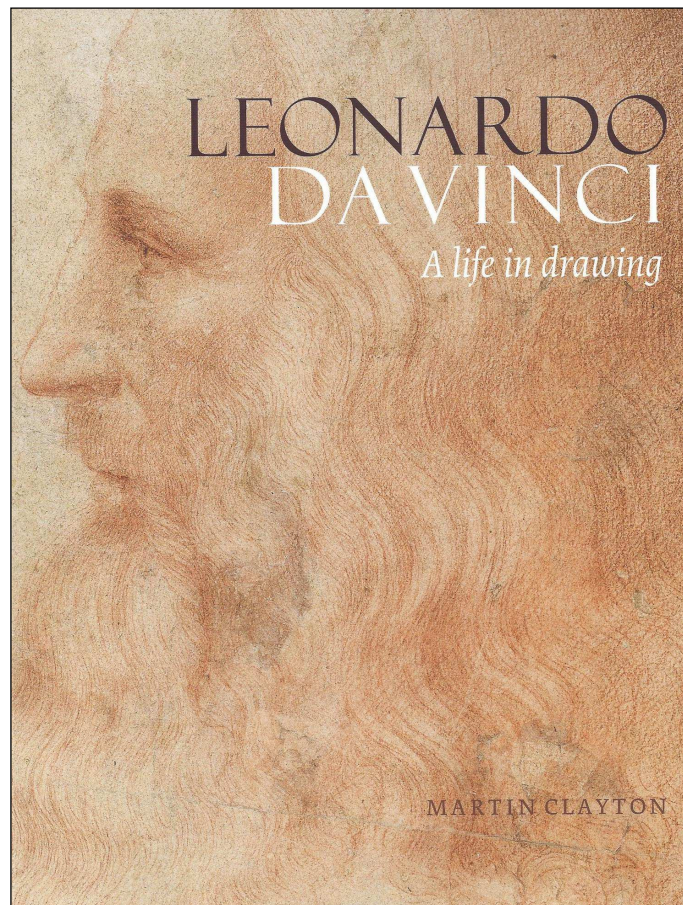


# ***LEONARDO'S TRANSDISCIPLINARY MODERNITY***



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## LEONARDO'S TRANSDISCIPLINARY MODERNITY<sup>1</sup>

*'Occasionally heaven sends us someone  
who is not only human but divine,  
so that through his mind and the excellence  
of his intellect we may reach to heaven'  
VASARI, Lives of the Artists. 1550<sup>2</sup>*

**B**y the end of the year when we paid homage, in celebration of the quincentenary of Leonardo da Vinci's death, as we look into so much that has been written or told on the utmost geniality of the first humanistic personality of the Renaissance, one cannot help realising how much more is still left to discover.

The Renaissance years flourished in Europe, from the 15<sup>th</sup> to the 16<sup>th</sup> centuries, bringing back to life the ancient Greek splendid interest for human knowledge and culture. Leonardo da Vinci, the central humanistic figure of this historical period, is certainly the best example of how human culture and knowledge evolves in the minds of those who study human Anatomy through dissection. We will never know if he dissected to further enhance his superiority in

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<sup>1</sup> The author wishes to dedicate the present notes to Prof. J.A. Esperança Pina, beloved chairman, supervisor, and emeritus anatomist, who dedicated much of his post-jubilee career to write and lecture on the subject of Artistic Anatomy. His memorable speeches to the Lisbon Academy of Sciences on artistic anatomy in the Renaissance and throughout the Ages, impregnate the minds of his fortunate listeners with the fascinating desire to proceed studies in his field ...

