REVIEW

Eur. J. Anat. 18 (2): 63-67 (2014)

The origin of anatomy museums

Venkatesh G. Kamath[1], Biswabeena Ray*[,2], Shakuntala R. Pai[3] and Ramakrishna Avadhani[1]

[1]Department of Anatomy, Yenepoya Medical College, Mangalore, India, [2]Department of Anatomy, A.I.I.M.S, Bhopal, India and [3]Department of Anatomy, Srinivas Medical College, Mangalore, India

SUMMARY

The following article aims to review the contribution of anatomy museums to the development of anatomical science and to the understanding of human anatomy. We also describe the development of anatomical science since the thirteenth century, when artistic sketches and models were used by anatomists to demonstrate anatomical structures, due to religious and ethical issues preventing cadaveric dissection. These were prevalent at a time when there was a lot of inquisitiveness to know more about human anatomy. The origin of the concept of the anatomy museum and its evolution to contemporary anatomy museums are also discussed.

Key words: Mouseion – Wax models – Grave robbery – Anatomy laws – Notomies – Cabinet of curiosities – Tabulae pictae

INTRODUCTION

It is an inherent, distinctive and implicit human nature to preserve and care for objects that seem unique, rare and adorable. This instinctive desire of the human mind must have invented the concept of the museum. The origin of the word "museum" is found in the early seventeenth century, and derives from the Greek word "mouseion" which means "seat of the Muses"—the Muses are the divine patron of the arts divinities in Greek mythology (Findlen, 1989). A museum by definition is "An institution that houses and cares for a collection of artefacts and other objects of scientific, artistic or historical importance and makes them available for public viewing through exhibits that may be permanent or temporary" (Alexander and Alexander, 2008). Anatomy museums belong to the category of "science museums".

THE ORIGIN OF ANATOMY MUSEUMS

It is essential to know the history of anatomy, a science with a prestigious history, a foundation stone upon which the medical knowledge has evolved over the past one thousand years. It is quite obvious that, without a meticulous dissection of human bodies, no further scientific understanding of pathology, disease and methods of cure is possible. An anatomy museum essentially serves a very useful purpose of educating the students in the medical profession, as well as the general public. Methods have also improved dramatically over the years from the simple dissections, drawings & wax models of the eighteenth and nineteenth centuries to the complex techniques developed in the twentieth century.

The period from 1300 to 1500, called the Late Middle Ages, witnessed significant developments of anatomical science in Italy. Rengachary et al. (2009) have expounded the contributions of two eminent anatomists, Mondino de Liuzzi (1270-1326) and Guido da Vigevano (1280-1349), during this period. A manual of anatomic dissection was written, printed and published for the first time in history by Mondino de Liuzzi in 1316 (Wickersheimer, 1926).

During the period between 1500 and 1800, anatomical knowledge based on human dissection circulated mainly among Europe's educated elite, in the form of books, copper plate engravings, demonstrations and lectures in universities, museums and libraries.

*** Corresponding author:** Biswabeena Ray. Department of Anatomy, A.I.I.M.S, Bhopal, India. Tel: +918989097498. E-mail: biswabina.ray@gmail.com

Submitted: 27 September, 2013. *Accepted:* 12 November, 2013.

The article "The neuroanatomical plates of Guido da Vigevano" by Di leva et al. (2007), illustrates the contribution of the Italian physician and engineer to neuroanatomy in the 14th century. In his textbook *Anathomia*, six plates are displayed showing for the first time neuroanatomical structures and techniques which include trephination, depiction of meninges, cerebrum, spinal cord and also the ventricles.

Leonardo da Vinci (1452-1519) and Michelangelo (1475-1564) were the most eminent artists during the Renaissance period. The article "Michelangelo: art, anatomy and the kidney." by Eknoyan et al. (2000), depicts the artist's lifelong interest in anatomy. Michelangelo participated in public dissections in his early teens and by the age of eighteen performed his own dissections. The artist had special interest in renal anatomy and had made a painting of the separation of land and water which is in the shape of a bisected right kidney. His use of the renal outline in this scene representing the separation of solids (land) from liquid (water) suggests that Michelangelo was familiar with the anatomy and function of the kidney.

The article "Capital punishment and anatomy: history and ethics of an ongoing association" by Hildebrandt (2008), illustrates how the bodies of executed criminals were the only source of bodies for dissection between the thirteenth to early seventeenth century. In late seventeenth century bodies of unclaimed persons were made legally available in some countries. In nineteenth century the British system renounced the practice of use of bodies of executed people. The article thus provides an insight into the ethical and legal issues' regarding the procurement of dead bodies from the thirteenth to the nineteenth century.

However, by 1913 "Anatomy Laws" were passed in America and also in Britain allowing unclaimed bodies to be consigned to medical schools for dissection. These laws put an end to the illegal traffic in dead bodies (Thomas, 2003).

Ochani et al. (2004) have stated that the practice of grave robbery which was rampant in the eighteenth century is still prevalent in several developing countries. The article "Modern grave robbers" ascertains that the practice is still being followed for procuring skeletons for study by medical students in these countries where there is scarcity of skeletons due to religious interference. Moreover, those few skeletons that are available for purchase are very expensive and unaffordable.

