ANDREAS VESALIUS AND ANATOMY;
A RE-EVALUATION OF HIS EFFORTS

One of the greatest figures in the history of anatomy is Andreas Vesalius. In 1543, his massive book, *De Humani Corporis Fabrica*, appeared; it altered the history of anatomy and science in many ways. The *Fabrica* is often presented by historians as the origin point of modern anatomy. Analysis of anatomical studies just prior to Vesalius suggests this might not be the case. From studies of these earlier pre-Vesalian works it will be demonstrated here that a high level of anatomical sophistication existed. It will be argued that Vesalius was not an individual who one day arrived on the scene and completely revolutionized anatomy: Rather, much as scientists have done historically, he built upon a steadily growing foundation of anatomy laid and developed by the anatomists before him. The end result of today's talk provides a novel scientific presentation of Vesalius' contributions in forming the *Fabrica*, as well as a different interpretation of historical currents that affected anatomy in the sixteenth century.

Most modern writings on historical anatomy assert that little anatomical study occurred in the fifteenth century. A closer examination shows this not be the case and that at institutions like the University of Padua anatomies were conducted from 1404 onward with a formal decree issued in 1429; in fact Padua attained fame as a great anatomical center. It should be noted the reputation of Padua became widespread long before Vesalius accepted the chair of anatomy at Padua in 1536. Montagnana (d. 1460), an early anatomist at Padua, who wrote his *Consilia* in 1444, mentioned witnessing fourteen anatomies. By 1945 a statue was passed requiring that one male and one female per year be delivered to the school of anatomy. By the 16th century it was an ordinary occurrence for bodies of executed criminals to be provided to schools like Padua from anatomies.

An important Italian figure of this period who contributed much to anatomical studies was Leonardo da Vinci (1452-1519). In the early 1900's the historical literature was filled with controversy over whether Vesalius saw or was influenced for Leonardo's work. The argument was first presented by E. Jackchath in 1902 and Holl in 1905 that Vesalius' book, the *Fabrica*, was nothing more than a plagiarism of Leonardo's folios. Opposing arguments were put forth by Garrison and McMurrich and others. They argued that Vesalius could not have seen this work because it was sequestered by a friend of Leonardo at his death and never published. This alleged sequestration of Leonardo's folios had led many scholars to question his influence on sixteenth century anatomy. Most would have us believe that with Leonardo's death his manuscript disappeared.

It appears certain Vesalius was influenced by Leonardo, a man whose contributions to anatomy have been underrated. While proof does not exist that Vesalius actually handled Leonardo's Folios, the influence of Leonardo on the artists, the
anatomists, and the community that produced the Fabrica must have been considerable.

In 1568 Giorgio Vasari published his Lives of the Most Eminent Painters. Vasari was a prominent artist and very familiar with the Italian artists of this period, very likely the artists who produced the Fabrica’s great engravings. To provide evidence that Leonardo’s work was well known to the artists and anatomists of this period and easily available for study, reference will be made to the works of Vasari and others.

Vasari wrote about Leonardo’s intention to publish a major collection of anatomical treatises in collaboration with Marcantonio Della Torre, another excellent anatomist of this period. This collaboration was to yield a 120-volume encyclopaedia on anatomy called Quaderni D’Anatomia. Vasari writes on this collaboration:

“...He (Leonardo) afterwards gave his attention, and with increased earnestness, to the anatomy of the human frame, a study wherein Messer Marcantonio Della Torre, an eminent philosopher and himself did mutually assist and encourage each other. Messer Marcantonio was at that time holding lectures in Pavia, and wrote on the same subject, he was one of the first, as I have heard say, who began to apply the doctrines of Galen to the lucidation of medical science, and to diffuse light over the science of anatomy, which up to that time, had been involved in the almost total darkness of ignorance. In this attempt, Marcantonio was wonderfully aided by the genius and labour of Leonardo, who filled a book with drawings in red crayon, outlined with the pen, all copies made with the utmost care from the bodies dissected by his own hand...”

