



Léonard de Vinci

INVENTION ET INNOVATION

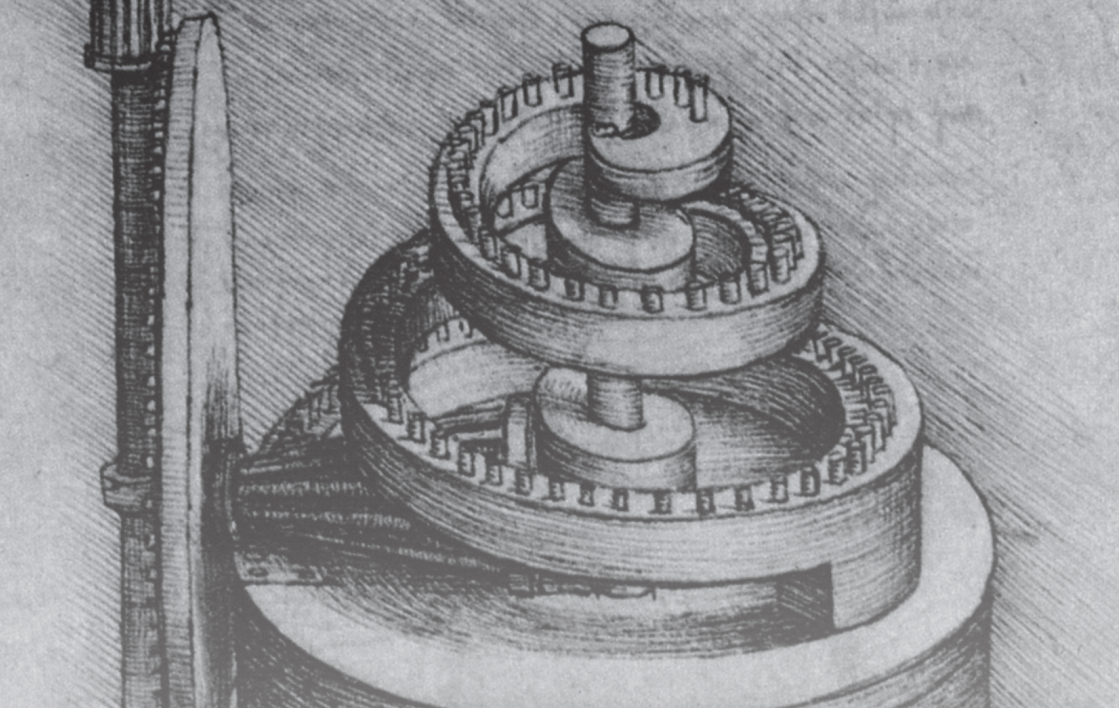
LXII^e COLLOQUE INTERNATIONAL
D'ÉTUDES HUMANISTES

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RÉSUMÉS/ABSTRACTS



Lundi 24 juin

Université de Tours, Site Tanneurs - Salle Thélème

17h30 Séance inaugurale **Carlo Vecce**, Università degli studi di Napoli – L'Orientale

Léonard de Vinci entre tradition et innovation

The dialectic between tradition and innovation, between the Ancients and the Moderns, is one of the deep contradictions of Leonardo's age. His contemporaries, the humanists, dreamed that ancient civilization, with its legacy of human wisdom, could come back to life again, in all its forms: philosophical and scientific thought, letters, theater, visual arts. That was the dream of the Renaissance. At the same time, in their cultural battles against the institutions of medieval culture, they developed forms of critical thought that would have evolved towards new horizons of knowledge, new discoveries and inventions destined to put the very voice of the Ancients in crisis. The world was turning out to be different from what was told in the pages of the books. Leonardo's initial training was outside the mainstream of humanistic culture, but in reality he shared the same anxiety of renewal. The development of his scientific, technological and artistic research led him on many occasions to contradict the teaching of the authors (whom he called "altri"). The dialogue with them, however, was always alive, as it is shown by the recent investigations into his library. Leonardo was able to use simultaneously all the cognitive tools available, from the direct experience of natural phenomena to the careful study of the books of philosophers and scientists who have examined those phenomena before him.

