*, which, according to Vasari, was intended to represent “the most perfect and well-proportioned composition of the human body in its most varied positions” [9, 18].

The obsession of artists of the period to study anatomy on their own was quite prevalent and not unique to Michelangelo [19]. The church, of course, objected on principle to the desecration of the dead, but did allow





**Fig. 2.** (Top) *The Last Judgment* (1536–1541) by Michelangelo, Sistine Chapel, Vatican (a). (Bottom) Copy by Marcello Venusti (1549) in Museo di Capodimonte, Naples (b). The highlighted boxed segments are discussed in the text.

for dissection of the cadavers of condemned criminals and even facilitated it. Permission to dissect corpses, provided the remains were buried decently, had been granted by Pope Sixtus IV (r. 1471–1484), who had been a student at the Medical School of Bologna. Still, corpses were rare, the notion resisted by the public, and cadavers were either stolen or made available through the church [13–16, 19–21]. Beginning in 1492, Michelangelo did most of his dissections at the Monastery of Santo Spirito to whose prior, Fra Niccolò Bichiellini, he made the gift of a wooden crucifix. Access to bodies awaiting burial in the mortuary of churches or that of their associated hospitals was not unique to Santo Spirito. Leonardo da Vinci (1452–1519), while in Florence (1500–1504), dissected the body of an old man in Santa Maria Nuova [19]. One Alessandro Allori, a late Mannerist painter of some reputation, is reported to have “*had a few rooms in the cloister of the venerable basilica of San Lorenzo; being a student of anatomy, he continuously brought there human bodies which he skinned and cut up according to his needs*” [19]. The bodies were not always those of criminals. Michelangelo is said to have inadvertently dissected the corpse of a young Corsini, whose powerful family subsequently sought revenge during the chaos that followed the fall of the Republic of Florence in 1530 [5]. His realization of this digression from the accepted norm may have contributed to his having given up dissection after more than a decade of persistent work.

It is in such a heady atmosphere in which the disciplines of art and science had the blurred edges so fundamental to Renaissance intellectual freedom that Michelangelo grew to maturity in Florence, where he was part of that ultimate center of Renaissance humanism—the Court of Lorenzo de’ Medici [22–25]. There, in addition to his exposure to Elia del Medigo, he must have encountered Giovan Francesco Rustici (1474–1554), a Florentine of noble descent and member of the select intellectuals in the Medici circle, who is reported to have “*also applied to the study of necromancy by means of which, I am told, he gave strange frights to his servants and assistants. . . .*” [19]. In fact, one of the leading humanists in the circle of Lorenzo, Marsilio Ficino (1433–1499), was the son of a surgeon and had, himself, studied medicine [17]. Thus, the very milieu in which Michelangelo’s persona was formed allowed for dissection, exposed him to it, and brought him in contact with men familiar with medical texts [12].

His early anatomical interest was revived later in life when having established himself as a divine painter, sculptor, and architect, he seems to have aspired to become a published author and scholar. He had begun writing poetry in his mid-20s. In his late 60s and early 70s, he attempted to publish some 105 of them, but abandoned the project in 1546, at the death of his principal financial advisor, literary companion, and intimate friend

Luigi del Riccio [5, 26, 27]. At about the same time, he also seems to have considered publishing an anatomical treatise for artists and to collaborate in an anatomical text for students of medicine. His plans for the former and his anatomical interest are recorded by Vasari and detailed by Condivi, “. . . *when he gave it up (dissecting corpses) he was so learned and rich in knowledge of that science that he has often had in mind to write a treatise, as a service to those who want to work in sculpture and painting, on all manner of human movements and appearances and on the bone structure, with a brilliant theory which he arrived at through long experience. He would have done it had he not doubted his powers and whether they were adequate to treat the subject properly and in detail, as someone would who was trained in the sciences and in exposition*” [10].

Michelangelo’s standing interest in anatomy is reflected in his painting of the *Last Judgment* (1536–1541). Prominently displayed to the left of Jesus is Saint Bartholomew, balancing the position of Saint Peter on the right (Fig. 2a). Why is there a focus on an otherwise obscure disciple who had been relegated to the shadows by other painters? The message is probably in the flayed skin Bartholomew holds in his left hand and the flaying knife in his right. That the face on the flayed skin is that of Michelangelo only reinforces the underlying meaning [28]. For Bartholomew, having been adopted as the saint of tanners and butchers seems to have been chosen also by anatomists and artists, still scrounging for acceptance and blessing for the dissection of cadavers. It is of special interest in this regard that the Spanish pupil of the famous Professor of Anatomy and Michelangelo’s physician, Realdo Colombo (1516–1559), Juan de Valverde de Amusco (c. 1525–1587), who accompanied Colombo to Pisa and Rome when he left Padua, published an illustrated text on anatomy upon his return to Spain. In the text, he refers to the importance of anatomy in the work of contemporary artists: “. . . *the truth of this has been shown in our time by Michelangelo florentino and Pedro de Rubiales extremo who having given themselves at once to anatomy and painting, have come to be the most excellent and famous painters that have been seen for a long time*” [29]. The illustrations of Valverde’s book on anatomy (*Historia de la Composicion del Cuerpo Humano*), published in 1556, were done by the Spanish artist Gaspar Becerra (1520–1570), who had trained in the studio of Michelangelo [29, 30]. His rendering of the muscular man, shown as a flayed body holding its skin in one hand and a blade in the other (Fig. 3), was to become a pose used in the frontispiece of several subsequent texts of anatomy [29–32]. Its similarity to Michelangelo’s portrait of Bartholomew is striking.

