



Review

# Juan Valverde de Amusco: Pioneering the Transfer of Post-Vesalian Anatomy

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**Abstract:** This article delves into the life and accomplishments of Juan Valverde de Amusco (c. 1525–c. 1587), a Spanish anatomist. Specifically, it focuses on his book titled *HISTORIA de la composición del cuerpo humano*. The book was the first anatomy opus published after Andreas Vesalius' *De humani corporis fabrica libri septem*, written in a Romance language, the Castilian Spanish language, making it the most renowned post-Vesalian anatomy book in Europe and beyond during the 16th and 17th centuries. Compiling complete editions and reproductions of figures, it had 19 editions and several translations. One of its principal contributions was the initial graphical representation of the stapes ossicle. It provided the first accurate description of the pulmonary circulation, vomer bone, and four extraocular rectus muscles. Throughout the book, Valverde corrected numerous of Vesalius' anatomical observations. *HISTORIA de la composición del cuerpo humano* was the first anatomy book to use chalcographic illustrations, which are of superior anatomical quality than those printed from engraved wood in Andreas Vesalius' book. Next, many anatomy textbooks of that time incorporated Valverde's book illustrations. Valverde's book was practical, timely, and well referenced, making it a valuable resource for scholars and non-scholars. The conclusion is that Juan Valverde de Amusco merits a place as a pioneer in scientific knowledge transfer.

**Keywords:** renaissance anatomy; 16th-century anatomists; history of anatomy; anatomical terminology; carotid circulation; extraocular rectus muscles; oculomotor muscles; pulmonary circulation; stapes ossicle; vomer bone



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## 1. Context

Century XVI was the starting point of the Renaissance, the European cultural movement that determined the modern conception of nature and human beings. The Renaissance began in Florence, and its first expansion was in Northern Italy. Gutenberg's printing (c. 1440), universities, and patronage of kings, popes, and prominent families (e.g., such as those of the House of Medici in Florence and the Colonna family in Rome) prompted its development. Humanism was a foundation for Renaissance intellectual thought, derived from significant translations of Greco-Latin Antiquity and Islamic Golden Age authors in the late Middle Ages [1]. New conceptions led to the Protestant Reformation. Then, Pope Paul III (papacy period: 1534–1549) established the Roman Inquisition (1542) and the Council of Trent (1545–1563) as part of the Counter-Reformation, the Catholic answer to Protestantism.

Even though experience and inductive reasoning were gaining impetus among the learned scholars of Christendom, the early Renaissance was the last and most magnificent phase in the history of Galen medicine [2]. Under Galenism, function, form, and finality are complementary parts. The form turned out to be the basis of the anatomy of the Renaissance at the beginning of the Modern Era. The human body and its parts became

a distinctive object of study, not only for medicine and surgery, but also for revealing the implications intertwined with nature, humans, and divinity. Since objective knowledge of the human body was the goal for constructing modern anatomy, the dissection of the human body was preferred [3,4].

An osmosis was established between the fields of art and anatomy. Italian Renaissance artists, including Antonio Pollaiuolo (1433–1498), Leonardo da Vinci (1452–1519), Michelangelo Buonarroti (1475–1564), and Baccio Bandinelli (1493–shortly after 1560) dissected human bodies. Pope Sixtus IV (papacy period: 1471–1484), who had studied at the Medical School of Bologna, granted permission to carry out human body dissections, subject to the condition that the dissected corpses were buried afterward in a dignified manner. Again, Pope Clement VII (papacy period: 1523–1534) endorsed the teaching of anatomy through dissection in 1531. The practice of dissecting human bodies was also prompted by the custom of stuffing and embalming the remains of individuals who distinguished themselves through their examples and doctrines (since Pope Paul IV (papacy period: 1555–1559) until the present day) [3–6]. On the other hand, the Reformation favored the emergence of modern anatomy by allowing for the dissection of human bodies, at least as early as 1540, in London and other cities [7].

Alessandro Benedetti (1450?–1512), a professor at Padua and a prominent figure in Renaissance humanism, proposed in his book *Anatomice*, published in 1502, the first anatomical theater, which may have been in operation in 1522 [4]. Other prominent humanists who were anatomists as well were Jacques Dubois (Latinized as Jacobus Sylvius) (1478–1555), Johann Winter von Andernach (1505–1574), and Miguel Servet (Latinized as Michael Servetus) (1511–1553)—who, parenthetically, were teachers of Andreas Vesalius (1514–1564) (Vesalius herein). Among other locations, the private practice of human dissection gained momentum in Paris and Italy. The initial printed work that came into view from that environment is *Anatomica methodus* by Andrés Laguna (1510–1559), which was published in 1535 (Table 1). Andrés Laguna influenced Vesalius' formation [8].

**Table 1.** Published anatomy books by Spanish anatomists during the XVI century (Spanish Golden Age).

| Year | Author  | Title (Place of Publication: Publisher)  |
|------|---|--|
| 1535 | Andrés Laguna<br>(c. 1510–c. 1559)                    | <i>Anatomica methodus seu de sectioni humani corporis contemplatio</i> (Paris: Ludouicum Cyaneum)  |
| 1542 | Luis Lobera de Ávila<br>(c. 1480–c. 1551)             | <i>Libro de Anatomía, es primera parte de “Remedio de cuerpos humanos y silva de experiencias y otras cosas utilísimas”</i> (Alcalá de Henares: Juan Brocar)   |
| 1549 | Pedro Jimeno<br>(c. 1515–c. 1551)                     | <i>Dialogus de re medica, compendiaria ratione, praeter quaedam alia, universam anatomem humani corporis perstringens</i> (Valencia: Juan Mey)   |
| 1551 | Bernardino Montaña de Monserrate<br>(c. 1480–c. 1558) | <i>Libro de la Anathomía del hombre</i> (Valladolid: Sebastián Martínez)   |
| 1555 | Luis Collado<br>(c. 1520–c. 1589)                     | <i>Cl. Galeni Pergameni Liber de Ossibus ad tyrones. . . enarrationibus illustratus</i> (Valencia: Juan Mey)   |
| 1556 | Juan Valverde de Amusco<br>(c. 1525–c. 1587)          | <i>HISTORIA de la composición del cuerpo humano</i> (Roma: Antonio Martínez de Salamanca y Antoine Lafréry)  |
| 1559 | Alfonso Rodríguez de Guevara<br>(c. 1520–c. 1587)     | <i>In pluribus ex iis quibus Galenus impugnatur ab Andrea Vesalio Bruxelensi in de constructione et usu partium corporis humani, defensio: et nonnullorum quae in anatome deficerent videbantur supplementum.</i> (Coimbra: Juan Barreiro) |

Two pivotal works of the scientific revolution of the Renaissance appeared in the year 1543: *De revolutionibus orbium coelestium* by Nicolaus Copernicus (1473–1543) and *De humani corporis fabrica libri septem* (“. . .Fabrica. . .” henceforth) by Vesalius. The latter conveys the

perception that, in anatomy, only what can be seen and shown is correct. Vesalius dedicated his monumental work to Charles (reigning period: 1520–1558) (King Carlos I of Spain and Emperor Carolus V of the Holy Roman Empire, among many other titles). Vesalius served as Charles's physician and surgeon. Next, Vesalius likewise served Charles' son Philip (reigning period: 1556–1598) (King Felipe II of Spain and I of Portugal, King of Naples and Sicily, Duke of Milan, Lord of the Seventeen Provinces of the Low Countries, and King *iure uxoris* of England and Ireland, among other titles). Philip designated Vesalius as *Conde Palatino* (Count Palatine) [9].

During the Spanish Golden Age (1492–1659), Spain was the dominant potency in Europe and beyond. The Castilian Spanish language spread. King Charles I of Spain established the initial universities in the Americas: Santo Domingo (Royal and Pontifical University of Saint Thomas Aquinas, 1538); Lima (Royal and Pontifical University of the City of the Kings of Lima, 1551, currently known as National University of San Marcos), and México (Royal and Pontifical University of Mexico, 1551) [10].

However, there was an intense relationship between Spain and Italy regarding artistic, political, and military affairs, human interchanges and humanistic knowledge, not the least that of medicine. The cultural infrastructures of Italy, including the Roman heritage, numerous art collections, universities, printing houses, and libraries, particularly the *Biblioteca Apostolica Vaticana*, served as further incentives for such an exchange. Many Spanish physicians traveled to Italy to find their way into the medical marketplace at the papal, cardinal, and other courts, as well as the numerous hospitals and other medical institutions [11], or to complete their education with the finest anatomists, as the instruction in anatomy and surgery at Spanish universities was somewhat lacking. Sephardi Jewish physicians who had come to Rome from Spain played a significant role in translating medical classical books in the city, often with papal and other ecclesiastical support [12].