Mardi 25 juin

Université de Tours, Site Tanneurs - Salle Thélème

I - L'étude des sources au service de la compréhension de l'innovation

9h30 Jan Sammer, Prague

The Royal Banquet at Cloux on 17 January 1518

During Leonardo's sojourn in France, a royal festivity was held at his residence of Cloux. Our knowledge of it has thus far depended on a letter sent from Amboise two days after the event by the Milanese nobleman Galeazzo Visconte. The letter, dated 19 June 1518, was included in vol. 25 of the *Diarii* of Marino Sanuto, published in 1889 in Venice. In 1904, Edmondo Solmi cited its initial paragraphs, arguing that the event was a re-enactment of Bellincione's *La Festa del Paradiso*, first staged in Milan in 1490 using an elaborate apparatus designed by Leonardo. In 1919 Luca Beltrami endorsed Solmi's thesis, but erroneously sourced the letter to the Mantuan archive. The date assigned to the letter by Sanuto cannot be correct, as the court was at that time no longer in Amboise. The event was in fact a festive dinner accompanied by dancing, held on Sunday, 17 January 1518 under a tent erected on the grounds of Leonardo's residence. Further details are provided in an unpublished letter by the Mantuan envoy Grossino, sent from Amboise the following day. Leonardo was no doubt involved in the preparation of the event, having offered his residence as the venue, but was not among the participants.

10h Monica Taddei, Biblioteca Leonardiana di Vinci

E-Leo: the Biblioteca Leonardiana's Online Digital Archive for the consultation and study of Leonardo da Vinci's corpus. State of the art and future prospects

E-leo (www.leonardodigitale.com) is a digital archive for the history of science and technology. The Biblioteca Leonardiana at Vinci (Italy), a research and documentary centre specializing in Leonardo da Vinci studies, has published on the web almost the entire corpus of Leonardo's work, relying on its collection of editions (from the first, dated 1651), and has set itself an even more ambitious goal, that of contextualizing them within the broader framework of Italian and European historical and scientific heritage.

The apparatus is proposing an integrated processing model for Renaissance manuscripts by artist-engineers. In parallel, a scientific programme is being developed for the study of Leonardo's specialized "languages" (mechanics, optics, anatomy, architecture, etc.), with the aim of giving access to the various 15th and 16th century manuscript production in the Vulgar Italian. A programme of translations into English of Leonardo's corpus has also been started.

11h Pamela Smith, Columbia University

Making and knowing: Leonardo in prospect

The Making and Knowing Project explores the intersections between historical craft making and scientific knowing. The Project is preparing an open-access digital critical edition and English translation of a late sixteenth-century French manuscript, Bibliothèque nationale de France, Ms. Fr. 640. This anonymous manuscript is the written result of recipe collecting and workshop practice in the sixteenth century, and it gives insight into craft and artistic techniques, and material and intellectual understandings of the natural world. This compilation of artisanal techniques, recipes, and experi-

mental notes, like Leonardo da Vinci's writings, stands at a pivotal moment in the growth of a new mode of gaining knowledge, and, like Leonardo's work, it grants an invaluable view into the continuous experimentation and "invention" through which art objects were created by skilled labor, and how this process of artistic creation yielded insights into the behavior of natural materials.