That flaying was more than a transient vagary displayed in the *Last Judgement* can be gleaned from an anecdote recounted by Benvenuto Cellini (1500–1571)



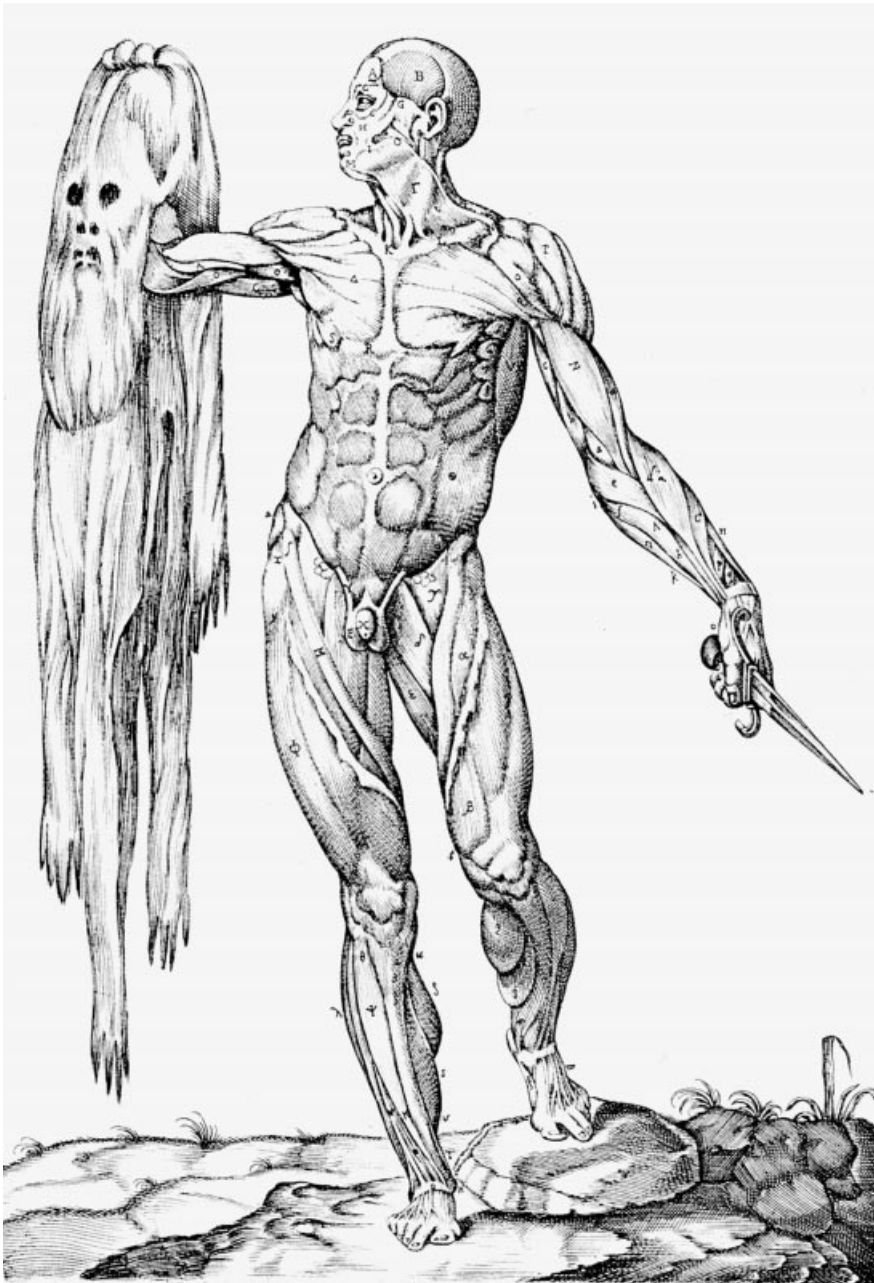


Fig. 3. Figure of the flayed muscle man holding his skin and flaying knife by Gaspar Bercera in *Historia de la Composicion del Cuerpo Humano* (1556) by Juan Valverde de Amusco.

in his autobiography [33]. In 1552, when Cellini visited Michelangelo in Rome to entice him to return to Florence, he quotes a response of Michelangelo's longtime devoted housekeeper and assistant Urbino (Francesco Amadori): "I will never leave my master Michelangelo's side till I shall have flayed him or he shall have flayed me," that is, dissected after death. These words, considered stupid by Cellini, show that dissection was accepted, discussed, and possibly practiced in the house of the master well into the 1550s.