CONCEPT OF ANATOMY MUSEUM

The origin of the concept of anatomy museums can be traced back to the year 1699 to 1763 when the guild of Barber Surgeons of Edinburg determined to create a collection of anatomical specimens, pictures and books. It was called the "cabinet of curiosities" (Kemp and Barner, 2009).

However, the museums mainly consisted of wax, clay, ivory and wooden carved models called "Anatomical manikins" and ethnological curiosities ostensibly set up as learning exhibits for physicians and a curious general public, as working on cadavers was considered illegal and unethical.

Maraldi et al. (2000) have described the Museum of Human Anatomy of the University of Bologna as one of the most ancient museums. The birth of the medical college was around 1288, the period in which Taddeo Alerotti gave the first public anatomy lectures. In 1316, the anatomical treatise "*Anathomia Mundini*" of Mondino de Liuzzi was published which reintroduced the use of anatomical dissection abandoned since the 3rd century B.C. The first anatomical specimens of the Bologna museum were located at the Institute of Sciences in 1711. The early collections include the models of clay, wood and wax made by the famous painter Ercole Lelli (1702-1776) representing statues of skinned bodies showing surface muscles called "Notomies". The collection was further enriched between 1789 and 1815 by acquisition of wax models made by the renowned modeller Clemente Susini.

Sixteenth- to eighteenth-century museums again predominantly contained paintings and models, due to several unresolved ethical and legal issues concerning dissection of dead bodies. Riva et al. (2010) have described the evolution of anatomical illustration and wax modelling in Italy from the sixteenth to the early nineteenth century. By 1600, Fabricius is stated to have amassed over 300 paintings which made the "*Tabulae Pictae*" a famous atlas of anatomy. The article also describes the museum of anatomical waxes at the University of Cagliari, Sardinia, Italy. The museum houses some of the best models prepared by the 18th century modeler Clemente Susini who prepared over 2000 models during his career based on the dissections made by the anatomist Francesco Antonio Boi.

The article "Role of anatomy in our contemporary age and the history of the Anatomy Museum of Naples" by Esposito and Chiapparo (2006) portrays the anatomy museum in Naples as an academic place which was established by the famous surgeon and anatomist Marco Aurelio Severino in the seventeenth century. A dissection cabinet was first established in the seventeenth century containing the first prepared specimens. The article thereby provides an insight into one of the very ancient museums.

The La Specola Collection in Florence was the first great collection of anatomical wax models as noted by Lotti et al. (2006). It was formed in the

year 1775 and included a life-size female figure called the “Medical Venus” that revealed the body structures. It also included several models showing biological systems, muscle mass and cross-sectional models.

The famous anatomical models of La Specola, Florence, have been embellished in several articles and journals related to history as some of the most interesting wax models ever made. These models have been distinguished for their true-to-life appearance, and each piece is a perfect blend of art and science. Hillowala and Renahan (1985) have stated that the source of these models is the work of the Dutch anatomist, Bernard Siegfried Albinus (1697-1770) and Jan Wanderlaer (1690-1759), his artist and engraver. The copies of some of these models were purchased in 1850 by the Medical Department of University of Louisiana in New Orleans.

The most famous anatomical collection in the eighteenth century was that of John Hunter from 1783 to 1793 at his house-cum-anatomy school in London’s Leicester Square, as reported by Chaplin (2005), which was later purchased by the government in 1799. The museum has a very important role to play in uncovering the historical context of anatomical study at a time when anatomy laws were not passed, dissection was unethical and grave robbery was rampant.

One of the most forgotten days in the history of anatomy model-making are the papier-mâché models made by the French graduate physician, Louis Thomas Jerome Auzoux (1797-1880). He made papier-mâché models of men, animals, flowers and accurate models of body structures which were sold world-wide and used for educational purposes for about a century and a half (Papier Mache man exhibition, 2001).

Ballestriero (2010) recounts the first coloured wax models prepared in the late seventeenth century by the wax modeller Gaetano Giulio Zumbo and the French surgeon Guillaume Desnoues. The quality of models prepared from wax surpassed those prepared from wood, marble or clay. In the eighteenth century this art spread to Europe, first to Bologna with Ercole Lelli, Giovanni Manzolini and Anna Morandi and then to Florence with Felice Fontana and Clemente Susini. The anatomical ceroplastics were brought to London from Florence by the sculptor Joseph Towne.

The Museum of the Royal College of Surgeons of Edinburgh houses one of the largest and most historic collections of pathological anatomy in the United Kingdom. It is Scotland’s oldest museum, developed as a teaching museum for students of medicine and has been open to general public since 1832 (Tansey and Mekie, 1982).