11h30 Claudio Giorgione, Museo della Scienza di Milano

Francesco di Giorgio's legacy: from copies of "Trattato" to Theatri Machinarum

Francesco di Giorgio Martini left different kinds of manuscripts, starting from the drawings of machines (the early *Codicetto*, now in the Vatican Library and the *Opusculm de Architectura*, once in Urbino and now at the British Museum) and arriving to the more complex *Trattato d'Architettura Militare e Civile*, composed in different periods between the late 1470s and early 1490s (four manuscripts now in Biblioteca Reale, Turin, Biblioteca Medicea Laurenziana and Biblioteca Nazionale Centrale, Florence and Biblioteca degli Intronati, Siena). In his *Trattato*, Martini developed drawings and texts being inspired by the work of Vitruvius and by the contemporary development of engineering and military architecture. The influence and importance of his work is largely documented starting from the end of the 15th century. Leonardo da Vinci, for instance, had a copy of Martini's *Trattato* in his library and was inspired by him in different studies. The Frieze on the Art of War commissioned by Federico da Montefeltro in the ducal palace in Urbino used as subject many drawings by Francesco di Giorgio. Starting from the first half of the 16th century, Martini's *Trattato* and his drawings of machines inspired the production of many copies which have been produced in Urbino, which have peculiar features and different levels of quality. This tradition lasted until the beginning of the 17th century, where echoes of Francesco di Giorgio machines are to be found the illustrations of the *Theatri Machinarum*, printed repertoires of machines of engineers and artists like Jacopo Strada and Vittorio Zonca.

12h Davide Russo, Università degli studi di Bergamo

A multidisciplinary approach to the reconstruction of the history of Renaissance machines: Leonardo and the glossary of mechanics

In recent years historiographical research has been the theater of major changes. The main factors of its development were the digitization of manuscripts that were previously not accessible and the introduction of new techniques of text mining and content analysis from artificial intelligence together with virtual design tools easy to use even for non-experts.

This multidisciplinary approach has contributed to support linguists in drafting the glossary of Leonardo's mechanics and to virtually reconstruct Leonardo's textile and building machines in the Museo Leonardiano di Vinci

II - Politique et philosophie

14h30 Marco Biffi, Università degli Studi di Firenze, Accademia della Crusca

Leonardo inventore di parole

Leonardo, having to identify a language to convey the technical-scientific knowledge, has no doubts and elects unreservedly the contemporary Florentine language, his mother tongue so rich in words that he has to worry about not understanding things rather than not being able to write them ("l' ho tanti vocaboli nella mia lingua materna, ch'io m'ho piuttosto da doler del bene intendere le cose che

del mancamento delle parole colle quali io possa bene esprimere il concetto della mente mia"; Windsor Castle, Royal Library c. 19021v; *Quaderni di Anatomia* II, c. 16r; ed. Keele/ Pedretti 62v). Yet Leonardo, as evidenced by the lists contained in the Trivulziano codex and other codices of his manuscript corpus, also tries to enrich the maternal lexicon with the erudite one. But the real challenge arises when, with his speculative method, Leonardo finds himself identifying and having to name elements that had never been highlighted. For this reason, especially in certain disciplines (such as mechanics, anatomy, but also painting), he was called upon to become a lexical inventor, using various strategies to form new words that univocally indicate the parts of nature that are revealed from time to time.

15h John Venerella, Équipe e-Leo

Moments personnels, moments originaux dans la découverte de Léonard de Vinci

One of the difficulties of the task of evaluating innovativeness and inventiveness lies in the absence of well-defined and broadly agreed-upon dimensions of creativity. Though the final verdict is given by the viewer who is struck, or not at all impressed, by a given contribution, we can, as a start, point to two ways in which invention and innovation can manifest: in unexpected combinations of familiar objects or ideas; and in transcending limitations of received patterns of thought, producing contributions that are unfamiliar, novel, or surprising and that are of value.

Whether through the media of inscriptions, drawing, or painting, Leonardo showed examples of contributions in each of these ways, with the *impresa* being a form in which he visibly left traces of his attempts and of his intentional process toward invention and innovation.