Michelangelo's interest in the project of a text on medical anatomy is evident in the continuation of the previ-

ous quote from Condivi on Michelangelo's interest in anatomy: "He also began to discuss this with Master Realdo Colombo, a very superior anatomist and surgeon and a particular friend of Michelangelo's and mine, who sent him for this purpose the corpse of a Moor. . . . On this corpse Michelangelo showed me many rare and recondite things, perhaps never before understood, all of which I noted and hope one day to publish with the help of some learned man for the convenience and use of all who want to work in painting and sculpture" [10]. Of note, in these quotations is the expressed admission of the need to collaborate with someone "trained in the

*sciences and in exposition*” by Michelangelo and with “*some learned man*” by Condivi, in other words, the need to partner with an experienced anatomist-physician in any such project.

The Master Realdo Colombo, mentioned by Condivi, was indeed a superior anatomist and physician. Having obtained his medical degree in Padua in 1540, he was first assigned there as a lecturer in philosophy and then an assistant to Vesalius, whom he succeeded to the Chair of Anatomy in 1543. This was about the time that medicine was undergoing its own Renaissance, fueled by anatomical research, and most competing Italian cities were establishing or invigorating their own medical schools. One of these was in Pisa, to which the Duke of Tuscany, Cosimo de' Medici, invited Colombo to teach anatomy in 1547 [34]. Following one year in Pisa, Colombo was recruited to teach anatomy at the Papal Medical School of the University of Rome, which had been founded earlier by Pope Boniface VIII (r. 1294–1303) at the beginning of the 14th century. In Rome, Colombo is said to have “*dissected an extraordinary number of bodies and so devoted himself to the solution of problems in anatomy and physiology that he has been aptly styled the Claude Bernard of the sixteenth century*” [35]. By then, the popes had established their dominance over Rome and its surroundings and made the Papal Court not only a collective obsession of artists, but also that of humanists, intellectuals, and physicians attracted by its lure to Rome [35, 36]. Among the medical luminaries who followed Colombo to Rome were Bartolomeo Eustachius (1520–1574), Andrea Cesalpino (1519–1603), and Marcello Malpighi (1629–1694). It is in this continuous Papal effort to promote the prominence of Rome and at the specific request of the Farnese Pope Paul III (r. 1534–1549) that Colombo was given temporary leave of absence from Pisa to teach anatomy in Rome. Pertinent to Michelangelo's intent to collaborate in the publication of a book on anatomy is a letter Colombo wrote in 1548 to Cosimo de' Medici, his patron in Florence, entreating him to grant him a longer stay in Rome, wherein he mentions his work on an anatomy book and that “. . . *fortune has presented me with the greatest painter in the world to assist me in this*” [34]. By then, Andreas Vesalius (1514–1564), Colombo's predecessor to the Chair of Anatomy in Padua and his academic rival, had already published his illustrated *Fabrica* in 1543 [20, 21, 34].

Whether Michelangelo made any anatomic drawings for Colombo will never be known. Colombo's *De Re Anatomica* was published in 1559, shortly after his death, without any illustrations other than that of its frontispiece [34]. Michelangelo's own project to publish an anatomical treatise for artists was never realized. He is known to have destroyed many of his drawings on an ongoing basis and to have burned most of what remained shortly before his death. Very few of his anatomical studies have

survived [5, 22, 23]. What level of fruition the hoped for collaboration with Colombo reached will never be known. One can only wonder what turn the course of the history of medicine would have taken had Michelangelo gone on to illustrate Colombo's *De Re Anatomica*.

It is evident then that Michelangelo had a life-long interest in anatomy, was in contact with several physicians, and was likely exposed to the internal organs, including the kidney, in his youth, well before he painted the Sistine Ceiling. That he may have used the shape of the kidney in his art can perhaps best be appreciated from Vasari's statement that “*Michelangelo was a man of tenacious and profound memory, so that on seeing the works of others only once, he remembered them perfectly and could avail himself of them in such a manner that scarcely anyone has ever noticed it,*” and the commentary of Edwin Panofsky on it that “*He then subjected them to a transformation so radical that the results appear no less Michelangelesque than his independent creations*” [37]. This may have been the case with the shape of the mantle of the *Creator in the Separation of Land and Waters*.

#### MICHELANGELO AND KIDNEY DISEASE

The so-called fortune of Colombo was actually Michelangelo's misfortune. During the latter part of the 1540s, while busy finishing the Crucifixion of St. Peter in the Pauline Chapel and attending to papal architectural commissions, Michelangelo became ill with recurrent urolithiasis, for which he ultimately sought medical help from none other than the then most prominent physician in Rome, Realdo Colombo, as related by Condivi and confirmed by Vasari: “. . . *in his old age he (Michelangelo) suffered from gravel in his urine which finally turned into kidney stones, and for many years he was in the hands of Master Realdo Colombo, his very close friend, who treated him with injections and looked after him carefully*” [10]. A better appreciation of his kidney disease can be gleaned from Michelangelo's own words and those of his friends. The following quotations from Michelangelo's letters are referenced to their numerical listing in the translation by Ramsden [38]. In a letter dated March 15, 1549 to his nephew Lionardo di Buonarroto Simoni, the son of his favorite younger brother Buonarroto (1477–1528), he writes, “*As far as they can make out, the doctors say I am suffering from the stone. They are still not certain. However, they continue to treat me for the said malady and are very hopeful. . . . If it is the stone, the doctors tell me that it is at an early stage and that it is a small one. They are therefore very hopeful, as I have said*” (Letter 323). The nature of the injections given by Colombo that are mentioned by Condivi will never be known, but his long-term treatment and its outcome are detailed in a subsequent letter dated March 23, 1549, to Lionardo: “*Since then, having been given a certain kind of water to*

*drink, it has caused me to discharge so much thick white matter in the urine, together with some fragments of the stone, that I am much better and hope in a short time I shall be free of it—thanks to God and to some good soul*” (Letter 325).