<sup>2</sup> Quoted by Irma A. Richter, Oxford University Press, 1952

Art, or whether it was his early interest for the development of engineering, architecture and the artistic representation of human bodies, which led him to dissect. Leonardo's anatomical studies may have started in Florence, at the *Ospedale di Santa Maria Nuova*. He later proceeded to dissect at the *Ospedale del Broco*, unit of the Milan *Ospedale Maggiore*.<sup>3</sup> Leonardo stated to have dissected more than 30 corpses. Later on, he was prosecuted by Pope Leo X, for dissecting and this may have led him to work in distressful solitude and to hide the best of his legacy to human culture.

Martin Kemp (2006) indicates that, although there are some 6000 surviving pages of Leonardo's works in papers, "It can be estimated that around four-fifths of his written and drawn output is lost."

According to Irma A. Richter (1952):

"It was not only the beauty of nature but also the spirit at work beneath the world of appearance that fascinated him. Combining an artist's sensitivity with a scientist's desire of knowledge, he analysed the objects of vision and the way in which vision functioned. [...] He used scientific methods of research in order to ascertain Nature's laws and introduce them in his own works. [...] He was not an abstract theorist [...] but a 'universal' genius of the Renaissance intent on artistic creation, he attempted to ground his natural

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<sup>3</sup> On the purpose of Leonardo's anatomical Works, Vasari (1550) stated, on the biographical notes entitled *Vita di Leonardo da Vinci. Pittore et Scultore Fiorentino*, that "Leonardo then applied himself, but with even greater care, to the study of human anatomy, working together with Messer Marc' Antonio della Torre, an excellent philosopher who was then lecturing in Pavia [...]" Furthermore, from the same book, on the purpose of Leonardo's Anatomical drawings, Vasari stated that he "created a book with red crayon drawings outlined in pen in which he sketched cadavers he had dissected with his own hand, depicting them with the greatest care. [...] Many of these papers on human anatomy are in the possession of Messer Francesco Melzi, a Milanese gentleman [...] And anyone who reads these writings will be amazed by how clearly this divine spirit discussed art, muscles, nerves, and veins, taking the greatest pains with every detail. There are also other writings by Leonardo in the possession of a Milanese painter, also written with the left hand from right to left, which treat painting and methods of drawing and using colour."

science on an acceptance of the philosophic system, inherited from Greek thought and medieval thought, which conceived of the universe as an organized cosmos corresponding to a work of art; and he profited thereby."

HRH Charles, the Prince of Wales stated, as Chairman of the Royal Collection Trust, on his "Foreword" to the volume in celebration of the 500<sup>th</sup> anniversary of the death of Leonardo [*in Clayton, 2019*]:

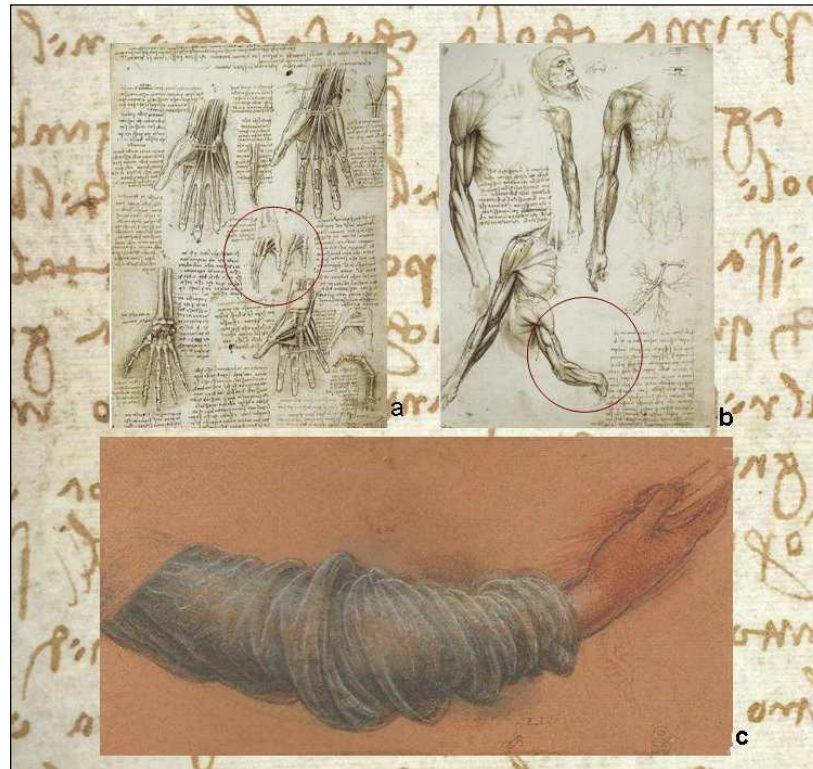
"Of Leonardo, perhaps more than any artist, it can truthfully be said that 'all human life is there': he used drawing to record, to explore and to think, and through this selection we can comprehend the many aspects of his boundless intelligence. From his studies of the human form - including his ground-breaking anatomical work - to his meditations on the beauty of Nature and finally to his haunted visions of the end of the world, every variety of experience is laid before us - and that is perhaps why Leonardo still speaks so strongly to us today."<sup>4</sup>