15h30 Marco Versiero, Milan

«Citoyen des mondes»: il cosmopolitismo di Leonardo, da Quinet e Michelet a Gramsci

The chapter "La révolution dans les arts" in the second book of Edgar Quinet's *Les révolutions d'Italie* (1848-1852) contains the cliché of the "citoyen des mondes" applied to Leonardo's personality, in the context of a wider interpretation of the cosmopolitan outlook typical among Italian intellectuals during the Renaissance, as described in the introductory chapter of the same book. A friend of Quinet and a reader of his *œuvre*, Jules Michelet assimilated this vision in the seventh book of *Histoire de France au Seizième Siècle*, entirely devoted to "La Renaissance" (1855): Leonardo is there considered a kind of 'prophet' of the "haute civilisation" of early modern Italy, even when traumatized by the beginning of Italian Wars. Later, Antonio Gramsci's prison writings in the early 1930s (preceded by a collaboration with Aldo Oberdorfer for the magazine *L'Ordine Nuovo* on the occasion of the fourth centenary of Leonardo's death in 1919) offered a fragmented though organic profile of Leonardo as a herald of what he discussed in terms of a 'reactionary' cosmopolitanism, responsible for the political failure of Renaissance Italy.

16h30 Romain Descendre, École normale supérieure de Lyon

Li omini inventori e 'nterpetri tra la natura e gli omini : Léonard inventeur

Sometimes Leonardo da Vinci presents himself as an "inventor". In order to specify what he means by this, he mentions another figure: the *interprete*, the translator, metaphorically conceived as an intermediary, placed between nature and men, whose function is to reveal to the latter the meanings carried by the former (C.A. 323 r). We will try to take seriously the linguistic and translation model that seems to be at work in this metaphor and to question its implications. What lessons does it bring to the notion of invention as Leonardo sees it? Is this image confirmed elsewhere in the manuscripts

and does it exhaust the Leonardian semantics of the invention? Is there any difference between invention and “discovery”? What is the relationship between invention and experience, since the latter is also defined as an *interprete infra l'artifiziosa natura e la umana spezie*?

17h **Fabio Frosini**, Università degli Studi di Urbino Carlo Bo

Léonard de Vinci et la nécessité « inventrice » (Forster III, f. 43v)

In the *Codex Forster III*, c. 43v, we read a quick note written in sanguine pencil: “Necessity is teacher and mentor of nature. Necessity is theme and inventor of nature, and bridle and eternal rule”. The *Codex Forster III*, compiled between the end of the 1480s and the beginning of the following decade, is a small notebook, used by Leonardo as an aid supporting the writing of texts which, in terms of format and commitment, represent its main reference point: first of all, *Manuscript C* and *A* of the Institut de France. In them, Leonardo sketches out a grandiose project of universal science, founded on the organic link between painting and perspective. It intends to propose itself as a new “natural philosophy” ranging from optics to acoustics, from hydraulics to dynamics, to statics and kinematics. My goal will be to relate the seemingly isolated affirmation of *Forster III* to this ambitious project, in particular, by exploring the singular formulation of an “inventive” or a “creative” necessity. Leonardo’s sentence will also be related to its closest sources of inspiration—Dante in the first place and a new and different transcription will be proposed.

Mercredi 26 juin

Université de Tours, Site Tanneurs - Salle Thélème

III - Technologie et mécanique (1)

9h30 **Andrea Bernardoni**, Museo Galileo di Firenze

History of mechanical philology: arts, engineering, information technology as tools for the analysis and interpretation of historical sources

Those that today we call mechanical philology studies can be traced back to the Renaissance period, when with the recovery of the technical treatises of antiquity the first hermeneutical questions were posed on how to reconstruct the drawings of machines starting from verbal descriptions. In this contest multidisciplinary study groups were created in which humanistic and engineering skills were integrated to rebuild ancient machines and technologies. The use of technical and scientific skills for understanding and interpreting the sources of the history of technology has therefore always played an important role in the exegesis of machines and technological processes, even in the past.