The good soul mentioned by Michelangelo is none other than Colombo, who had capitalized on this medical relationship to invite Michelangelo to illustrate his own book on anatomy. In his next letter to Lionardo, dated April 5, 1549, he provides additional information on the size of the stone and its treatment: “*As regards my malady, I’m much better. We are now certain that I’m suffering from the stone, but it’s a small one and thanks to God and to the virtues of the water I’m drinking, it’s being dissolved little by little, so that I’m hopeful of being free of it*” (Letter 326). He adhered to the prescribed water regimen as shown in a letter to Lionardo, dated June 8, 1549: “*Morning and evening for about two months I’ve been drinking the water from a spring about 40 miles from Rome (Viterbo), which breaks up the stone. It has done this for me and has caused me to discharge a large part of it in the urine. I have to lay in a supply at home and cannot drink or cook with anything else. . . .*” (Letter 334). The waters he refers to are now marketed in Italy as the Fiugi waters and remain popular to this day for their purported ability to dissolve urate stones, as specified on their label. Michelangelo seems to have continued to use the waters, as evidenced in a June 21, 1550 letter to Lionardo admonishing him for sending him Trebbiano wine, which “*I can’t drink being restricted to the waters of Viterbo.*” The water treatment notwithstanding, Michelangelo seems to have continued to suffer from urolithiasis and to have remained gratefully under the care of Realdo Colombo, as recorded in a May 22, 1557 letter to Vasari: “*I am physically enfeebled like all old men, by kidney trouble, the stone and the colic and Messer Eraldo (Colombo) can bear witness to this, because I owe my life to him*” (Letter 434). The recurrence of urolithiasis in 1557 is further documented in a June 16 letter to Lionardo: “*I’ve been ill recently through not being able to urinate, however, I’m alright now.*” Thus, urinary problems are documented for the period beginning in 1549 and for the rest of his life. However, while a specific cause is not mentioned, during much of 1544–1546, Michelangelo was in poor health, and on two occasions, when seriously ill, he was nursed by Luigi del Riccio in the palace of the Strozzi in Rome. The cause of these two episodes, acknowledged as severe illnesses by Vasari and Condivi, remain unidentified, but could be also caused by obstructive uropathy and a urinary tract infection. That Michelangelo may have suffered from kidney stones or gravel then is evident from a series of complaints written on the back of a strip of paper containing an epitaph he wrote in 1544: “*fevers, flanks, aches, diseases, eyes and teeth*” [27].

Whether Michelangelo suffered from the gravel at an even earlier period cannot be established. He must have been of good stock and had a robust constitution that sustained him during a long and arduous career, for he lived to be nearly 90 years, during which he survived several episodes of the plague in Florence and the malaria then common in Rome. He was a stoic who shunned attention, in general, and medical care, in particular. The exact nature of his recurrent illnesses, prior to the diagnosis of kidney stone in 1549, is unknown, other than for his frequent complaints of “ill health” and “not in good health” in much of his early correspondence with his father. The latter’s response, dated December 19, 1500 is somewhat more revealing: “*Buonarrotto tells me that one of your sides is swollen, which comes from being out of sorts or from fatigue or eating bad, windy food, or from putting up with cold or wet feet. . . . You must guard against all these things, besides it is dangerous for the eardrum, which might burst. So take care. I will now tell you about the remedies that I have found: I went for a few days eating only sops of bread, chicken and egg, and I took by the mouth a little cassia, and I made a poultice of thyme, which I put in a pan with rose oil, and camomile oil, and when the poultice was ready I applied it to the front of my body, and in a few days was well again. However, be careful, as this is dangerous*” [24]. While this home remedy suffused by paternal concerns could have been meant for intestinal colic, the abdominal symptoms may just as well have been due to renal colic. Further proof of undocumented episodes of illness during his youth is evidenced by the concern expressed by his father in a letter dated July 21, 1508: “. . . it upsets me that you are ill,” and of a letter to his father dated June 1509, “*I assured you in my last letter that I was not dead, although I did not feel well, now however, I have fully recovered, thank God*” (Letter 47), and of the July 1512 letter to Buanorrotto complaining of being “*in bad health*” (Letter 77). This was during the time (1508–1512) that he was painting the Sistine Ceiling.