Nevertheless, the dissection of human bodies was documented in Spain from an early age. The monks of Guadalupe (Crown of Castile, presently Spain) obtained a papal privilege as early as 1322, which allowed them to open the bodies of deceased pilgrims and investigate their causes of death. The dissection of human bodies received a significant boost owing to King Ferdinand II of Aragon (1452–1516), also known as the Catholic Monarch (who was also King of Sicily, Naples, Navarre, and King *iure uxoris* of Castile). In 1488, King Ferdinand II of Aragon granted a privilege to the physicians of Saragossa (Crown of Aragon, presently Spain), allowing for the dissection of human bodies [13]. Following that, King Charles I of Spain and the fifth emperor of the Holy Roman Empire, as a champion of the Catholic faith, sought the faculty of the Salamanca University (Crown of Castile, presently Spain) for their opinion about human dissection. The faculty responded that it was permissible under the Catholic Church's edicts [6]. The initial autopsy conducted on American soil occurred between 1520 and 1530 by a bachelor of medicine with the surname Barreda [10]. The twins Joana and Melchiora Ballestero were also autopsied in La Hispaniola (at present, this island splits between Haiti and the Dominican Republic) in 1533 to determine whether they shared a heart and, consequently, a soul [14].

Spanish universities were among the first to accept the Vesalius anatomy, thanks to Pedro Jimeno (c. 1515–c. 1551) and Luis Collado (1520–1589). Both were direct disciples of Vesalius at Padua and later held chairs of anatomy and surgery at Valencia University [15]. At Valencia University (Crown of Aragon, presently Spain), a series of structured lectures on surgery (in the year 1501) and anatomy (1549) had been established, marking the inaugural edition of these courses in Spain. These courses served as models for the subsequent courses established at other Spanish universities, including Valladolid in 1550, Salamanca in 1551, and the initial *Complutense* at the town Alcalá de Henares in 1560. In 1559, King Philip II of Spain signed a royal provision so that bodies of unclaimed dead people would be given to the university for the study of anatomy.

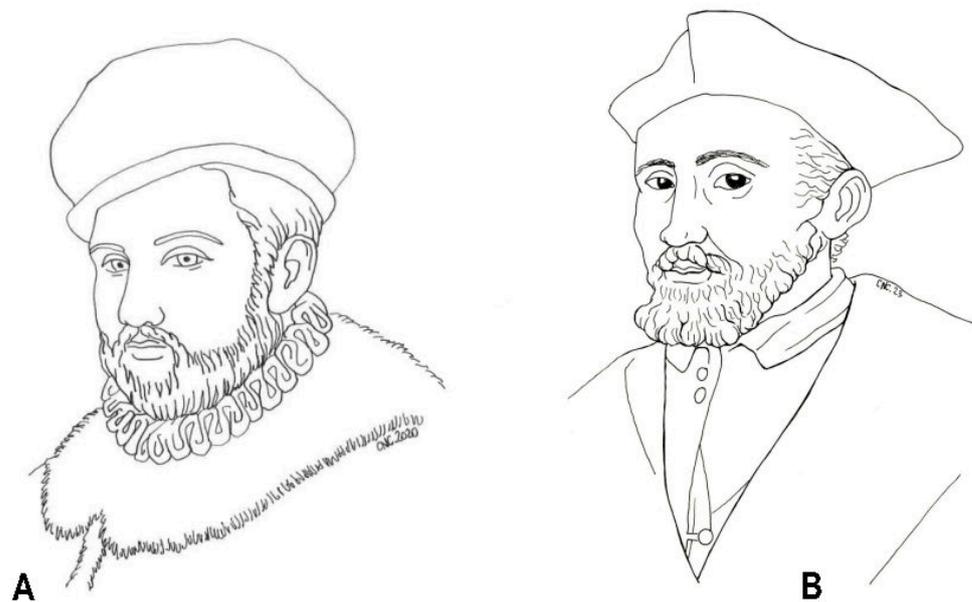
In the same year, a Royal Pragmatic (a royal decree) signed by King Philip II and dated 22 November 1559, prohibited the enrollment of subjects from the Spanish Empire in foreign universities—an exception was made to this prohibition with the universities

of Bologna, Rome, and Naples [16]. The Royal Pragmatic had two purposes. Initially, the defense against the contamination of the Catholic faith with Reformation ideas. Moreover, it may have served as a shield of contemptuous pride against the Black Legend. The Black Legend is a skewed collection of narratives and literary works that were initially disseminated by the affluent editorial establishment of the Seventeen Provinces (currently the Netherlands, Luxembourg, Belgium, and certain territories of northwestern France) and Italy during and after their rebellion against Spanish rule. The purpose of the Black Legend was to tarnish the image of the Spanish Empire, its people, and their culture [17]. The Royal Pragmatic of 22 November 1559, and the subsequent one signed by King Philip III of Spain on 7 November 1617, were turning points in the isolation of Spanish universities from Europe and the consequent scientific decline of Spain.

Despite the turmoil of that era, Spanish anatomists produced numerous anatomy books. Those published between 1535 and 1559 are listed in Table 1. Of particular importance, among them, is the *HISTORIA de la composición del cuerpo humano* by Juan Valverde de Amusco. No anatomy book written in Spanish was to be translated into another language until 1793, when Antonio de Gimbernat y Arbós published *Nuevo Método de Operar en la Hernia Crural*, translated into English by Thomas Beddoes two years later [18]. Valverde's life and work reflect the cultural upheavals occurring during the Renaissance.

## 2. Life

Juan Valverde de Amusco (J. Valverde henceforth) (Figure 1) was born in 1525 in the town of Hamusco (now Amusco) in the shire of Tierra de Campos (Crown of Castile, presently Palencia, Spain). There are few precise records of his life. The safest ones come from small comments disseminated throughout his books. The details regarding his childhood and youth remain unconfirmed. His probable Jewish origin has been suggested [19,20].



**Figure 1.** Line drawings of the two known portraits of Juan Valverde de Amusco (c. 1525–c. 1587). (A) The original portrait, painted by Gaspar Becerra [21], is exhibited in the Walters Art Museum of Baltimore, U.S.A. Available at <https://bancoimagenesmedicina.com/imagen/valverde-de-amusco-o-hamusco-juan-2/> (last time consulted, 15 October 2023). (B) The original portrait is in the book *Anatomia del corpo umano*, Venetia, Giunti (1586), the first Italian edition of Valverde's *HISTORIA de la composición del cuerpo humano*.

In the year 1542, J. Valverde was around 17 years old when he left for Italy. J. Valverde might have resided briefly in Perugia, but this is not supported by clear evidence [21]. Though it is not known where he obtained his medical degree, J. Valverde studied in

Padua, Pisa, and Rome, under the guidance of (Matteo) Realdo Colombo (1516–1559) and Bartolomeo Eustachi (1500 up to 1510–1574). It is assumed that Valverde's move to Padua was due to the renowned *Studi Paduani* (currently known as the University of Padua), where anatomy and surgery were taught by Vesalius. A further highlight was the clinical teaching provided by Giovanni Battista da Monte (1489–1551) at the *Ospedale di San Francesco Grande*. G.B. da Monte introduced clinical medicine into the curriculum to integrate theory and practice. Thanks to him, medical undergraduates and physicians could acquire knowledge at the patient's bedside, perhaps for the first time in Christian Europe [22]. In Padua, G.B. da Monte established the first permanent anatomical theater and botanical garden in 1545 [23].

J. Valverde was interested in Vesalius but met R. Colombo in Padua. At that time—the academic course of 1542–1543 was beginning—Vesalius was involved in the composition of the “...*Fabrica*...” and was ready to move to Basel to prepare the printing with publisher Johannes Oporinus (1507–1568). For the duration of the course, the chancellor of *Studi Paduani* arranged for Pamphilius Montius to be the reader of Mondino de Luzzi's *Anathomia corporis humani* (a book written in 1316), R. Colombo to be the *sector* (i.e. the surgeon in charge of dissecting the human body), and Paulus de Crassis to be the *ostensor* responsible for displaying the organs of the human body [24].

Vesalius resigned his chair at Padua after publishing “...*Fabrica*...” to become Emperor Charles V's *archiater*. He followed his father, the Emperor's pharmacist, in such a move [25]. R. Colombo officially assumed the Vesalius' chair of surgery and anatomy at *Studio Paduani* during the academic years 1543–1544 and 1544–1545. For the subsequent courses (1545 up to 1548), the Duke of Tuscany, Cosimo I de Medici, appointed R. Colombo as the chair of surgery and anatomy at Pisa University [23]. J. Valverde, who always acknowledged R. Colombo as his exemplary teacher, was at Colombo's side as a student and, presumably, as an assistant dissector [26]. At Pisa, J. Valverde assisted R. Colombo in investigating the minor (pulmonary) circulation of blood, among other matters [27]. With J. Valverde, R. Colombo dissected not only human bodies but also vivisected animals to study the functioning of the voice; the movement of the lungs, heart, and arteries; the dilation and contraction of the brain; variations in pulse; and other physiological functions [28]. Because of his discoveries, R. Colombo criticized Vesalius, and they engaged in resentful polemics with each other.