My intervention want to retrace the main stages of the development of this method of study which, especially after the 1939 exhibition in Milan where almost two hundred models of Leonardo's machine were built, led to the rise of new relevant problems for the historian, up to the contemporary age where, with the advent of computer science, mechanical philology has grown further by offering new possibilities for querying and analysing historical sources.

10h **Alexander Neuwahl**, ArtesMechanicae

La philologie des machines et la résolution de problèmes mécaniques au XV^e siècle

One of the main goals of the philological study of ancient machines is the investigation of the technological panorama of past eras. This kind of research requires a multidisciplinary approach in which the study of sources is made to converge with technical and scientific analyses for a reconstruction of machines, processes and methodologies that try to provide useful elements for an analysis of the state of evolution of technology in the various periods of history.

From this point of view the Renaissance is an extraordinary age: the rediscovery of the ancients' knowledges, the proliferation of studies on all fronts of knowledge and in particular the technical, scientific and mathematical ones, the vast production of treatises and the enormous quantity of works realized in every field of techniques and arts provides a fertile ground for a profitable research. In this context, Leonardo da Vinci is an exceptional witness: acute observer, insatiable curious, tireless editor of notes, he left us an enormous amount of information from which, integrating them with what is made available by historical, technical and scientific investigations, it is possible to approach many aspects of Renaissance technology.

11h **Luca Garai**, Bologne

Bio-inspiration: Studies for the Danae by Taccone, and Santa Maria della Consolazione in Todì, 1496

In Leonardo we can find enlightened ideas of modern rational mechanic and, also bio-inspiration, or biomimicry, typical of his approach: looking to nature for technical solutions. In the comedia of *Danae* we have an almond that expands itself coming out from an empty column, like the tail of a peacock.

In this way suddenly it appears a divinity at the summit of the column.

We have also in the comedy, written by B. Taccone, a moving sky and a scenography that changes

view from a palace in a court to a sky with the gods of the olympus, Danae and doves flying.

The sheets of studies by Leonardo for *Danae* are: Cod. Atl. F. 996 (358v-b) ; Windsor 12497; folio of the Metropolitan Museum.

A sheet of the same period, 1494-96, in the manuscript B, seems to be a study for the Church of Santa Maria della Consolazione in Todi, began to built in 1508. It remembers a gem of flowers.

11h30 Salvatore Magazù, Federica Migliardo, Università di Messina

Innovative elements in Leonardo's physics intuitions

In this talk some Leonardo's sentences concerning some concepts of Physics, such as the scientific method, the dynamics and the theory of heat will be examined.

A comparison with the approaches of Galileo, Newton and Fourier will be performed.

IV - Technologie et mécanique (2)

14h Pamela O.Long, Washington

Leonardo's Observational Mechanics

This talk focuses on a few pages of Leonardo da Vinci's *Madrid Codex I* which he created in the 1490s. What was Leonardo trying to do in these pages? What is the relationship between the textual blocks and the images? How do Leonardo's interest in machines and elements of machines relate to his interest in motion and in the efficient functioning of machines? How were these interests related to the medieval science of weights? These are the questions that this talk will explore. Leonardo's approach is described as one of "observational mechanics." The reasons for this descriptive phrase will be discussed.

14h30 Luisa Dolza, SciencesPo, CNRS (UMR 8239)

Innovation et élaboration : Léonard et la vis d'Archimède

Leonardo's studies of the Archimedean screw shed light on his relationship with innovation and intellectual property, to use contemporary terminology. Leonardo was fascinated by this device, attributed to Archimedes and Pitagora, and depicted it in numerous sketches, often representing variations that could not be used. My thesis is that Leonardo's drawings of the screw should not be seen solely as hydraulics studies but also as indicative of a cognitive paradigm of which Leonardo was the initiator.