His earlier and recurrent health problems are further evidenced in Condivi’s reference to Michelangelo’s overall health: “*Michelangelo is of sound constitution . . . even though he was sickly as a boy and has been seriously ill twice. For years he has found it painful to urinate, and if it were not for the allegiance of Messer Realdo, the problem would have developed into stones*” [10]. That the matter of his health was one of broader concern is expressed in a letter of introduction, which Donna Argentina Malaspina, wife of the exiled gonfaloniere of Florence Piero Soderini (1452–1522), sent to her brother Lorenzo, Marquis de Fosterone, when Michelangelo went to Carrara in 1514. In it she begs him that should Michelangelo fall ill, he should look after him as if he were a member of their own family. At that time, Michelangelo was 39 years old, at the height of his career,



and actively involved in the arduous work of quarrying marble. Yet another cryptic reference to chronic ill health is evidenced by a letter written by Giovanbatista Mini to Bartholomeo Valari, commissary in Florence, dated September 29, 1531, expressing concern that Michelangelo was “*drawn, emaciated, and would not live long unless a remedy were found for his ills. He worked too hard, ate little and poorly, slept less and for a short while has been suffering from a flux, headaches and giddiness*” [38].

Until the diagnosis of kidney stone was made in 1549, it is difficult to interpret his evidently recurrent and documented illnesses that so concerned his family and friends. They may be references, at least in part, to his known bouts of melancholy and depression, the universal ailment of creative minds. It is also likely that Michelangelo may have suffered from an undiagnosed chronic illness that haunted him much of his life, but never really incapacitated him. The answer may be in a letter to Lionardo dated July 5, 1555, after his recurrent nephrolithiasis had been diagnosed and was being treated: “*I haven’t been able to do so before, because of the cruelest pain I’ve had in one foot, which has prevented me from going out and has been a nuisance to me in a number of ways. They say it’s a kind of gout. . . .*” (Letter 405). As documented previously in this article, Realdo Colombo was still his physician then and may have been the one to have made this diagnosis as well. Could the “kind of gout,” which may have other connotations, actually have been due to uric acid? Quite likely. The recurrent nature of his nephrolithiasis and the small size of the easily passed stone fragments are certainly consistent with uric acid stones. While hyperuricemia and hyperuricosuria may have been acquired in old age, they could just as easily have been hereditary and affected him most of his life. If due to old age, they may be secondary to lead overload. He did imbibe homemade brew regularly and was exposed to lead-based pigments in his work. If hereditary, they could account for much of his life-long chronic illnesses [39–41].

He seems to have suffered yet another affliction in his old age that could be attributed to uric acid: the inability to write. While mention of a stroke has been made in the literature to explain this, that does not seem to be plausible. He continued to ambulate and work until the end of his days. Six days before he died, he was still working on the *Rondanini Pietà* [5, 22–24]. What appears to have been the problem is difficulty to use his fingers necessary for the fine work of writing, as might be expected from gouty arthritis. Michelangelo clearly states the problem in his last letter to Lionardo, dated December 28, 1563: “*Having received several letters of yours recently and not having replied, I have omitted to do so because I cannot use my hands to write; therefore, from now on I’ll get others to write and I’ll sign*” (Letter 480).

While this letter is written shortly before his death, he had documented trouble writing as early as 1556, relied on others to write his letters (Letter 425), and expressed the actual discomfort of using his fingers in August 17, 1557: “. . . *writing is very irksome to me. . . .*” (Letter 438). All of this occurred at a time that he continued to work on his sculpture, in which holding the chisel and hammer in the palm of the hand would not be as difficult as that of holding a pen between the fingers. In disorders of uric acid metabolism, the periarticular and subcutaneous depositions of urate results in deforming changes of the joint spaces, capsules, tendons, and bursae. Ankylosis and crippling inactivation are hallmarks of gout. In approximately 30 to 40% of such cases, urolithiasis precedes the onset of arthritis by years, as seems to have been the case here [39–41].

In his last year of life, Michelangelo seems to have suffered from congestive symptoms, spending most of his nights sitting up during his final days. In a letter dated February 14, 1564, summoning Lionardo to Rome, dictated to Daniele da Volterra (1509–1566) but signed by Michelangelo, a subscript by Volterra states that Michelangelo was breathing rather heavily and somnolent and was experiencing stomach and other kinds of upset. In a cover to this letter, dated February 15, 1564 is a note from the Sienese Diomede Leoni that states: “*I left him on his feet clear headed and in good spirits, but heavily weighed down by unending somnolence; and to rid himself of this, today between 22 and 23 hours (about 3 and 4 p.m.) he wished to make the effort to ride, following his custom every evening in good weather; but the coldness of the season and the weakness in his head and legs prevented him, and so he went back to his fireside, to sit down in a chair, where he stays more than in bed. We are all praying God to preserve him for some years, and to bring you safely to Rome*” [24]. These symptoms could be caused by congestive cardiomyopathy or fluid overload caused by renal failure secondary to his chronic obstructive nephropathy. That he might have sustained some form of renal insufficiency is fair to assume given his age and the recurrent urolithiasis and bouts of urinary tract obstruction that were the cause of his only documented illnesses [42]. Whether he actually had gout and developed uremia would be possible to ascertain were his remains subjected to currently available sophisticated analytical technologies. That decision must be made by the guardians of his remains in the Santa Croce Church in Florence. In the meantime, they remain a speculative but definitely possible diagnosis.