On the other hand, R. Colombo became a member of the School of Artists and developed a friendship with Michelangelo [29]. In August 1547, R. Colombo requested a license from the Duke of Tuscany and relocated to Rome, where Michelangelo had to illustrate R. Colombo's book, *De re anatomica libri XV* [30]. The book came out in 1559, but without images. However, R. Colombo and Michelangelo came together to share a great friendship. During R. Colombo's stay in Rome, Pope Paul III appointed R. Colombo to chair the anatomy course at the *Archigimnasio della Sapienza* (also named *Studium Urbis*; presently, *Sapienza-Università di Roma*). In the year 1548, R. Colombo made a lasting move to Rome. Gabriele Falloppio (1523–1562) succeeded him in Pisa. In 1549, Pope Paul III designated R. Colombo as *archiater*, and after the Pope's death, he was appointed surgeon of the conclave that elected Pope Julius III (papacy period: 1550–1555). This year, R. Colombo diagnosed and administered treatment to Michelangelo for nephrolithiasis [31]. R. Colombo became the first Chair of Anatomy at the *Studium Urbis* in 1552 [11]. He probably obtained the Degree of *Philosophia et Medicina* at the *Studium Urbis* around that time [32]. R. Colombo had been initially a *sector*, but later he became a physician of prestige, protected by Cardinal Girolamo Verallo (1497–1555), prefect of the Supreme Tribunal of the Apostolic Signature and member of the Roman Court of the Holy Office of the Inquisition. R. Colombo then served Juan Álvarez de Toledo (1488–1557), a son of the second Duke of Alba and a Cardinal and General Inquisitor in Rome himself.

While assisting R. Colombo in Rome, J. Valverde actively participated in the cultural and scientific life of the Metropolis. Relevant personalities of the ample Spanish colony and others met in *academia* and *salas*, such as the one at Palazzo Colonna. It included artists

such as Michelangelo, Gaspar Becerra, and Pedro Rubiales; cardinals such as G. Verallo and J. Álvarez de Toledo; humanist physicians such as Juan Aguilera (?–1560) (who was at the service of Cardinal J. Álvarez de Toledo and physician of Pope Paul III), and Andrés Laguna and Luis de Lucena (1491–1552), who were both serving Pope Julius III [33]. J. Valverde and J. Aguilera were part of a scientific social group around Cardinal J. Álvarez de Toledo [11]. Thanks to the recommendation of Cardinal J. Álvarez de Toledo, J. Valverde was appointed physician at the *Ospedale di Santo Spirito in Sassia* in Rome in 1555. By that time, J. Valverde was thirty years of age. At the *Ospedale di Santo Spirito in Sassia* (Rome), he honed his clinical skills and devoted himself to teaching and conducting anatomical research. He also embalmed human bodies in Rome, first with R. Colombo, then by himself. Under Colombo's direction, J. Valverde autopsied Cardinal Innocenzo Cybo (1550) and Ignatius of Loyola (1556) [26]. J. Valverde was a highly esteemed physician among the nobility and the affluent. Discrepancies exist regarding whether he was a physician at the court of Pope Paul IV [34]. In the final months of 1557 or early in 1558, J. Valverde acted as a private messenger between King Philip II of Spain, who at that time was residing at Brussels, and Duke Cosimo I de Medici at Firenze, possibly in connection with the invasion of the Pope's states by the King Philip II of Spain [34] (see also the "Dedicatory" subheading below).

In the year 1558, J. Valverde may have returned briefly to his home place in Spain carrying with him a papal bull given by Pope Paul IV for the *Cofradía-Hospital de San Sebastián* ("Brotherhood-Hospital of Saint Sebastian") in Amusco [35]. J. Valverde's date of death is unknown, but he died in Rome, probably circa 1587.

### 3. Scientific Work

J. Valverde published two books, one in 1552 and another in 1556. He was aged 27 and 31 years, respectively. Both books were intended to disseminate medical and anatomical knowledge to scholars and non-scholar people. One of the books was titled *De animi et corporis sanitate tuenda libellus* and focused on hygiene. The other is *HISTORIA de la composición del cuerpo humano* and targeted on anatomy.

#### 3.1. *De animi et Corporis Sanitate Tuenda Libellus* ("A Pamphlet on the Preservation of Mental and Physical Health")

This book deals with hygienic and sanitary issues frequently discussed by medical writers during the 16th century. The book is a work in the Latin language, printed in Paris in February 1552. Two editions were published (Figure 2). The initial edition was prepared in *Octavo* by Charles Estienne, a renowned printer and physician also known as Carolus Stephanus (1504–1564). In 164 pages, the book proposes secrets for health conservation and illness evasion. The book's small format, and therefore probable low-cost selling, possibly favored rapid dissemination among scholars but also those affluent curious who paid in exchange for learning the secrets of human nature.

The book's second edition was released in Rome the following year and printed at Domenico Giglio's print house in Venice (also known as Dominicus Lilius). This edition features updates such as a new frontpage, an index, a revised pagination system, and a list of typos. The author dedicated the book to Cardinal Girolamo Verallo (1497–1555), expressing gratitude with the words "*Vale mi Princeps studiosorum Patrono*", which translates to "Farewell, my Prince, Patron of the studios".



**Figure 2.** Frontpages of the two editions of *De animi et corporis sanitate tuenda libellus* by Juan Valverde de Amusco.

### 3.2. *HISTORIA de la Composición del Cuerpo Humano* (“*HISTORY of the Composition of the Human Body*”)

It is an opus written in the Castilian Spanish language. It provides accurate descriptions of human anatomy and explains the functions of the body and its parts. The overall organization of the book responds to a strict functional (Galenic) criterion [36]. The author aimed to not only educate on human anatomy but also to make the information widely available. *HISTORIA de la composición del cuerpo humano* (“*HISTORIA*. . .” henceforth in the present article) was the most broadly distributed anatomical publication after Vesalius during the *Cinquecento* [37]. It was the culmination of Valverde’s research and the knowledge he acquired from R. Colombo and collaborators. The opus includes a cover, dedication, preface to readers, two indexes (one of the chapters and one thematic), seven books (each divided into chapters), and forty-two illustrated plates with figures. Following the princeps edition, many more editions were published (Table 2).

**Table 2.** Editions and reprinting of Valverde’s *HISTORIA de la composición del cuerpo humano*, according to López Piñero [38] and Hernández-Mansilla [34].

| Year    | Language | Title   | Print House/Publisher                   | Place  |
|---------|----------|---|---|--------|
| 1556 *1 | Spanish  | <i>HISTORIA de la composición del cuerpo humano</i> | A. Martínez de Salamanca and A. Lafréry | Rome   |
| 1559 *2 | Italian  | <i>Anatomia del corpo umano</i>                     | Nicolò Bevilacqua                       | Venice |
| 1560    | “        | “   | Giunta                                  | “      |
| 1586    | “        | “   | “                                       | “      |
| 1596    | “        | “   | “                                       | “      |
| 1606    | “        | “   | “                                       | “      |
| 1607    | “        | “   | “                                       | “      |
| 1608    | “        | “   | “                                       | “      |
| 1657    | “        | “   | “                                       | “      |
| 1682    | “        | “   | Giunta/Niccolò Pezzana                  | “      |
| 1589 *3 | Latin    | <i>Anatome corporis humani</i>                      | Michele Colombo                         | Venice |
| 1607    | “        | “   | “                                       | “      |

Table 2. Cont.

| Year                | Language | Title  | Print House/Publisher | Place   |
|---------------------|----------|--|-----------------------|---------|
| 1566 * <sup>4</sup> | Latin    | <i>Viuæ imágenes partium corporis</i>  | Christophe Plantin    | Antwerp |
| 1572                | "        | <i>humaniæreis formis expressæ</i>   | "                     | "       |
| 1579                | "        |  | "                     | "       |
| 1568                | Dutch    | <i>Anatomie, oft levende beelden vande deelen des menschelicken lichaems: met de verclaringhe van dien, inde Neder-duytsche spraecke</i> | Christophe Plantin    | Antwerp |
| 1583                | "        |  | "                     | "       |
| 1583                | Dutch    | <i>Bedieninghe der anatomien</i>   | David van Mauden      | Antwerp |
| 1646                | "        | "  | "                     | "       |

\*<sup>1</sup> Available at [https://books.google.es/books/ucm?vid=UCM5320265722&printsec=frontcover&printdir\\_esc=y#v=onepage&q&f=false](https://books.google.es/books/ucm?vid=UCM5320265722&printsec=frontcover&printdir_esc=y#v=onepage&q&f=false) (accessed on 4 December 2023); \*<sup>2</sup> Available at <https://collections.nlm.nih.gov/catalog/nlm:nlmuid-9617625-bk> (accessed on 4 December 2023); \*<sup>3</sup> Available at [https://books.google.nl/books?id=x\\_72RuDANKYC&hl=es](https://books.google.nl/books?id=x_72RuDANKYC&hl=es) (accessed on 4 December 2023); \*<sup>4</sup> Available at <https://patrimonioidigital.ucm.es/s/patrimonio/item/578975> (accessed on 4 December 2023). To view the book's contents, please ignore the pop-up and scroll down the websites.