15h Mark Rosheim, Ross-Hime Designs, Inc (USA)

The bell ringer: Leonardo's digitally controlled robot

Leonardo's *Bell Ringer* (c 1510) represents his last and most sophisticated Automata. Unique in the large amount of descriptive text in Leonardo's own hand, the *Bell Ringer* could be considered the first digital device. Water powered it was a harbinger of 1960's field of fluidics which combined hydraulic computer logic elements with hydraulic actuators. Ringing the hours on the hour the *Bell Ringer* featured a Jack or humanoid robot that likely consisted of articulated joints.

I cannot tell Leonardo's story without telling my own. Starting with a bedtime story describing Leonardo's genius read by our babysitter, Leonardo inspired and shaped my design/engineering philosophy and lead me to the reigning master of Leonardo studies Carlo Pedretti. This relationship would lead to the recovery of Leonardo's lost robots. So broad has been this impact an entire conference could now be held on the subject!

“Insino a questo tempo”. Leonardo and clockworks

During the 15th century, a growing interest in automata increased the demand for creating self-operating machines, encouraged by the movement towards technological excellence in the field of Mechanics, Robotics and Clock making. In these automatic devices, the mechanisms of pendulum clocks were widely used, because they guaranteed perfect functioning. In fact clockworks were used in the construction of automata and was able to translate the oscillation of the pendulum into the power required to activate the rotation of the gears. It is well known that Leonardo acquired a deep knowledge of clock mechanisms thanks to his close friendship with Lorenzo Della Volpaia (1446-1512), architect, goldsmith, mathematician, but especially clockmaker and maker of scientific instruments. It is pretty unknown that Leonardo, during the first Florentine period, paid particular attention to the orioli. Who was the master who was able to transmit that knowledge? Through matching-up of documents, together with Della Volpaia, it was Verrocchio who introduced clockwork to a young Leonardo.

Leonardo's studies of perpetual motion: invention and innovation in his technical drawings

The paper will look at Leonardo's techniques of graphic representation and work methods in his technical drawings. It will focus on selected drawings of perpetual motion machines and address them in the larger context of Leonardo's interest in motion and artistic forms of representation.

Jeudi 27 juin

Château du Clos Lucé, Amboise

V - Biologie et médecine

9h30 **Jérôme Casas**, Université de Tours, IRBI

Insect physical ecology and bioinspired technologies

This talk will show how bio-inspiration is carried out today within large projects and will be more specialised than most other talks.

Insect chemical ecology is a mature, long standing field, with its own society and journal. By contrast, insect physical ecology is much less studied and the work scattered. Using work done in my group, I will highlight our approach and results on locomotion, both in granular materials as sand and at the water surface as well as sensing, in particular olfaction and flow sensing. In doing so, we will shift from the application of physics to biology to the identification of unsolved physical problem through biological application to the questioning of a two hundred years old physical law of friction through the study of the life of the most common ants. The bio-inspired implementations in MEMS technologies (Micro-Electrical-Mechanical-Systems) will be the closing chapter.

At the end of the talk I will briefly touch upon the decline of biodiversity and dare to ask whether Leonardo could have carried out his analogies in a world depauperated of much of its fauna.

10h **Pascal Brioist**, Université de Tours, CESR

Léonard de Vinci et la méthode biomimétique

Dans son jeune âge, période la plus naïve de ses études sur le vol, Léonard pense à des machines capables de se soulever en vol grâce au battement d'ailes, à l'imitation des oiseaux. La première difficulté qu'identifie Léonard est le déficit musculaire de l'homme en comparaison de sa masse corporelle par rapport aux oiseaux ou aux insectes, il s'agit alors pour lui de chercher dans l'observation de l'anatomie aviaire et dans les ruses mécaniques des solutions à ce problème. L'aile battante cause une autre difficulté : si pendant l'abaissement elle doit offrir à l'air la plus grande résistance possible, pour maximiser la portance, pendant la montée la résistance doit être minimale. Un système imaginé par le maître toscan pour obtenir cet effet consiste à réaliser une aile rigide dont la surface est composée d'une série d'orifices qui grâce à la pression de l'air se ferment pendant la descente de l'aile alors qu'ils s'ouvrent pendant la montée de façon à permettre à l'aile d'être traversée par l'air même à ce stade du mouvement. Léonard se pose à cette occasion le rôle joué par les plumes chez les oiseaux.