The Anatomy Museum of the University of Turin, Italy, has been acknowledged by Abbott (2008) for its collection of neuroanatomy specimens. The museum was established in 1739 and first opened to the public in 1830. In 1880 Carlo Giacomini, a renowned neuroanatomist developed a dry method of preserving brain specimens. The museum houses over 950 of such specimens, as well as models of brain created throughout the nineteenth century which show how the knowledge of brain anatomy evolved extensively during this period. The other collections include an exquisite series of wax human embryos showing the development of the nervous system. A collection of skulls and death masks of the great and good and of the criminals is a unique feature of the museum.

Heylings (1990) has described the Anatomy Museum of Queen’s University of Belfast established in 1835. The museum has separate rooms for osteology specimens and wet specimens, and also houses a separate radiology section and a section that contains portraits of all the past Professors of anatomy. The museum also houses a vast collection of paintings of late nineteenth century.

An article written by Kemp and Galenakis (2011) illustrates the collection of ancient Greek skulls in the Oxford University Museum. The collection was made by the first anatomy and physiology Professor of the University, Professor George Rolleston (1829-81). Several hundreds of such skulls have been collected and carefully preserved.

Hopwood (2007) explains the situation in the mid-nineteenth century in his article, “Artist versus Anatomist, Models against Dissection: Paul Zeiller of Munich and the Revolution of 1848”. Paul Zeiller (1820-1893) was a modeller who confronted the Professor of anatomy of those times, claiming that the models created by him could save the proletarian corpses from dissection. He and his wife Franziska Zeiller continued through the 1860’s and 1870’s to campaign against “knife anatomy”. The article thereby emphasizes that dissection, though widely recognized by the law in several countries, was still a topic of debate and remained controversial as a final punishment for poverty and the relative merits of natural and artificial preparations continued to be discussed.

Bates (2008) reports the introduction of the Obscene Publications Act of 1857 in his article “Indecent and demoralizing representations: Public anatomy museums in mid-Victorian England. The act provided the magistrate the power to destroy all the obscene books, prints and other materials including obscene models which were considered “dangerous to public morality”. In 1860, Louis Lloyd’s Anatomical Museum in Leeds became the first museum to be prosecuted under the act. Several obscene models that belonged to the famous Kahn’s Museum were also seized and destroyed and the museum proprietors were charged with

"exhibiting certain indecent and demoralizing representations for the purpose of gain". Woodlands Museum at Manchester was also prosecuted under the act in 1874.

The article "A brief history of brain archiving" by Gere (2003) recounts the advances in preparation of brain specimens and their study from mid-eighteenth century to the late twentieth century. It describes the history from the early techniques of preservation in spirits of alcohol to the latest refinements in cryogenic technology.

Scarani et al. (2001) observed a strict relationship between scientific pathology reports of the nineteenth century and a large number of specimens from the Pathology Museum of Bologna. Such an experience suggested rectifying whether a similar relationship exists between the nineteenth century collections of the Anatomy Museum at Bologna and the contemporaneous anatomic scientific literature. This has been published in their article "Contemporaneous anatomic collections and scientific papers from the nineteenth century school of anatomy of Bologna: preliminary report".

Montenegro et al. (2006) have described the Pedro Ara Anatomy Museum founded in 1920 at the National University of Cordoba, Argentina which houses 1211 anatomical specimens. The museum exhibits anatomical works from the embryonic stage to old age. The most valuable work is named the "Old man's head" made by Professor Pedro Ara in 1928-1929, owing to its high quality despite being exhibited for over eighty years.

The article "The modern anatomy museum as a teaching aid" by Basmajian (1961) expounds the role of anatomy museums in educating the medical students and the public. The article is based on a survey conducted in Kingston, Canada which suggested that anatomy museum did play a major role in scientific education, therefore, the survey created awareness among the medical universities to establish good anatomy museums.

Marreez et al. (2010) have also emphasized the role of anatomy museums in contemporary medical education. The article describes two modern day museums, which include the Anatomy Museum of Leiden Medical University in Netherlands and the Museum of Kawasaki Medical School, in Japan. The museums have applied the advances in information technologies and audio-visual aids for educational purpose. The museum also displays related pathology specimens with electronic screens that display educational information regarding each specimen.

In summary, the anatomy museums have undergone a series of transitions, from an institute that housed a collection of models in the eighteenth century to those that collected a variety of dissected specimens in the nineteenth century, to museums of the twentieth and twenty first centuries, which use computer software and audio-visual aids and also have a large variety of sections for its visitors. In addition to the traditional anatomical sketches, models, osteology specimens, dry specimens and formalin-fixed dissected specimens, the modern anatomy museums display specimens prepared by novel techniques like plastination and corrosion. The newer museums also use computerised audio-visual aids and robotic models to educate the medical students and the public. Thus for centuries anatomy museums have contributed a major role in educating both the public and the medical students regarding the intricacies of human body. The earlier anatomists of the thirteenth to late eighteenth century have played a major role in understanding anatomy, and their contribution to this subject needs to be honoured as these eminent scientists dealt with more ethical and religious difficulties which are not faced by the present day anatomists. This article is a tribute to the earnest efforts of the earlier anatomists, artists, modellers and museum technicians, and we as anatomists express our sincere gratitude.

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