### 3.2.1. Princeps Edition

The opening publication of “*HISTORIA...*” originated from the presses of the Spaniard Antonio Martínez de Salamanca (c. 1478–1562) and the Frenchman Antoine Lafréry or Lafreerij (1512–1577) in Rome in the year 1556. A. Martínez de Salamanca was instrumental in spreading Spanish culture in Rome. He was concurrently a partner in the printing of “*HISTORIA...*” and Lafréry’s primary adversary in the Roman publishing industry [26].

**Frontpage and Imprimatur.** The first word of the book title is HISTORIA [sic] (Figure 3). Valverde gave the book explicit meaning by emphasizing the parallelism between the description of natural facts of the human body through experience and the story of human events [34]. There is printing permission granted by Pope Paul IV. It also includes a warning of automatic excommunication and a fine of 100 gold ducats for those who copy the book without the author or editors’ permission during the next 10 years after that edition.

**Dedicatory.** After initially considering dedicating “*HISTORIA...*” to Pope Paul IV [26], J. Valverde decided to dedicate the book to his protector, Cardinal J. Álvarez de Toledo, who was Pope Paul IV’s confessor. The precise cause of this shift remains uncertain. Nonetheless, it might be associated with the ongoing conflict between Pope Paul IV and King Philip II of Spain, a component of the Italian War of 1551–1559. Chiefly, it can be attributed to Pope Paul IV’s unsuccessful attempt, with King Henry II of France, to remove King Philip II of Spain as king of Naples in 1556, and to the sub-sequent preparations for the arrival of King Philip II’s troops in Rome. This entry finally took place in 1577 and was commanded by Fernando Álvarez de Toledo, third Duke of Alba, and nephew of Cardinal J. Álvarez de Toledo.

The dedicatory provides a clear picture of Valverde’s position regarding Vesalius. J. Valverde, acknowledging Vesalius as the master whom he would always follow, “except for certain instances where he exhibited less diligence than necessary (presumably due to fatigue from the arduous task at hand), which I shall note”. (Without further comment, this quote and similar ones that follow in this article are translations of Valverde’s original Spanish text.)

**Preface to Readers.** Once again, there is an explicit eulogy for Vesalius’ authorship and merit. J. Valverde wrote, “Even though some friends of mine thought I should make new figures, without using the ones from Vesalius, I haven’t done it because I want to evade confusion [...] and because his figures are so well-made that it would be, to me, envy or meanness not making use of them”.

Next, J. Valverde explained that all Figures belonging to any of the seven “*HISTORIA...*” books are put at the end of the corresponding book because, “being printed from copper

engravings, they could not be mixed with it [the main text] without producing confusion". J. Valverde also offered a lengthy explanation about the letters and end notes that appear in each of the legends to the figures [39]. By placing all images at the end of the books, he made the final format smaller to make it less expensive than other anatomical books like Vesalius' "...Fabrica..." [32].



**Figure 3.** Frontpage of the princeps edition of *HISTORIA de la composición del cuerpo humano* by Juan Valverde de Amusco. It is according to the symbolic custom of the time. At the center of the composition, two telamons hold the coat of arms of Cardinal Juan Álvarez de Toledo, protector of Juan Valverde de Amusco. The coat of arms features a checked vertical oval surrounded by nine pennants that represent the possessions and titles of the Alba family, including manors, counties, marquessates, and duchies. Topping the coat of arms is a cross with trefoil endings and two *putti* holding the cardinal hat. Below the telamons' feet, the title and author of the book stand within a horizontal oval surrounded by four shells (two representing birth and life; the third one is the head of a gargoyle sited there to ward off demons and evil spirits; the fourth item is the skull of a ram, symbolizing the transience of life).

**Books and Chapters.** According to Renaissance criteria, "*HISTORIA...*" is divided into books, each divided into chapters. "*HISTORIA...*" encompasses seven books, akin to Vesalius' "...Fabrica...", but the topics of the books are different in the two opuses (Table 3). "*HISTORIA...*" and "...Fabrica..." do not share either the descriptive order or the conceptual idea instilling it. "...Fabrica..." clearly demonstrates a constructing sequence comprising supporting structures, union elements, organs, and entrails, according to their importance categorization. The order in "*HISTORIA...*" varies from book to book. It is imperative to emphasize again that "*HISTORIA...*" is an opus that served as both an anatomy book and a popularizing science book, with a significant degree of overlap; in it, there are chapters intended for general notions, such as Book I, Chapter I; Book II, Chapters

I–II and IV; Book VI, Chapters I–II; Book VII, Chapter I. J. Valverde constructed the general notions produced in “*HISTORIA...*” by abstracting from observation as detailed as possible of anatomical structures, with a rigorous realist criterion. Such a criterion is like that of Vesalius, but distinct from that of Galen and their followers, for whom the form, function, and teleological reasons of the form regarding function are inseparable [40].

**Table 3.** Book content in Valverde’s *HISTORIA de la composición del cuerpo humano* and Vesalius’ *De humani corporis fabrica libri septem*.

| Book    | Valverde’s “ <i>HISTORIA...</i> ”   | Vesalius’ “... <i>Fabrica...</i> ”      |
|---------|---|---|
| First   | <i>Huesos y ternillas</i><br>(bones and cartilages)   | Bones and joints                        |
| Second  | <i>Ligamentos y músculos</i><br>(ligaments and muscles)   | Ligaments, muscles,<br>and integumentum |
| Third   | <i>Miembros de la digestión y la generación</i><br>(digestive and reproductive organs)                | Veins, arteries, and glands             |
| Fourth  | <i>Miembros de la vida</i><br>(life members (lungs and heart))  | Nerves and spinal cord                  |
| Fifth   | <i>Miembros necesarios al movimiento y sentido</i> (members needed to sense and movement; encephalon) | Organs of nutrition and generation      |
| Sixth   | <i>Venas y arterias</i><br>(veins and arteries)   | Heart and associated organs             |
| Seventh | <i>Nervios</i><br>(cranial and spinal nerves)   | Encephalon                              |

Books I and II are concerned with body structure, and their descriptive order is morphological. In Books III–V, however, following the Platonic doctrine, the organic cavities are categorized according to their functional order, specifically the rational/cranial, vital/thoracic, and vegetative/abdominal, which would be the respective locations of the three souls: immortal (*tò logistikón*), irascible (*tò thymoeidēs*), and concupiscible (*to epithymētikón*) [41]. In Books VI–VII, ducts, which include veins, arteries, and nerves, are elucidated. Here, J. Valverde disagreed with Galenic theory. Galen’s theory correlates veins, arteries, and nerves with the three spirits (pneuma natural, pneuma vital, and pneuma animal) and the spirit generator organs (liver, heart, and encephalon). Galen’s theory proposes that pneuma flows mixed with blood through the pulmonary artery and veins. J. Valverde adhered to Colombo’s concepts, positing that only blood flows through arteries and veins [42]. Precisely, J. Valverde described the pulmonary circulation of blood (while acknowledging R. Colombo as the author of the discovery). J. Valverde considered that the function of the lungs is to receive air and obtain it for the fabrication of life spirits. Furthermore, the lungs refresh the heart of excessive heat by blasting fresh air. In 1553, three years before the publication of “*HISTORIA...*”, the Aragonese Michael Servetus (Villanueva de Sigena, Crown of Aragon, presently Spain; 1511–1553), in his theological treatise *Christianismi restitutio*, had described, for the first time, the pulmonary or minor circulation in the Christian West [43,44].

J. Valverde was not interested in the philosophical discussion of nature, even though Galen’s theory was a part of his physiological thinking. He was interested in revealing the body structures that serve as a substrate for the function and its diffusion throughout the body. This view distinguished J. Valverde from other anatomists and medicine theorists—for instance, Thomas Willis (1621–1675), the great experimentalist physician [45]—who often entangled in theoretical disputes about the nature of the spirits, their origin, and the action mechanism of *animae* (movements).