11h **Domenico Laurenza**, Museo Galileo, Firenze

Starting from below. The anatomy of man and animals in Leonardo

Leonardo tended to emphasise aspects common to man and animals and to define man starting from below, namely from the animal world. An opposite line will prevail in Renaissance anatomy, while in the 18th century Carl Linnaeus would still classify animals starting from above, that is starting from human anatomy and characterizing animals for what they lack in comparison to man. We shall analyse Leonardo's rather unconventional approach to humans and animals in anatomy and in other connected fields from psychology to technology, and also consider its repercussions on his studies of fossils. We shall then reconstruct Leonardo's legacy in this field and try to give a historical context

to his studies, their differences and debts towards the ancient tradition and, notwithstanding their limits, their aspects of modernity.

11h30 Dominique Le Nen, CHU de Brest

Léonard de Vinci et innovation : la dissection du corps humain

Léonard de Vinci se passionne pour le corps humain laissant en héritage une somme impressionnante de dessins anatomiques.

Peintre et anatomiste à la fois, il va plus loin dans le démantèlement et la représentation du corps ; après une période d'observation, il saisit un jour le bistouri, se met à disséquer et retranscrit le fruit de ses observations dans ses carnets. Il soulève toutes les strates qui composent le corps humain. Rien dans ses démonstrations n'est le fruit du hasard, il développe une stratégie de travail toujours raisonnée. Il a tout étudié chez l'homme ou la femme, des ventricules du cerveau aux cavités du cœur, de la musculature au squelette de la colonne vertébrale qui pour la première fois est justement représentée. Il commettra des erreurs liées à son attachement pour l'anatomie des anciens, en particulier celle de Galien. Néanmoins, il s'affranchira de sa pensée dogmatique en observant, en expérimentant. Le sujet anatomique devient un vaste champ d'études de l'Homme. Anatomiste visionnaire, Léonard de Vinci est précurseur d'une anatomie descriptive, topographique et fonctionnelle. S'il ne laisse aucun ouvrage, comme il en avait émis l'idée, les centaines de notes et les dessins qu'il laisse en héritage, plus ou moins ordonnés, constituent un corpus aussi riche d'informations que n'importe lequel de nos livres d'anatomie moderne.

Au cours de cette communication, certaines planches anatomiques seront confrontées à l'imagerie moderne ; d'autres seront présentées en maquettes 3D, dans deux domaines essentiellement, l'anatomie de la main et celle de la boîte crânienne.

VI - L'homme de tous les savoirs

14h30 Emmanuel de Crouy Channel, CESR, Tours

Léonard et les transformations contemporaines de l'artillerie

Que Léonard de Vinci se soit intéressé à l'artillerie n'est guère surprenant, tant cette technique, qui connaît au tournant des années 1500 une évolution rapide, est essentielle dans les arts de la poliorcétique et de la fortification, qui constituent le cœur du métier de l'ingénieur. En ce domaine, les carnets de Léonard témoignent tout à la fois de sa volonté de se tenir à jour de l'état des connaissances et de son envie de développer des solutions techniques nouvelles. Mais, et c'est là qu'émerge la question de la nature même des innovations de Léonard, ses champs de spéculation favoris ne sont pas ceux des grandes mutations en cours de l'artillerie. Où s'alimentent, finalement, les réflexions de Léonard et ne demeure-t-il pas un *outsider* au monde des canonniers ?