It is obvious from this passage, that Leonardo’s work was available to the artist, and that it made a great impression upon the minds of his contemporaries. The gentleman to whom Vasari refers, Francesco da Melzi, made the papers of Leonardo available to all who wished to see them. This is verified in the writings of other artists:

— 1523: Melzi writes he made his inherited papers of Leonardo available to his "fellow painters".
— 1537: Anonimo Gaddiano in his De Subtilitate gives a description of Leonardo's folios and notes he saw them at the Melzi residence. Gaddiano comments on the relationship of Vesalius to Leonardo.
— 1540: Lomazzo — Idea Del Tiempo Della Pittura. A Milanese painter who mentions in this work a visit to Melzi to see Leonardo’s work.
— 1549: Biondo in his Eulogy of Painting mentions Leonardo work on anatomy.
— 1568: Benvento Cellini intends to publish some of Leonardo’s work.
— 1584: Borghini in his Riposo mentions Leonardo’s anatomy of the horse and man. On the basis of the comments presented above, it is clear that at least in the Sixteenth Century, Leonardo’s folios were easily available for inspection.

Leonardo, in his Treatise on Painting prophetically predicted the scenic styles of the Fabrica plates when he stated: "All the figures in a painting ought to be in an attitude suitable to the subject they represent; so that in viewing them one may easily know what they think and what they would say. To assist your imagination in this suitin the attitudes to the figures, consider attentively the gesture of mutes, who express the thoughts and conceptions of their mind by the motions of their eyes, hands, and the whole body..."

It would be intriguing to speculate whether Vesalius plagiarized from Leonardo’s work. This issue will be controversial until more definite evidence surfaces. But to say that Leonardo’s work did not contribute significantly to the Fabrica is an incomplete analysis of the historical evidence. The Fabrica is mainly an effort of artistic talent developed by one of the great schools (Titian) of Italy. It seems fair...
to say the artists were influenced by the available folios of Leonardo, by Leonardo's three-dimensional discussion and presentations, and by Leonardo's knowledge of anatomy, which was infinitely superior to medieval anatomy. The most obvious conclusion is that Leonardo had a major influence upon this period. This evident by the widespread distribution of his work among the art groups.

To continue this discussion of anatomical studies of this era the next important figure is Jacopo Berengario da Carpi (1470-1530). In 1521, shortly after Leonardo died, a thick octavo book appeared written by Berengario complete with anatomical illustrations and frontispiece with a dissection scene. This book, a commentary on Mondinus' anatomy, was written by one of the leading anatomists of the Renaissance and professor at Bologna. That he was active in anatomy is evident from his own writings where he notes that he dissected over one hundred bodies. Berengario's woodcuts, though not offering the elegance of Vesalius, contain surprisingly accurate representations when compared to the earlier works. This book carries on an Italian tradition of reducing the influence of Galen and other « authorities ». Berengario in his text on Mondinus decries the habit of anatomic writers who follow authorities like cattle and warns the reader not to be deceived by some of our moderns who involve anatomy with authorities and not with observation. He says also that he always accepts Galen's views except where observation is at discord with them. Berengario was not subservient to teachings of the ancients, but was capable of observation and interpretation — skills held by some historians to have developed first with Vesalius some twenty years later.

In 1545 there appeared from the presses of Simon de Colines the most costly book done by this shop, authored by Charles Estienne (1503-1564). It was to have been published originally in 1539, but legal actions delayed its publication until 1545. The book contains the first examples of wholly illustrated external venous and nervous systems. The book excells particularly in neurological illustration. Estienne selected a motto of Galen for his book: « An observor of nature shall not trust anatomical books but only his own vision. » Estienne was among those anatomists of this era who stressed the importance of pictures for communication; one could then deal with vision and image instead of relying solely on the written word. In his works the reader sees an open criticism of Galen, criticism which he in turn supported with his own observations. Again we see an original investigator who was not a servile follower of Galen.