**Illustrations.** “*HISTORIA...*” was the first anatomy book to use illustrations created with a burin-over-copper technique, which allowed for increased precision and elegance in tracing [46]. The opus contains 42 anatomical plates consisting of 214 numbered images that have caught the attention of historians for their beauty and execution. While some

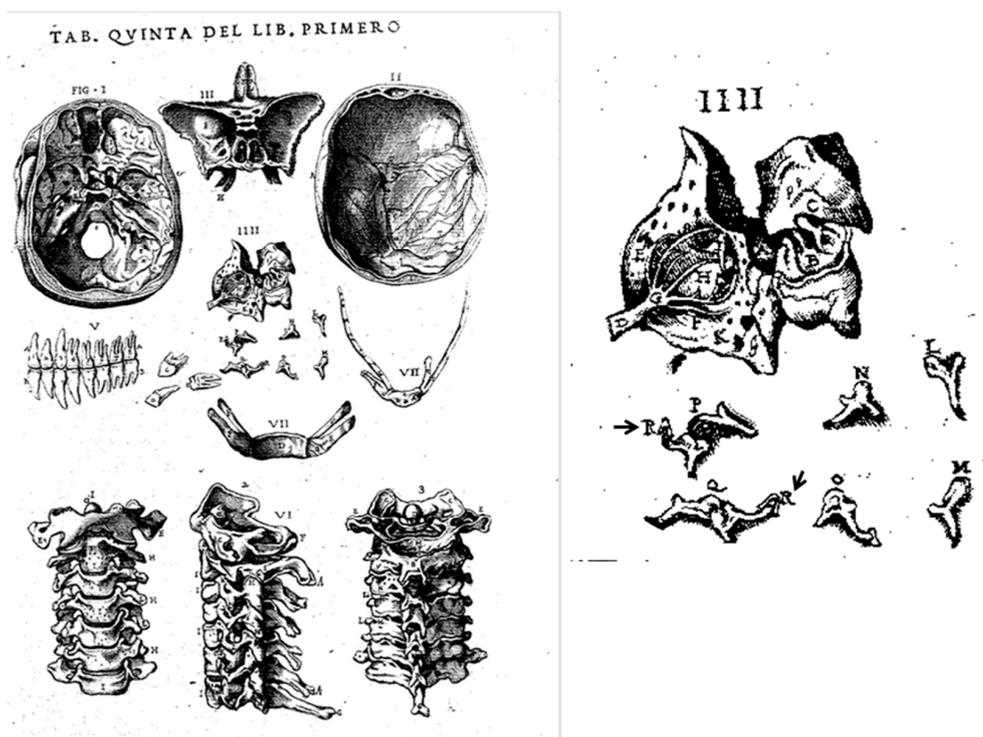
argue that these illustrations tarnish Valverde's reputation for originality, he publicly acknowledged that he derived complete inspiration from "...Fabrica..." for their conception. Nonetheless, the opus includes 15 new illustrations, 42 corrections, and 9 clarifications to "...Fabrica..." [47]. The artists in charge of drawing and engraving the illustrations in "HISTORIA..." are not credited in the opus.

#### Novel anatomical contributions.

**Osteology and Myology.** J. Valverde initially described the vomer bone in a written text in "HISTORIA...". The discovery probably came out from dissections performed by Colombo's school members, of which J. Valverde was part. J. Valverde states in Book I of "HISTORIA...", "The vomer is between the cuneal bone and the palate bones. This bone looks like a plow, Vesalius does not mention it because it lacked, to him, momentum". In the Castilian Spanish language, the term "Arado", or "Reja del Arado", refers to the plow. In the Latin language, vomer means plow. R. Colombo wrote about this bone in his book *De re anatomica libri XV* (1559) [48].

J. Valverde presented a detailed analysis of the teeth and their supporting structures, vascularization, and innervation in "HISTORIA...". He also described techniques for reducing mandibular dislocation [49].

The print of the stapes ossicle appeared in "HISTORIA..." for the first time. J. Valverde wrote of it, "...which nobody before me has even mentioned" (Book I, Table V, Figure III) (Figure 4). It appears that Giovanni Filippo Ingrassia (1510–1580) was the first to name stapes this ossicle as early as 1546, but this remained unknown until the publication of *In Galeni librum of doctissima ossibus et expertissima commentaria* in 1603. B. Eustachi (c. 1500–1574) also named stapes the ossicle in his magnificent book titled *Tabulae anatomicae* (completed in 1552 yet published in 1714). However, in any case, the first published book in which the term stapes appears for naming the ossicle is the book *Cl. Galeni Pergameni liber de ossibus ad tyrones [...]* *Medicae doctore* (1555) by L. Collado (Table 1).



**Figure 4.** On the left side of this figure is the copy of Table V from Book I of *HISTORIA de la composición del cuerpo humano* by Juan Valverde de Amusco (available at: [https://books.google.es/books/ucm?vid=UCM5320265722&printsec=frontcover&redir\\_esc=y#v=onepage&q&f=false](https://books.google.es/books/ucm?vid=UCM5320265722&printsec=frontcover&redir_esc=y#v=onepage&q&f=false); please, ignore the pop-up and scroll down the website;

the last time consulted was 4 December 2023). It displays various bones, including the auditory ossicles. On the right side is a magnification of Figure IIII from Table V of the same book. Letters L–M indicate the first ossicle (the malleus), while N–O represents the second ossicle (the incus). The letter R indicates the third ossicle (the stapes, pointed at by an arrow). Importantly, this is the first instance that the stapes appears illustrated in an anatomy book.

Regarding muscles, there are thirty-two corrections to Vesalius in “*HISTORIA...*”. They concern oculomotor muscles, facial muscles, throat muscles, and muscles of the palm and plant [50]. In Book II, Chapter VII, Valverde wrote, “The eye muscles are four in number, with a fine consistency, and arranged in four directions. This allows the eye to move in four directions.” J. Valverde categorically affirmed the nonexistence of what Vesalius calls the “coanoid muscle” or *retractor bulbi*. Galen also mentioned this muscle. Valverde argued that Vesalius found this muscle in dissections of animals, but not human bodies [51].

*Neurology and Angiology.* In Table I of Book V, the brain is depicted together with the dura mater. The name *dura mater* originates from the Greco-Latin Antiquity and Islamic Golden Age literatures, but it was first used in Christendom in “*HISTORIA...*”. In addition, J. Valverde elucidated, for the first time, the commencement of the intracranial course of cerebral arteries. He, however, maintained that there is minimal distinction between arterial vessels and veins. G. Falloppio later corrected this error in his *Observationes anatomicae* (1561) [52].

**First post-Vesalian anatomical publication in a Romance language.** Terminology only has value when used [53]. Besides his anatomical contributions, J. Valverde played a noteworthy role in developing and disseminating anatomical terminologies written in Castilian Spanish, a vernacular Romance language. Hence, he pioneered this practice, which remains associated with the official *Terminologia anatomica* until today [54].

Vesalius’ “*...Fabrica...*” was intended for physicians and Latin surgeons and was written in a dark style of the Latin language that is difficult to comprehend even by scholars. J. Valverde penned his “*HISTORIA...*” in the Castilian Spanish language of the era. It was for physicians, Latin surgeons, barber surgeons, midwives, and algebraists (bonesetters) in Spain and its territories, as well as for paramedic practitioners without university education, who had difficulty understanding most anatomy texts written in Latin, but who were “those who most need to understand”, as J. Valverde wrote in “*HISTORIA...*”. Authors suggest that this must have been under the direction of Cardinal J. Álvarez de Toledo, as the Cardinal thought the book would be highly convenient for the Spanish nation [11]. Perhaps this is the rationale, or an additional one, behind the dedication of the princeps edition to the Cardinal (but also consider the reasons above, in the “Dedicatory” subheading).

It is worth noting that R. Valverde was not the only anatomist to write in Castilian Spanish in the 16th century. Luis Lobera de Ávila (c. 1480–c. 1551), a physician in Emperor Charles V’s House, had already started that venture a little earlier. L. Lobera studied anatomy in France and authored several books in Castilian Spanish covering topics such as medicine, hygiene, and diet and nutrition. One of his works, written in 1542, was the book *Libro de anatomía, es primera parte de “Remedio de cuerpos humanos y silva de experiencias y otras cosas utilísimas”* (“Anatomy book, it is the first part of ‘Remedy of human bodies and forest of experiences and other very useful things’”). Another anatomist, Bernardino Montaña de Monserrate (c. 1480–c. 1558), who also served Emperor Charles V, wrote the *Libro de la anathomia del hombre* (“Book of the human anatomy”) in 1551 and taught anatomy at the University of Valladolid (Crown of Castile, presently Spain) [55]. However, J. Valverde named more parts of the human anatomy in Castilian Spanish than the other authors and even changed some of the names they used. Many of Valverde’s terms have been used in classical literary works, such as *Don Quixote* by Miguel de Cervantes (published in 1605 and the second part in 1615) [56].