In addition to his housekeeper, Antonio, Daniele da Volterra, Diomede Leoni, and Tommaso Cavalieri attended to him until he died in the late afternoon of February 18, 1564. Also in attendance were two Florentine physicians, Frederigo Donato and Gerardo Fidellissimi, who are said to have treated him with concoctions

of honey, vinegar, sea water, and crushed almonds [24]. His nephew, Lionardo, never made it to Rome in time to see him before he expired.

## MICHELANGELO AND THE KIDNEY

It is evident then that at the time of his painting of the Sistine Ceiling, Michelangelo, apart from his special interest in the supporting structures of the body, was likely familiar with the internal organs and had been either exposed to medical texts on the subject or, through his famous retentive memory, caught on to them from discussions on the subject [12]. The prevalent concept of kidney function at the time was based on the teachings of Galen. According to Galen, the kidney was endowed by attractive forces that allowed it to separate solids from the serous part of the blood. Galen also knew that the amount of urine secreted every day reflected the amount of fluid drunk, less that which came away with “*the dejections or passes as sweat or insensible perspiration*” [43]. Thus, the kidneys as the organs that separate solid from liquid were probably familiar to Michelangelo, if not from his own studies then at least at second hand, and would constitute an appropriate symbolic backdrop for the Sistine Ceiling scene on *Separation of the Waters from the Firmament* (Fig. 1a). It would seem that Michelangelo ingeniously fused his knowledge of anatomy and physiology in an emblematic representation of kidney function in his rendering of the events that involve the Congregation of the Waters and span the second and the fourth days of creation, as recorded in the book of Genesis. The very culture in which he grew to maturity in 15th century Florence facilitated the acquisition of this knowledge. His own creative mind actively absorbed that information and then either consciously or subconsciously seems to have used it in the third panel of the Sistine Ceiling. Such a functional interpretation need not entirely cancel out an allegorical one that was likely its original intent. Actually, there is good reason why, in principle at least, such an interpretation would be possible. Michelangelo was known to be allegorical in his work, a form of art he learned to favor in Florence from the master of allegory himself, Sandro Boticelli (1445–1510), and whose three frescoes on the walls of the Sistine Chapel he saw daily as he worked on the ceiling.

Whether there is also an element of self-reflectiveness in the third scene of the *Creation* is also a possibility that deserves consideration, since a biographical root of his art has been considered [27, 44]. It is clear from his correspondence that later in life he developed a special preoccupation and personal concern over the ailment of his own kidneys. In one of his self-mocking poems, written between 1546 and 1550, in which he bitterly denounces his infirmities [27], he writes the following:

“*I myself have gotten to know urine  
and the little tube it comes out of, through that slit  
that calls me every morning before daybreak.*”

That his interest in urine antedates this period is shown in his 1531 chalk rendering of the Bacchanal of Children, reportedly executed for Cavalieri [37]. In this comical rendering of sensual desire, the micturitional humor of the putto (in the right upper corner of the drawing), urinating into a wine cup evokes the same fixation on urine that he expressed in his equally comic but more somber rhyme written some 15 years later [5, 23].

Of the many copies of the *Last Judgement*, one of the best known is that by Marcello Venusti (1512–1579), now in the Capodimonte Museum in Naples. Made for Cardinal Alessandro Farnese, it was painted under Michelangelo’s direction [5, 18, 22]. Of special interest in this copy is a small reproduction of Michelangelo’s *Separation of the Land and Waters* placed immediately above the figure of Christ (Fig. 2b). The inclusion of a figure of the Creator was clearly for religious reasons, as immediately below it is another addition by Venusti—a white dove representing the Holy Ghost. In other words, Venusti is illustrating the Trinity: the Father, the Holy Ghost, and the Son. Could the choice of this singular figure of God from the Sistine Ceiling, or anywhere else, have been intentional? Venusti painted the copy in 1549, just about the time that Michelangelo was recuperating from his then diagnosed severe illness with the kidney stone. Could it be that the choice was more than coincidental? Could it have been selected by Michelangelo under whose directions Venusti was making the copy? These are questions that cannot be answered, but do allow for speculation.

Having written under a license to interpret freely so far, one can extend the license to one of the four ignudi that frame the scene of *Separation of Land and the Waters*, specifically, the ignudo sitting to the left of the enthroned figure of the Persian Sibyl. On first inspection, the nude figure is shown leaning on what appears to be a pillow (Fig. 4a). Closer inspection reveals actually two separate pillows that the figure is holding under his left and right arms. Each of the pillows has the shape of a right (under the ignudo’s right arm) and a left (under the left elbow) kidney (Fig. 4b). The shape of the left pillow is quite suggestive of the characteristic appearance of a kidney, with a partially stripped capsule (in bluish gray) still covering the hilum of the right kidney where it forms a knot at the site of entry of the vessels and exit of the pelvis. Also striking is the facial expression of this singular ignudo, which, in contrast to the serene, thoughtful, surprised, or peaceful facial expressions of the other ignudi, seems to be expressing pain. The uniqueness of the facial expression of this ignudo has been recognized and attributed to “*an incoherent fear*”





**Fig. 4.** Detail from the panel of the *Separation of Earth and Waters* showing one of the naked figures (*ignudi*) sitting atop the Persian Sibyl (1511; left figure). Computer-assisted removal of the *ignudo* highlighting the kidney-shaped pillows. The two smaller inserts show the removed *ignudo* (bottom) and its study in chalk (top) in the Royal Collection, Windsor.