The next important figure in this study is Nicholas Massa (d. 1569) who in 1536 published a quarto size volumes entitled Liber Introductorius Anatomiae. This book, which has no plates, shows the author to be a man of enormous ego and arrogance; and, like so many of this generation, a follower of Mondinus. Its importance lies in the fact that the author was a surgeon who insisted that students and teachers alike make many and varied dissections and avoid the subservience of the authorities. On the concept of adherence to the authorities Massa makes the following comment in Chapter 32 on the dissection of the tongue: « ... if sometimes writers would listen to Galen's advice and trust the anatomy books less and if with their own hands they would touch the bodies of men and write down what they see and feel... I shall not cease to desire that the disputants in these matters should trust themselves entirely to their senses and put aside sophisticated reasoning, as the ancient wise men were accustomed to do; they did not disdain to dissect the bodies of various living creatures in their search for the truth. » Later in this chapter he says again on this subject of adherence to the ancients « ... since what I have said does not conform to what is said on the subject by ancient writers and will thus be ambiguous to my readers, I beg them to lay aside arguments and discusses these difficulties with a knife that cuts by dissecting ». These quotes show us an individual, who some years before Vesalius, argued of original and independent investigation.
Bartolomeo Eustachius (1524-1574) was a truly eminent scholar; but a victim of circumstances, he never received the honor of distinction he deserved. A contemporary and critic of Vesalius, he did much in the way of original investigation. He had completed his *Anatomical Engravings* in 1552, but they were not to be published until 1714.

Eustachius was a severe critic of Vesalius, so much so he would not even refer to Vesalius by name. Eustachius warned students to read Vesalius critically since his text and illustrations were not always accurate. In one section of his published writings he attacks Vesalius for publishing a canine kidney, this is a text on human anatomy.

It is interesting to note the sober style of Eustachius figures. They lack the dynamics and appeal of Vesalius' figures yet are anatomically more accurate. It is as if the work is a skillful affront to Vesalius's whom Eustachius disliked. In his plates one notes an almost surrealistic approach, occasioned by the mathematical precision Eustachius used in his figures.

This, it is apparent that, contrary to the views of many historians, Vesalius did not singlehandedly revolutionize anatomy. Instead, there was a gradual yet complete transition from medieval anatomy into Renaissance anatomy. In a span of less than forty years, a transition occurred from scholars like Leonardo, Berengario, and Estienne, who provided the foundation for anatomists like Canano, Vesalius, and Eustachius. Rather than being the sole bright, innovative anatomist who alone sawed off his Galenic shackles, Vesalius was an anatomist who used the work of his predecessors.

Vesalius did have a superb mind, and he did present many convincing rebuttals of Galen. But in this same period there were other great minds also doing interesting and original scientific inquiry. Are we to give lesser credit to Colombo, Estienne, Berengario, Copernicus, Fernel, Fallopius, and others for original landmark investigations?

A final thought: We have seen how Vesalius' scientific work developed. Other than his major effort with the *Fabrica*, his work was mostly Galenic commentaries, and discourses on bloodletting and on the China Root. With the publication of the *Fabrica*, Vesalius becomes a King's physician and a scientific mute. Twelve years later (1555) the second edition of the *Fabrica* appeared, more beautiful than ever because of the improved skills of his printer. The scientific advances of this volume were minor, except for some new but minimal experimental data. On this point John Fulton has commented: «As a book, the *Fabrica* has probably been more admired and less read than any publication of equal significance in the history of science.» In the second edition, Fulton made an analysis and notes the changes are comparatively unimportant, The lack of scientific production here leads one to ask: What has happened to this creative mind over twelve years?

It might seem that Vesalius' important contribution was bringing together a great printer, a superb engraver, and a school of well-trained artisans under the direction of a skilled craftsman. His commentary on the engravings, while provocative, and certainly not intellectually bankrupt, proved too obscure to be useful to the average physician. If Vesalius' one achievement had been in the idea for the volume and then the recruitment of people to do it, then this would have been truly a great contribution. But Vesalius provided little recognition of his colleagues and apparently made effort not to reveal the identity of his contributing contemporaries.

I would like to know leave with a final thought:

The real value of a man's work can only be estimated with an approach to accuracy with it is seen against the background of the intellectual life of his time: When his contributions to the world's thought are confronted with ideas of his contemporaries, whether they run together in harmony or diverge into independent ways of development.