J. Valverde was concerned with form, function, and position to coin the Castilian Spanish term for an anatomical part [40]. In the book “*HISTORIA...*”, Valverde elucidated anatomical terminologies using words derived from vulgar discourse, including many

derived from the customary slaughter of pigs [52]. J. Valverde also enriched the anatomical vocabulary with synonyms. When J. Valverde found the common language insufficient or inadequate, he used numbers, such as when he talked about the cartilages of the larynx and wrist bones. Despite losing some rigor, Valverde's terminology gained much for paramedic practitioners and the public to understand [40]. It is enticing to consider why J. Valverde assembled the images of the book from burin-over-copper-engraved plates of such high quality for the non-scholarly and less affluent public. This would surely have a high economic cost. It appears that the success of the book was worth the cost and that the magnificent figures ultimately gave J. Valverde most of his scientific legacy.

### 3.2.2. Diffusion of the Work

Later editions gave "*HISTORIA...*" and its figures even broader access than that of the works of Vesalius and R. Colombo to readers in Catholic and Reform countries [37].

**Nine complete editions in Italian (1559 up to 1682).** "*HISTORIA...*", or its figures, accumulated 18 editions in several languages following the princeps edition (Table 2). The initial nine were in Italian, translated by Antonio Tabo de Albenga, complete, and particularly well known. The title was *Anatomia del Corpo Umano* and the dedication to King Philip II of Spain. The first one of the nine, although printed in Venice, appeared in Rome in 1559 from the same publishers as the princeps edition. The 1586 edition was the most famous of these nine Italian editions. Then, J. Valverde was about 61 years of age, and his demise was imminent. The frontpage of the 1586 edition has an engraved portrait of Valverde (Figure 1) achieved between 1561 and 1565 [21]. It is one of the few portraits of the anatomist that have survived to present day. This 1586 edition has 46 plates with 253 figures, of which 4 are new and interpolated according to the 42 plates of previous editions. All these new plates depict "muscle men" [57].

**Two complete editions in Latin (1589 and 1607).** In 1589, Michael Colombo released a whole Latin version of "*HISTORIA...*", reprinted in 1607 (Table 2). M. Colombo was a son of R. Colombo and physician, philosopher, and translator of some works of Girolamo Mercuriale. The dedicatory is to the Duke of Savoy in this 1589 edition. Such an honoring appears to be very unlikely to have occurred in Valverde's life, which strongly suggests that Valverde died before 1589 [21,26].

**Seven editions of "*HISTORIA...*" figures as a part of other books (1566 up to 1646).** *Vivæ imagines partium corporis humani æreis formis expressæ* ("Realistic figures of the human body parts from brass molds outputs") is a medley book in Latin published by Christophe Plantin (c. 1520–c. 1589) in Antwerp three times from 1566 up to 1579. The authorship of the book is currently credited to J. Valverde de Amusco, J. Grévin, and A. Vesalius, in that order, as can be seen in [https://catalog.nlm.nih.gov/discovery/fulldisplay/alma992329263406676/01NLM\\_INST:01NLM\\_INST](https://catalog.nlm.nih.gov/discovery/fulldisplay/alma992329263406676/01NLM_INST:01NLM_INST)), or to J. Valverde de Amusco (<https://wellcomecollection.org/works/zyhu6y23>) (the last time consulted was 4 December 2023). The figures are from "*HISTORIA...*" by J. Valverde. The main text is from Vesalius' book *Andrea Vesalii suorum de humani corporis fabrica librorum epitome* of 1564 ("...*Epitome*" henceforth). "...*Epitome*" is an abridged version of "...*Fabrica...*". Some short Latin-language texts and one Table are from Jacques Grévin's *Partium omnium corporis differentiae* (c. 1565). Figure legends were translated from the Castilian Spanish language into Latin by the French physician J. Thorius. Yet, the medley lacks commentary on the figure legends that precede every book in whole editions of "*HISTORIA...*". No text written by J. Valverde appears in the miscellany. With this, any of Valverde's recognition of Vesalius' merit as an anatomist, or the initial Vesalius influence of many of the images in "*HISTORIA...*" disappears. Valverde's authorship is not credited on the frontpage of the Plantin medley. There is also no author list in it. Valverde's authorship of the medley images is only recognized in the dedication that C. Plantin makes to the Senate of Antwerp. Moreover, the medley dedicatory details the steps C. Plantin undertook to obtain the permission of Andreas Wechelus (died 1581) for reproducing the text of the Paris edition of 1564 of the Vesalius' "...*Epitome*" [39]. There is no mention of a printing

permit issued by J. Valverde or his editors. To the best of the knowledge of the authors of the present article, it is unknown if this printing had the permission of J. Valverde or his editors. Perhaps it was not necessary because Plantin's medley appeared ten years after the publication of "*HISTORIA...*" princeps edition (see above, princeps frontpage and imprimatur subheading), or because the warning issued by Pope Paul IV was improper at the time of the armed conflict between Flemish Protestants and the Catholic King Philip II of Spain.

Plantin's medley featuring Valverde's "*HISTORIA...*" figures is among the first books printed with copperplate-engraved figures by Plantin Print House. It was a turning point for such a renowned print house [58]. Pieter Huys (c. 1519–c. 1584) engraved the copperplates with his brother Frans. The result was an anatomy synthesis with a practical goal: to satisfy the demand of physicians, Latin surgeons, and medical students. It is undeniable that the understanding of the anatomy of the human body possessed and possesses a large and competitive market. A brief dedicatory from C. Plantin to those who study medicine ("*Artis medicae studiosis*") underlines the utilitarian approach of the edition. There is also the announcement of a German dictionary, which was in preparation, the *Thesaurus Theotonicæ linguae*, published seven years later, in 1573 [59].

*Anatomie, oft levende beelden vande deelen des menschelicken lichaems: met de verclaringhe van dien, inde Neder-duytsche spraecke.* ("Anatomy, or living images of the parts of the human body: with the explanation thereof, in the Dutch language") is the same miscellany as above, but in Dutch, and published twice (1568 and 1583; Table 2). The favorable reception received by the publication of the medley *Vivæ imagines partium corporis humani æreis formis expressæ* prompted C. Plantin to translate the complete version of the book into the Dutch language. Current references to this book place J. Valverde de Amusco as the author (see [https://books.google.es/books?id=tiEttwAACAAJ&printsec=frontcover&hl=es&source=gbs\\_ge\\_summary\\_r&cad=0#v=onepage&q&f=false](https://books.google.es/books?id=tiEttwAACAAJ&printsec=frontcover&hl=es&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false); moreover, you can browse the book contents, including the illustrations, in this link (the last time consulted was 4 December 2023)).

*Bedieninghe der anatomien* ("Operation of anatomy") (1583 and 1646; Table 2). Other medleys of anatomy (collected from texts by Galen, Vesalius, Falloppio, and Arantius and accompanied by anatomical plates by Vesalius and Colombo) appeared in Antwerp. David van Mauden (c. 1538–c. 1597) was the author of the book, in Dutch, entitled *Bedieninghe der anatomien*, with explicit reference to J. Valverde as the author of Figures [60]. Plantin Print House published it in 1583 and again in 1646.

*Unpublished Greek language complete edition.* In the 18th century, Kousis translated the book "*HISTORIA...*" into Greek, though he did not make it to print [61].

#### 4. Reservations

Due to the wide use of the Castilian Spanish and Italian Romance languages and the beauty and anatomical detail of the images, Valverde's "*HISTORIA...*" had a broad impact. Nevertheless, the images of "*HISTORIA...*" have been regarded as a copying of Vesalius' "...*Fabrica...*". The following examines the authorship of these illustrations to discuss whether there is innovation or plagiarism in them.

##### 4.1. Illustrations

A highly influential factor in the success of Valverde's "*HISTORIA...*" was the splendid 214 numbered figures it contains; furthermore, these images are an essential support for the main text [46]. Vesalius' "...*Fabrica...*" has 379 Figures in its princeps edition (1543) and 4 more in the second edition (1555). The resemblance between the "*HISTORIA...*" figures and the "...*Fabrica...*" figures holds the attention of most historians who have discussed Valverde's book. Some authors have marked the "*HISTORIA...*" figures with the stigma of plagiarism.