[1, 4]. If so, could it be fear of the agonizing pain of renal colic? Also relevant is his sitting atop the Persian Sibyl, the prophetic of dark destiny, destruction, and death, with both looking away from the viewer [11]. In fact, the very arched appearance of this figure, exposing the costo-vertebral angle in which the kidney is located, is quite typical to that of those experiencing kidney pain, during which one would be expected to arch the back in an attempt to immobilize the kidneys and to place the hands over the area of pain. The difference here is the external representation of the kidneys as pillows that the *ignudo* is holding, that is, immobilizing. A speculative interpretation? Yes, but as controversial as it might be considered, once recognized, these similarities and associations are stunning. Thus, while the significance of the *ignudi* cataloguing a variety of human and psychological possibilities continues to be debated, this *ignudo* might be construed as self-representation by Michelangelo of someone in fear of the impending colic or actually experiencing the pain of renal stone.

Yet another unique feature of this scene is the medallion held by the two *ignudi* above the Persian Sibyl. While the other nine pseudobronze medallions depict scenes from the Old Testament, the one in this scene is blank. It is said that it originally had a representation of Elisha curing Naaman of Leprosy (2 Kings 5) [3, 11]. If so, it would be unique in being the only scene related to health, illness, and cure. As it stands, it is its blankness that calls attention to the *ignudo* holding the kidney

shaped pillows (Fig. 4). The medallions are considered to be related to the histories of the scenes they adorn [11, 44]. Could there have been yet another hidden message in this now blank medallion?

“*Every painter paints himself*” is attributed to Michelangelo by Vasari, but may actually be traced to the leading classical scholar and tutor of the Medici children, Angelo Poliziano (1454–1494), who expounded on the subject in the very Medici Gardens where Michelangelo spent his early teens. Whatever its origin, the statement was proverbial in the late 15th and 16th centuries precisely because the arts were construed as self-revelatory [45]. Thus, to delve into possible autobiographical resonances in the imagery of this scene from the Sistine Chapel does not seem unreasonable [27, 45–47]. Michelangelo expounds on his tendency to include self images in the visual portrayals in his poetry, comparing himself to the marble *David* in progress as early as 1501, in his 1534 admission of “*I only draw out of it what’s suitable and similar to me,*” and in his explanation of painting in which “*one portrays himself*” in 1540–1544. The latter is perhaps best evidenced by his self-portrait as Nicodemus in the *Florence Pietà* on which he worked from 1547 to 1555. He had done it earlier in his painting of the *Last Judgement* (Fig. 2a). He may well have done the same, albeit allegorically, in his painting of the Sistine Ceiling.

Some of the above interpretations must remain uncertain in the absence of clear documentation, but their absence does not rule out their plausibility. There is

always the danger that once we suppose the existence of “hidden” meanings, we become free to find anything we want when thinking takes off from what the eye perceives. On the other hand, once the available evidence is reviewed and these similarities are observed, to deny them becomes a greater danger to what may well be the truth. Whatever its ultimate psychological motivation, there is convincing, albeit not entirely incontrovertible, evidence that Michelangelo was familiar with kidney structure and function, had an early interest in its function in producing urine, used the imagery of urine in his art and poetry, suffered from kidney disease, and may well have sustained renal failure at the end of his life. That he also used the kidney in his art is quite likely.

## ACKNOWLEDGMENTS

I would like to acknowledge the technical services of Mr. Donald P. Eknoyan and Mr. Patrick Kusack in preparing Figure 1 and of Mr. Joe Martinez in preparing Figure 4; the secretarial support of Ms. Marcia Wilber in typing the many revised drafts of the manuscript; and the assistance of the staff of the Hirsch Library of the Museum of Fine Arts in Houston.

Reprint requests to Garabed Eknoyan, M.D., Department of Medicine, Baylor College of Medicine, One Baylor Plaza, Houston, Texas 77030, USA.