We feel most grateful for the opportunity to have visited the enlarged exhibition of Leonardo's 200 sketches, open to the wider public at Buckingham Palace, in August 2019, to mark the 500<sup>th</sup> anniversary of Leonardo's death (... or should we best say, 'in commemoration of Leonardo's everlasting modernity?'). On that occasion, we believe to have fulfilled the aim of Her Majesty The Queen of England, "that everyone who visits these exhibitions should be as inspired as [Prince Charles] has always been by Leonardo's brilliance". Indeed, that overwhelming "brilliance" of Leonardo's legacy inspired these present notes on

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<sup>4</sup> HRH The Prince of Wales. Foreword. In Clayton M. (2019) *Leonardo da Vinci. A Life in Drawings*. The Royal Collection Trust, London, 2019.

Leonardo's modernity that we write in singular gratitude for the occasion of still having access, 500 years later, to Leonardo's geniality and disturbing modernity.



**a**-The bones, muscles and tendons of the hand,, c.1510-11 - Black chalk, pen and ink, wash. RCIN 919009r [in Clayton M.(2019), pg.171.]  
**b**-The muscles of the arm, and the veins of the arm and trunk,, c.1510-11 -Red chalk, pen and ink, wash.RCIN 919005r [in Clayton M.(2019), pg.166.]  
**c**-The drapery of the Madonna's arm,, c.1510-15 - Red and black chalks, wash, pen and ink, on orange-red prepared paper. RCIN 919005r [in Clayton M.(2019), pg.200.]

The singular mark of Leonardo's unique and everlasting modernity derives from his multi- or trans-disciplinary approach to every subject with which he dealt.<sup>5</sup> According to his own writings, "That mental discourse that originates in its

<sup>5</sup> Bettencourt Pires M.A. (2017), *Interdisciplinarity, Multiculturalism, Anatomy and Art* [Public lecture and Master Class to the University of Pernambuco, Brazil]

first principles is termed science. Nothing can be found in nature that is not a part of science, like continuous quantity, that is to say geometry. [URB Ir-v] " <sup>6</sup>

In fact, as Sara Tagliagamba reports, Leonardo spent much of his time to demonstrate the analogy between machineries and the human body, considering both as marvellous works of Nature, because the rigid laws of Nature apply not only to the mechanical instruments, as also to the movement of animals.<sup>7</sup>

Following the same line of thoughts, João Lobo Antunes wrote that:

"Leonardo is truly the precursor of scientific anatomical illustration, as he introduced multiple perspectives to his anatomical sketches, with transcutting, transparency, and superposition of planes. [...] Not much was added to Leonardo's anatomy, until anatomy was taught by radiographic images, computed tomography, or Magnetic Resonance Imaging." <sup>8</sup>

Furthermore, Martin Kemp (2006) considers that:

"No one used paper as a laboratory for thinking, on Leonardo's kind of scale. No one covered the surface of pages with such impetuous cascade of observations, visualised thoughts, brainstorming alternatives, theories, polemics and debates, covering virtually every branch of knowledge about the visible world known in his time. [...] Leonardo is now the very image of '*uomo universale*'- the 'universal man' of the Renaissance, someone mastering a range of pursuits that would be unthinkable for a single individual today." <sup>9</sup>

Nowadays, (much probably in the sequel of Leonardo's humanistic efforts to transcend and to dissolve some of the rigid boundaries between different fields of human culture), we should consider the necessity of smooth evolution in the transition from *MULTI-disciplinarity* to *CROSS-disciplinarity*, through *INTER-*

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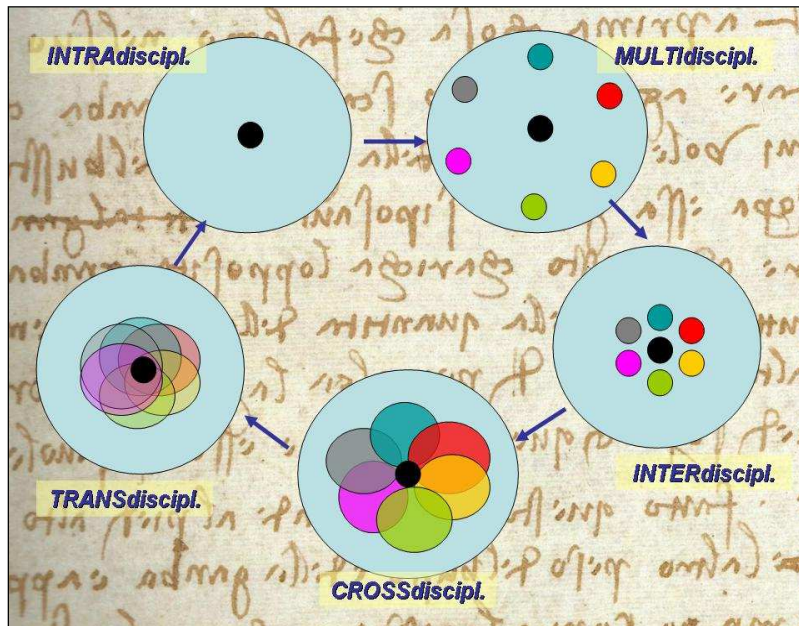
<sup>6</sup> Vasari (1550), as quoted by Kemp M. (2006)

<sup>7</sup> Tagliagamba S. (2010)

<sup>8</sup> Lobo Antunes J. (2013) (My translation).

<sup>9</sup> Kemp M. (2006).

disciplinarily, and towards *TRANS-disciplinarily*, as a goal to enhance and further improve every field of studies, involved.<sup>10</sup> Such is one of the most precious lessons we should learn from the Great Leonardo.<sup>11</sup>



**Graphic representation of the cyclic path from Intradisciplinarity to Transdisciplinarity.**

[Artwork. M.A. Bettencourt Pires, 2019, adapted from JENSENIUS (2012)<sup>10</sup>]

Nowadays, we tend to differentiate the terms “Intra-”; “Multi-”; “Inter-”; and “Cross-” to “Trans-disciplinary” works, in reference to the inevitable multidisciplinary evolution of modern knowledge and culture, and the innovation efforts that are in need, after a long period of overspecialized” knowledge acquisitions through “Intradisciplinary” works and research on different fields of human culture.