Comparative studies of "...*Fabrica...*" and "*HISTORIA...*" have shown that many of the images in "*HISTORIA...*" that are similar to the matching ones in "...*Fabrica...*" contain

significant variations that not only improve the quality and clarity [50] but also illustrate more anatomy particulars for the first time [62]. Not least, there are, in “*HISTORIA...*”, 15 wholly original anatomy figures [57]. In other words, “*HISTORIA...*” holds 15 plates (out of 42) that are entirely or partially non-Vesalian [50] (Figure 5).

#### 4.2. Artistic Authorship

Indeed, making artistic illustrations of “*HISTORIA...*” exhibits technical superiority over those produced by Calcar for Vesalius’ “...*Fabrica...*” [46,63]. The artists who made the drawings and copper plate engravings for the images of “*HISTORIA...*” are not mentioned in full name in the book, as was usual then.

Several artists might be the makers of the “*HISTORIA...*” images. Namely, Gaspar Becerra [64–66], Pedro Rubiales [63], and Nicolas Béatrizet [52]. In Book II, Table III of the princeps edition, Valverde explicitly referred to P. Rubiales and Michelangelo, of whom he said, “*por haberse dado a la Anatomía juntamente con la pintura han venido a ser los mas excelentes y famosos pintores que grandes tiempos han visto*” (“for having given themselves to the anatomy along with painting they have become the most excellent and renowned painters who have seen great times”). However, this reference was a recognition of the artistic and humanistic qualities of P. Rubiales and Michelangelo but not of authorship in Valverde’s book. J. Valverde, G. Becerra, P. Rubiales, and Michelangelo were customary of the same circles in Rome at the time. G. Becerra, who had worked in the studio of Michelangelo, was the author of Valverde’s portrait at the Walters Art Museum of Baltimore, Maryland, U.S.A [21]. G. Becerra and P. Rubiales presumably collaborated in the preparatory drawings of the “*HISTORIA...*” figures. Probably, P. Rubiales drew the sketches for the entirely original figures or those bearing a more artistic classic theme: for example, those decorating the anatomical preparations with sculptural naked torsos [67].

The engraver on copperplates would have been N. Béatrizet and the craftsman in charge of opening the copper leaves Thomas Barlachi [61]. N. Béatrizet worked between 1540 and 1562 for A. Lafréry and A. Martínez de Salamanca; N. Béatrizet’s initials “NB” appear on several of the figure plates in “*HISTORIA...*” princeps and subsequent editions, and as well in Valverde’s portrait incorporated in the “*HISTORIA...*” edition of the year 1589.

One of the “*HISTORIA...*” princeps edition’s most striking original figures is that of an *écorché* with its skin hanging from its right hand while wielding a dagger with the left, suggesting the *écorché* has inflicted upon itself the skinning (Figure 6A). In addition, the face with the sagging skin has some resemblance to Valverde’s face (Figure 6B).

#### 4.3. Innovation or Plagiarism

The initial opus “*HISTORIA...*” came out of the presses in 1556. Vesalius accused “*HISTORIA...*” of plagiarism in a posthumously published book (1564), titled *Anatomicarum Gabrielis Fallopii observationum examen*—where Vesalius criticized *en passant* the scientific ambiance of Charles V’s court. Vesalius stated in the book that he did not understand how G. Falloppio could consider J. Valverde a great anatomist. Vesalius added regarding J. Valverde: “*Qui manus sectioni nunquam adhibuit, & medicinae, viti & primarum disciplinarum, est ignarus, & in Hispanam linguam interpretis tantum in nostra hac arte munus, turpis quaestus causa obit*” (“He, who never used his hands for cutting or for medicine, and not for the vines, is ignorant of the main disciplines. And he practices the job of translator into the Hispanic language in this our art only because of filthy lucre”). In the interim, R. Colombo and Vesalius had become bitter rivals by 1555. R. Colombo had censured Vesalius for the same thing that Vesalius did later concerning J. Valverde, that is, avoiding the dissection of human bodies by himself, thus depicting the anatomy of animals instead of humans in his books [28]. Meanwhile, Vesalius severely criticized the findings and merits of R. Colombo in the same way and for the same reason. In the book “*HISTORIA...*”, J. Valverde criticized Vesalius precisely for an equal cause.

All the above suggests that Vesalius' unforgiving criticism of J. Valverde was plausibly directed also towards R. Colombo and those who had dissented from some of Vesalius' findings and techniques. It is reasonable to think too that Vesalius' hostility was venomously aimed at J. Valverde because "*HISTORIA...*" was the first post-Vesalius book—one in which Vesalius' influence is candidly acknowledged besides—but also the first one that explicitly corrected Vesalius, and many times. To make matters worse, "*HISTORIA...*" was a successful book written in a widespread common language and promptly translated into Italian. All this probably irritated Vesalius because he thought it damaged his authority [46]. It looks like a vicious circle of jealousy caused by public reconnaissance of merit and, not least, conceivable prospects of bookselling.

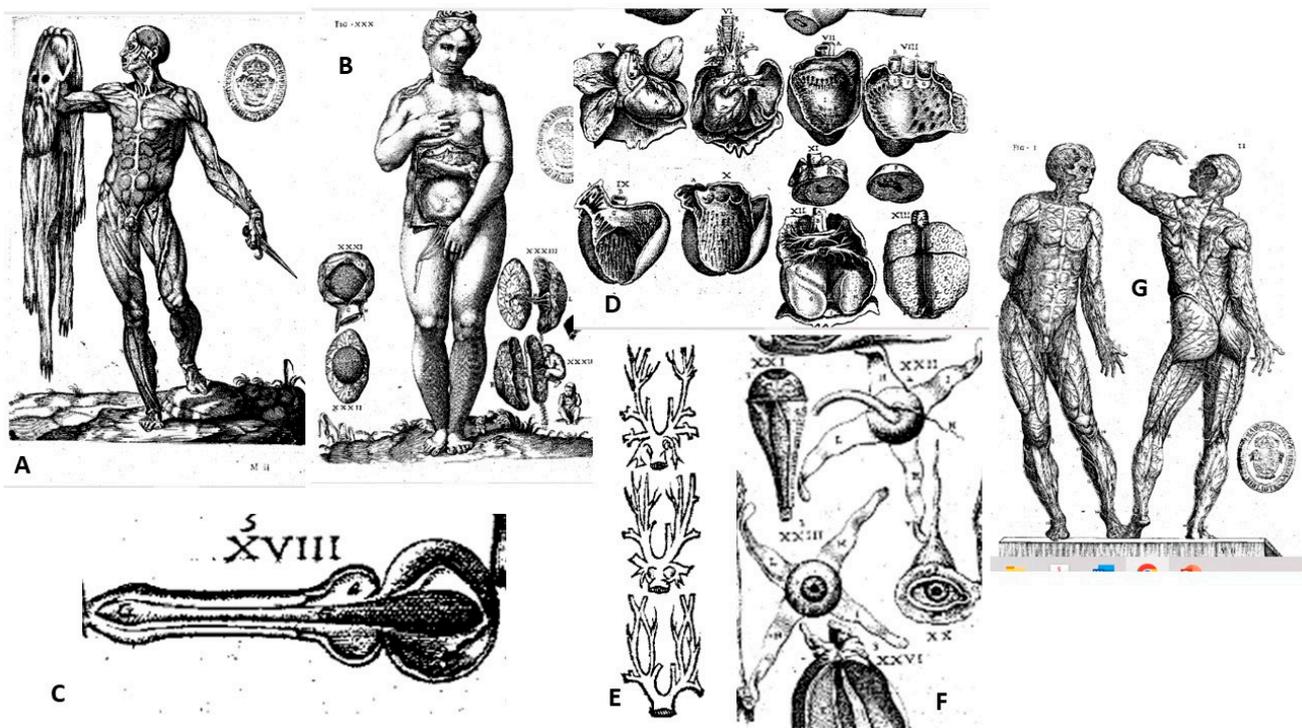
Subsequent high appreciation of Vesalius' works by traditional historiography makes that his critical reference to J. Valverde stays as "the" truth [68]. It might well be that the Black Legend helped do it. Some factors are to be thought of here, such as (A) Valverde's recognition of Vesalius' initial authorship of many images of "*HISTORIA...*" is suppressed in the miscellanies published by C. Plantin in Antwerp and (B) the rebellion against the rule of King Philip II of Spain in the Seven Provinces, and Spain as a global power in many other places, may have prevented J. Valverde from defending his author's morality and copyrights. They were times of war, with all the consequences.