E-mail: geknoyan@bcm.tmc.edu

## REFERENCES

- SEYMOUR C JR (editor): *Michelangelo: The Sistine Chapel Ceiling*. New York, W.W. Norton & Co. Inc., 1972
- RICHMOND R: *Michelangelo and the Creation of the Sistine Chapel*. New York, Crescent Books, 1992
- PARTRIDGE L: *Michelangelo. The Sistine Chapel Ceiling*. Rome, New York, G. Braziller, 1996
- DE VECCHI P (editor): *The Sistine Chapel: A Glorious Restoration*. New York, Harry N. Abrams Inc., 1994
- HUGHES A: *Michelangelo*. London, Phaidon Press Limited, 1997
- BECK J: *The Three Worlds of Michelangelo*. New York, W.W. Norton Inc., 1999
- DE TOLNAY CD: *Michelangelo. II. The Sistine Ceiling*. Princeton, Princeton University Press, 1945
- WILDE J: *Michelangelo: Six Lectures*. Oxford, Clarendon Press, 1978
- VASARI G: *The Lives of the Artists*. Oxford, Oxford University Press, 1991
- CONDIVI A: *The Life of Michelangelo*. Baton Rouge, Louisiana State University Press, 1976
- DOTSON EG: An Augustinian Interpretation of Michelangelo's Ceiling. *Art Bull* 61:223–256, 405–429, 1979
- SUMMERS D: *Michelangelo and the Language of Art*. Princeton, Princeton University Press, 1981
- SCHULTZ B: *Art and Anatomy in Renaissance Italy*. Ann Arbor, UMI Research Press, 1982
- MAYOR AH: *Artists and Anatomists*. New York, The Metropolitan Museum of Art, 1984
- VASARI G: *Vasari on Technique*. New York, Dover Publications Inc., 1960
- MARGOTTA R: *The History of Medicine*. New York, Smithmark Publishers, 1996
- KRISTELLER PO: *Eight Philosophers of the Italian Renaissance*. Stanford, Stanford University Press, 1964
- STEINBERG L: A corner of the Last Judgement. *Daedalus* 109:207–273, 1980
- WITTKOWER R, WITTKOWER M: *Born Under Saturn. The Character and Conduct of Artists: A Documented History from Antiquity to the French Revolution*. New York, W.W. Norton, 1963
- CUNNINGHAM A: *The Anatomical Renaissance: The Resurrection of the Anatomical Projects of the Ancients*. Hants, Scholar Press, 1997
- MOE H: *The Art of Anatomical Illustration in the Renaissance and Baroque Periods*. Copenhagen, Rhodes, 1995
- SYMMONDS JA: *The Life of Michelangelo* (2 vol). London, John C. Nimmo, 1893
- HIBBARD H: *Michelangelo* (2nd ed). New York, Harper & Row Publishers, 1974
- BULL G: *Michelangelo: A Biography*. London, Penguin Books, 1996
- MURRAY L: *Michelangelo*. London, Thames and Hudson Ltd., 1980
- MICHELANGELO B: *Complete Poems and Selected Letters of Michelangelo* (translated by Creighton Gilbert), edited by LINSKOTT RN, Princeton, Princeton University Press, 1980
- SASLOW JM: *The Poetry of Michelangelo: An Annotated Translation*. New Haven, Yale University Press, 1991
- STEINBERG L: Michelangelo and the doctors. *Bull Hist Med* 56:543–553, 1982
- SZLADITS LL: The influence of Michelangelo on some anatomical illustrations. *J Hist Med Allied Sci* 9:420–427, 1957
- GUERRA F: Juan de Valverde de Amusco: Evidence for the identification of his portrait claimed to be that of Vesalius—with a reappraisal of his work. *Clio Med* 2:339–362, 1967
- SCHMIDT H, SCHADEWALDT H: *Michelangelo and die Medizin seiner Zeit*. Stuttgart, Schattauer, 1965
- ELKINS J: Michelangelo and the human form: His knowledge and use of anatomy. *Art Hist* 7:176–186, 1984
- CELLINI B: *The Life of Benvenuto Cellini*. London, Phaidon Press Limited, 1995
- EKNOYAN G, DESANTO N: Realdo Colombo (1516–1559): A reappraisal. *Am J Nephrol* 17:261–268, 1997
- WALSH JJ: *The Popes and Science*. New York, Fordham University Press, 1908
- CASTIGLIONI A: *The Renaissance of Medicine in Italy*. Baltimore, Johns Hopkins Press, 1934
- PANOFSKY E: *Studies in Iconology*. New York, Harper & Row Publishers, 1972
- RAMSDEN EH: *The Letters of Michelangelo* (2 vol). Stanford, Stanford University Press, 1963
- GRAHAME R, SCOTT ST: Clinical survey of 354 patients with gout. *Ann Rheumatol Dis* 29:461–468, 1970
- YU TF: Uric acid nephrolithiasis in gout: Predisposing factors. *Ann Intern Med* 67:1133–1148, 1967
- WEDEEN R: Lead and the gouty kidney. *Am J Kidney Dis* 11:559–563, 1983
- KLARH S: New insight into the consequences and mechanism of renal impairment in obstructive nephropathy. *Am J Kidney Dis* 18:689–699, 1991
- EKNOYAN G: The origins of nephrology—Galen, the founding father of experimental renal physiology. *Am J Nephrol* 9:66–82, 1989
- HART F: Lignum Vitae in Medio Paradisi: The Stanza d' Eliodoro and the Sistine Ceiling. *Art Bull* 32:115–145, 181–218, 1950
- BAROLSKY P: *Michelangelo's Nose: A Myth and Its Maker*. University Park, Pennsylvania State University Press, 1990
- BAROLSKY P: *The Faun in the Garden: Michelangelo and the Poetic Origins of Italian Renaissance Art*. University Park, Pennsylvania State University Press, 1994
- LILLENBERGER J: *Images and Relics: Theological Perceptions and Visual Images in Sixteenth Century Europe* Oxford, Oxford University Press, 1999