A.R. Jensenius, quoting from Marilyn Stember (1991), offers concise definitions to the several terms of “disciplinary” studies:

- “Intradisciplinary”: working within a single discipline;
- “Crossdisciplinary”: viewing one discipline from the perspective of another;
- “Multidisciplinary”: people from different disciplines working together, each drawing on their disciplinary knowledge;

<sup>10</sup> Jensenius A.R. (2012)

<sup>11</sup> In fact, as I have previously referred, when looking for traces of the cultural interest for interdisciplinarity throughout history, it becomes clear that “those times when human anatomy and dissection were performed, are followed in the near future by great eras of scientific and also artistic flourishing. (Think of ancient Egypt, Greece, or the Renaissance times...) [Bettencourt Pires M.A., 2013; 2015; 2017]

As we learn from Marilyn Stember (1991) on her "Presidential address"<sup>12</sup>:

"What are now called disciplines and specialties are products of the nineteenth and twentieth centuries when the empirical disciplines one by one exerted their independence. Increasing specialization and segregation of disciplines affected all intellectual life. In recent decades, signs clearly indicate a move again toward unity, but not the medieval type where disciplines were related under a strict system of subordination. The contemporary view is that disciplines exist in an open-minded confederation and that knowledge can be understood and advanced through interdisciplinary work. [...]"

Although interdisciplinary research and educational programs were launched in limited ways after World War II, the interdisciplinary experience in universities is only a few decades old. Universities devised mechanisms to offset the risk of narrow specialization, joint course listings, joint faculty appointments, interdisciplinary thesis committees, research centers, special committees, and interdisciplinary majors. [...]"<sup>13</sup>

Our modern trend for the importance and necessity of transdisciplinary works may date back as early as the mid-twentieth century, when with his usual intelligent wit, Chesterton (1935) already referred to the scientific culture, to say: "[...] Only the modern, advanced, progressive scientific culture is reasonably incomplete. It is, as Stevenson said: '*a dingy ungentlemanly busyness*'. It leaves so much out of a man"<sup>14</sup>. Later on, Charles Percy Snow (1951) exposed on the need to transcend and dilute the frontier barriers between the "Two Cultures".<sup>15</sup> This collection of innovative lectures, led John Brockman (1995) to publish an

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<sup>12</sup> Stember M. (1991) "Presidential Address"

<sup>13</sup> Wohl R.R. (1955) (as quoted by Stember M., 1991)

<sup>14</sup> Chesterton G.K. (1935)

<sup>15</sup> Snow C.P. (1959); lectures, later published in Book: Snow, Charles Percy (2001) [1959]. *The Two Cultures*, London: Cambridge University Press. [Quoted by Bettencourt Pires M.L.& Bettencourt Pires M.A. (2013)]



interesting sequel on the modern necessity for trans-disciplinarity, for the further development of modern culture.<sup>16</sup>

Nowadays, we have learnt the fundamental need for trans-disciplinarity in human culture, in most of its fields and lines of action, such as in higher education<sup>17</sup>; in scientific research<sup>18</sup>; in economics and finance<sup>19</sup>; or in medical current practice, or cancer research<sup>20</sup>; or even for knowledge building<sup>21</sup>.

Indeed, the greatest lesson we should learn from the golden era of Humanism, lies on the profitable gaining of every single parameter of human culture, through multinational trans-disciplinary works. This means full integration, cooperative team work, but above all, open-mindedness, and inter-exchange, for a better developed cultural world.

Leonardo concealed the greatest part of his works from his contemporary public, but some 6000 pages survived, with the probable "visionary" expectation that, at least 500 years (half a millennium) later, a better developed public would learn to appreciate his legacy.

Although one cannot help feeling dazzled at the overwhelming "brilliance" of most of Leonardo's works, his greatest legacy relies in the everlasting power of trans-disciplinary works, through which every single side of culture gains with enhanced advancement.

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<sup>16</sup> BROCKMAN J. (1995) *The Third Culture*.