Therefore, Vesalius' derogatory opinion is the one that most frequently has prevailed. It has even led to extreme positions, from absolute ignorance about Valverde's works [69,70] to apologetic defense, even nationalistic [13,71]. Still, consideration of "*HISTORIA...*" just as a mere translated copy of Vesalius' "...*Fabrica...*" [72] or respect for Valverde as a contributor and diffuser of the Vesalius revolution [73,74] always remained. Thus, Johann Gottfried von Berger (1659–1736) declared: "*Fama itaque meritissima Valverdu frueatur, livore etiam frustra obnubilante*" ("Valverde has great fame, despite envy that in vain beclouds") [75]. Albert von Haller (1708–1777) asserted: "*Minorem sanguinis circulationem non ignoravit*" ("He was not ignorant of minor circulation of blood") [76]. François-Joseph-Victor Broussais (1772–1838) acclaimed "*HISTORIA...*" "because it was the only anatomy book published in Spanish-Castilian during the Renaissance" [77]. An untrue fact, since F.-J.-V. Broussais surely was ignorant of Lobera's book *Libro de Anatomía, es primera parte de "Remedio de cuerpos humanos y silva de experiencias y otras cosas utilísimas"* of 1542 and Montaña de Montserrat's book *Libro de la anathomia del hombre* of 1551 (Table 1). Remarkably, figures from "...*Fabrica...*" and "*HISTORIA...*" were precedents of equal merit to Figures in *Teşrih-ül Ebdan ve Tercümânı Kibale-i Feylesûfan*, the first illustrated anatomy book written in the old Turkish Ottoman language [78]. This book was handwritten in the 17<sup>th</sup> century and reproduced many times in the 18<sup>th</sup> century, always during the long-lasting rivalry between the Ottomans and Christians. The authorship of Vesalius and J. Valverde is unacknowledged in the book.

For all the above, plagiarism cannot describe Valverde's work. Plagiarism applies to publishing data that belong to someone else—including applications for grants and a publication submitted in a different language—yet, notably, without precise reference to the genuine author. Other acts of plagiarism are paraphrasing without crediting the source, using "blanket" references, "second-generation" references, and duplicating or repetitive publication of one's own previously published work [79]. A significant historical example was the one by the renowned William Cowper (c. 1666–c. 1709) [80]. W. Cowper, a student in Leiden of Frederick Ruysch (1638–1731), who established the finest anatomical museum in the 17<sup>th</sup> century, purchased the copperplates of Govert Bidloo's anatomical book (1685), which were prepared by the Belgian painter Gerard de Lairesse (1641–1711) and engraved by Pieter van Gunst (1658 or 1659–1732). W. Cowper added his improved text but did not credit the plates to G. Bidloo. The amalgamation of Bidloo's plates and Cowper's text produced "the most elaborate and beautiful of all 17<sup>th</sup> century English treatises on anatomy and also one of the most extraordinary plagiarisms in the entire history of medicine" [81].

On the contrary, in the princeps and subsequent full editions of "*HISTORIA...*" (besides those medleys published by C. Plantin in Antwerp), J. Valverde recognized Vesal-

ius' initial authorship and why Valverde wished to take advantage of the images of "...Fabrica...". In addition, explicit acknowledgment of the debt of knowledge that the student (J. Valverde) has with the teacher (R. Colombo) appears in the book. R. Valverde assigns R. Colombo authorship in discovering pulmonary circulation and other anatomical and physiological facts. Again, in the dedicatory to King Philip II of Spain in the first Italian edition of "HISTORIA..." (1559), J. Valverde states that, "*seruitomi in essa per la maggior parte delle figure del Vessalio, per parermi più degne d'imitatione, che di biasimo: Successe dapoi, che molti non intendendo la lingua Spagnuola, & vedendo le mie figure non-molto diuerse da quelle, cominciarono à dire ch'io hauea tradotta l'istoria del Vessalio*" ("making the best use of Vesalius' figures because I find them worthy of imitation more than of censorship, it happened since that moment that many of those who did not understand Spanish, seeing my figures not very different from his, started saying that I had translated my history from Vesalius").



**Figure 5.** Anatomical illustrations in Valverde's "*HISTORIA de la composición del cuerpo humano*" about which there is consensus on originality. According to Alberti-López [50]; Meyert and Wirt [57]; Huard and Imbault-Huart [62] and Skaarup [82]. (A) An écorché with its skin hanging from the right hand and wielding a dagger with the left as if the écorché has inflicted upon itself the skinning (Book II, Plate I, Fig I). (B) A Venus with an open abdomen and a detached fetus in the lower right-hand corner of the same plate (Book III, Plate VI, Figure XXX). (C) A longitudinal section of the urinary bladder, prostate, urethra, and penis (Book II, Plate XVI, Fig XVIII). (D) Images depicting the opened heart (Book II, Plate XV, Figure XX to XXIII). (E) A marginal illustration, a diagram, on Book VI, page 87 (reverse side) of the princeps edition and page 123 (obverse side) of the first Italian edition. It depicts the origin of great vessels from the heart. (F) An eyeball with its fascial sheath, optic nerve and palpebral fissure, and the extraocular, recti eye muscles (Book II, Plate XV, Figure XX, and Figures XXI to XXIII, respectively). (G) Two-skinned standing men (front and back views) with visible subcutaneous veins (Book VI, Plate I, Figures I and II).



**Figure 6.** (A) This image is from *HISTORIA de la composición del cuerpo humano* by Juan Valverde de Amusco. This image has no relation to those in *De humani corporis fabrica libri septem* by Andreas Vesalius. This image shows an écorché with its skin hanging from its right hand while simultaneously wielding a dagger in his left hand, indicating that the écorché is self-skinned. The face in the engraving seems to resemble that of J. Valverde de Amusco. (B) There is a similarity between this écorché depicted in *HISTORIA de la composición del cuerpo humano* and the one hanging from Bartholomew's hand, as seen on the ceiling of the Sistine Chapel in the Judgment Section Final, frescoed by Michelangelo between 1536 and 1541. On the other hand, the body posture of the écorché depicted in *HISTORIA de la composición del cuerpo humano* is comparable to that of classical statues, such as (C) the Apollo Belvedere in the Vatican Museums, which was a source of inspiration for Michelangelo's David [83] and (D) the *Ephebus of Antikythera* in the National Archaeological Museum of Athens.

## 5. Conclusions

For everything said so far, the first conclusion is that it is unwise and unfair to say Valverde's "*HISTORIA...*" is plagiarism. That the book ended up being a selling success must be entirely attributed to the science and judgment of J. Valverde, who published with practical purposes in two widely spoken Romance languages a popularizer anatomical

work that was well founded, timely, and with appropriate references to authorship of others. The second conclusion of this article is that, because of his activities as a dissector and author, Juan Valverde de Amusco pioneered the implementation and transfer of post-Vesalian anatomical scientific knowledge.

## 6. Epilogue

During the 15th and 16th centuries, the study of anatomy made significant advances. The progress was due to observing and interpreting nature directly. From that point forward, the dissection of human bodies, whether macroscopic, microscopic, chemical, or using any other technique, was the primary study method in anatomy. During the Renaissance period, several authors made significant contributions to gross anatomy. These authors include Jacopo Berengario da Carpi, who wrote *Isagoge breves* in 1522, regarded as a turning point by Gabriele Falloppio. Nicolò Massa wrote *Anatomiae libri introductorius* in 1536, while Charles Estienne authored *De dissectione partium corporis humani libri tres* [84] in 1545. Andreas Vesalius contributed highly notably with his work *De humani corporis fabrica libri septem* in 1543. Historians consider Andreas Vesalius the epitome of Renaissance anatomy. At the same time, other notable Renaissance anatomists include Bartolomeo Eustachi (*Tabulae anatomicae*, completed in 1552 yet published in 1714), (Mateo) Realdo Colombo (*De re anatomica libri XV*, 1559), and Gabriele Falloppio (*Observationes anatomicae*, 1561) [68]. (Mateo) Realdo Colombo and Andreas Vesalius were known for their public rivalry. They criticized each other's findings and merits, like how Andreas Vesalius also criticized Juan Valverde de Amusco. *HISTORIA de la composición del cuerpo humano* (1556) incorporates knowledge of anatomy with pragmatism. In this book, Juan Valverde de Amusco used the most advanced techniques of his time, such as the dissection of human bodies; the best possible illustration techniques; and dissemination in prevalent languages. Juan Valverde de Amusco wanted to spread the knowledge of modern anatomy. Today, this multidisciplinary approach is called knowledge management, knowledge transfer, or knowledge translation [85,86].

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## List of Abbreviations (of Book Titles)

“Cl. Galeni Pergameni Liber de Ossibus ad tyrones [...] Medicae doctore”: Cl. Galeni Pergameni Liber de Ossibus ad tyrones; interprete Ferdinando Balamio Siculo; enarrationibus illustratus à Lodouico Collado Valentino publico artis Medicae doctore. “. . . Epitome”: Andrea Vesalii suorum de humani corporis fabrica librorum epitome. “. . . Fabrica. . .”: De humani corporis fabrica libri septem. “HISTORIA. . .”: HISTORIA de la composición del cuerpo humano.

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