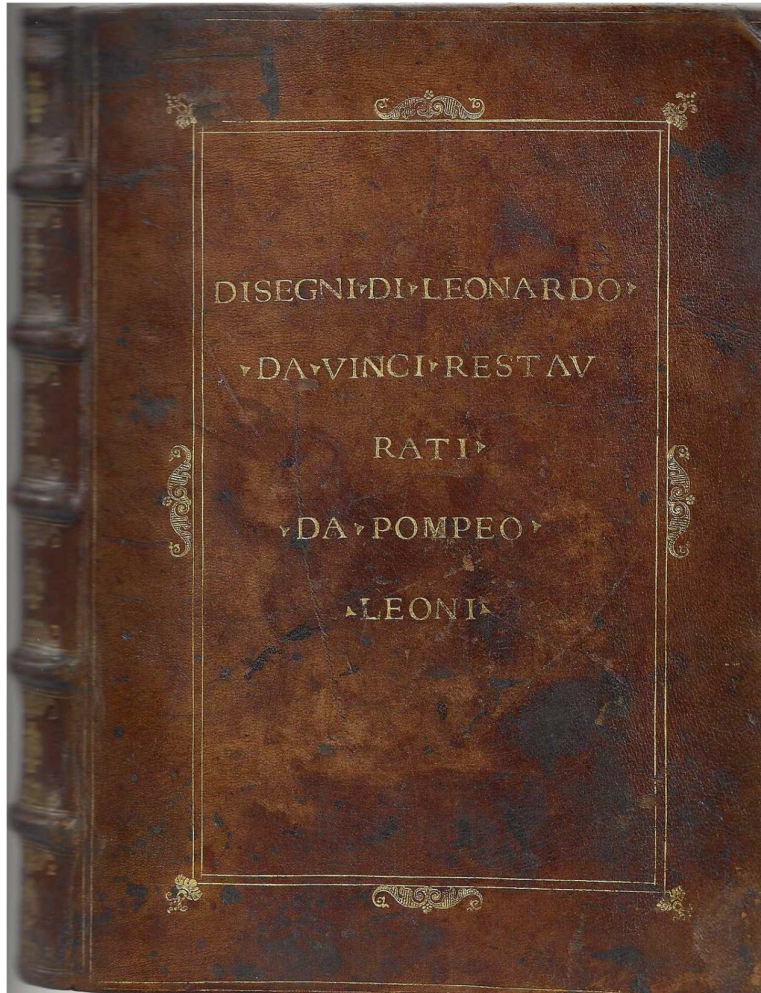
<sup>17</sup> Borrego M.(2010); Tsitavets T.(2019)

<sup>18</sup> Zhiya Zuo, Kang Zhao (2018)

<sup>19</sup> Kozarevic E.(2017)

<sup>20</sup> JEssup R.(2007); Giust E.M. (2017); Ussi A.(2018); Choi B.(2006; 2007; 2008)

<sup>21</sup> Visvanathan S. (2019)



*The Leoni Binding*. c.1590  
Leather, gold tooling. 47.0x33.0x6.5 cm. RCIN 933320 [in Clayton M.(2019)]

**ACKNOWLEDGEMENT:**

The author wishes to express her gratitude to the many interesting contributors that were posted on the online discussion, that she started in 2017, on the *Research Gate* online platform, on the subject of "Multidisciplinarity":

[https://www.researchgate.net/post/Whats\\_the\\_difference\\_between\\_Interdisciplinarity\\_and\\_Multidisciplinarity](https://www.researchgate.net/post/Whats_the_difference_between_Interdisciplinarity_and_Multidisciplinarity)

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[https://www.researchgate.net/publication/319332280\\_Interdisciplinarity\\_Multiculturalism\\_Anatomy\\_and\\_Art](https://www.researchgate.net/publication/319332280_Interdisciplinarity_Multiculturalism_Anatomy_and_Art)
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## BIONOTE

MARIA ALEXANDRE BETTENCOURT PIRES (MD, PhD) works currently as tenured Professor of Anatomy at the NOVA Medical School of the New University of Lisbon, where she started her career as anatomy lecturer, in 1993, proceeding to PhD degree in "Normal Human Morphology" in 2009. Apart from her academic works, she keeps parallel medical career as a specialist in Ergonomics and Occupational Medicine, since 2003. Her primary and secondary studies at the Lycée Français Charles Lepierre de Lisbonne strongly influenced the pendant for humanistic studies, also accompanied by her dear Mother's research and academic activities in this field.

At present, she counts 197 scientific research publications, including 56 journal articles; 9 books and book chapters; 82 scientific meeting and conference papers, many of which dedicated to research on the field of Anatomy, artistic anatomy and history of dissection. Apart from her works as member of the board of Editors of 5 indexed scientific publication, her insertion as an active member of the "PUBLONS" online platform, reflects regular activity as peer reviewer for several international indexed scientific journals.

[[https://www.researchgate.net/profile/Maria\\_Bettencourt\\_Pires](https://www.researchgate.net/profile/Maria_Bettencourt_Pires)];

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**ABSTRACT**

When we look into History, in search for traces of the cultural interest for interdisciplinarity, it becomes clear that those times when human anatomy and dissection were performed, soon were followed by the greatest eras of scientific and artistic flourishing. Such was the case of ancient Egypt, Greece, or the Renaissance times. These thoughts inevitably crossed our minds, when visiting the enlarged exhibition of the Royal Collection of Leonardo da Vinci's 200 sketches, open to the wider public at the "Queen's Gallery" of Buckingham Palace, in August 2019, to mark the 500<sup>th</sup> anniversary of Leonardo's death. On that occasion, we believe to have fulfilled Queen Elizabeth's aim "that everyone who visits these exhibitions should be inspired by Leonardo's brilliance". We will never know if Leonardo dissected to further enhance his superiority in Art, or whether it was his early interest for the development of engineering, architecture, human anatomy and physiology, which led him to dissect. He worked alone and in secrecy, and he concealed the greatest part of his works from his contemporary public, but the smallest parcel of the overwhelming brilliance of his legacy that survived for half a millennium, has been waiting for a better developed public to learn and appreciate his efforts to dilute interdisciplinary frontier barriers, thus evolving to a better world of transdisciplinary culture, as the modern trend of the 21<sup>st</sup> century.

**RESUMO**

Ao analisar a História Universal, procurando vestígios do interesse humano pela interdisciplinaridade, fica bem patente o facto de que aquelas épocas em que se aperfeiçoaram estudos anatómicos por dissecação cadavérica humana, logo foram seguidas por grandes eras de florescimento científico e artístico, como no caso do Egipto Antigo, da Grécia Clássica, ou do Renascimento. Tais pensamentos impregnaram-nos o espírito, por ocasião da recente visita à Exposição da colectânea real britânica dos 200 desenhos de Leonardo da Vinci, na Galeria Real do Palácio de Buckingham em Londres, em celebração do 500<sup>o</sup> aniversário da morte de Leonardo. Nessa ocasião, sentimos ter plenamente correspondido ao desejo expresso pela Rainha Isabel II de que "quem visitasse essa exposição se sentisse inspirado pelo brilhantíssimo fulgor da Obra de Leonardo". Não conseguiremos destrinçar se Leonardo dissecou corpos humanos no sentido de enaltecer a sublime superioridade artística, ou se, ao invés, teria sido a precocidade do seu interesse por engenharia, arquitectura, anatomia e fisiologia humana, que o levaram a querer dissecar e explorar o interior dos corpos. Trabalhou só, e em segredo, escondendo a maior parte dos trabalhos do seu público contemporâneo, mas a pequena parcela do brilhantíssimo fulgor do seu legado, que subsistiu após meio milénio, aguardou por um público culturalmente mais desenvolvido, mais capaz de aprender e apreciar os seus esforços de diluição de barreiras disciplinares, na evolução cultural para a "transdisciplinaridade" como marca cultural do limiar do século XXI.