15h Landrus Matthew, University of Oxford

Leonardo and the science of military engineering

Leonardo's promotion of his skills as a military engineer in 1483-89 survive primarily as written and illustrated demonstrations. There is no evidence of his work on military engineering projects during this period. In 1483-84, he was likely aware of the Ludovico Sforza's expenditure of three quarters of his budget on the war with Venice, and the hiring of Ambrogio Ferreri as Milan's director of military

engineering. Although his engineering studies began in the early 1470s and he was never formally trained in a military engineer's studio, Leonardo's interest in the subject expanded in 1487-93 to his designs of a sophisticated series of military-related devices, for a variety of military and civil purposes. Precise calculations for these designs surpassed previous engineering draughting techniques. I will argue that his intended contribution to the Sforza Court was the adoption of Euclidian principles for the improvement of precision in design and thus, function. These military engineering demonstrations coincided with Leonardo's work—at the request of Ludovico il Moro—on a book on painting (the lost *Codex Sforza*), in which Leonardo argued for the superiority of painting over the other arts because it was considered a mathematical 'science' (*scientia*), founded on perspective. I will argue that his approach to military engineering, to the "vile meccanico" of the technical arts (according to Poliziano), was an attempt to show that the *artes mechanicae* was also a mathematical science, when designed with Euclidian proportional, projective geometry. This science was also fundamental to Leonardo's plan to design machines that were as useful as they were beautiful. By 1493, he provided evidence that the military arts met humanist guidelines for their potential inclusion among the Liberal Arts, though this may not have been his initial intention.

16h Camilla Cavicchi, CNRS, CESR, Tours

L'invention musicale chez Léonard de Vinci

Léonard a laissé plusieurs esquisses d'instruments destinés à produire des sons tenus et en polyphonie: la viola organista, un psaltérion dont les cordes étaient sollicitées par un mécanisme de rue associé à un archet; une flûte à bec glissando; la piva continua, une cornemuse particulière à sons tenus; un accordéon-orgue; la trompette à double soufflet, etc. Ses cahiers présentent également de nombreuses réflexions sur la sonorité des objets et sur la fabrication d'instruments populaires qui lui inspireront ensuite des inventions. Au cours du XV^e siècle, en Europe et en particulier en Italie, nous assistons à une véritable exploration des possibilités acoustiques des instruments qui deviennent un terrain d'expérience technologique sans précédent, spécialement dans les ateliers des facteurs d'instruments liés aux milieux des cours princières que Léonard de Vinci fréquentait. Musicien lui-même, Léonard participa certainement aux réflexions sur la technologie musicale qui animaient les discussions de ses contemporains.

Cette communication propose une lecture analytique et contextualisée des esquisses d'instruments pour montrer comment Léonard observait la sonorité du quotidien et les phénomènes acoustiques et pour situer ses réflexions dans le contexte plus large des ateliers de fabrication d'instruments musicaux du le Nord de l'Italie.

16h30 Sophie de Mijolla-Mellor, Université de Paris Diderot

Le besoin de savoir de Léonard de Vinci

Freud, and psychoanalysts after him, most often refer to Leonardo da Vinci's "remembrance of childhood". Here, we will use a psychoanalytic approach to address the visionary intuition of the painter that relates to his ambition of a total adhesion on a spectacle embraced by an omnisighted gaze.

The thought then becomes itself image, the eye and the hand being united in a centripetal-centrifugal apparatus and the flow of visual perceptions being retranslated immediately into drawings and sketches.

This almost immediate re-creation of impressions appears as an inner constraint to ensure a knowledge that eliminates any risk of resurgence of the worrying strangeness, any danger of return of a threatening enigma.

Vers une nouvelle vision architecturale : le séjour de Léonard à Rome en 1505

En avril 1505 Léonard passe un bref séjour à Rome. Cette expérience lui permet de se familiariser avec les nouvelles acquisitions typologiques et stylistiques du pontificat de Jules II (1503-1513), notamment les réalisations et les projets de Bramante, de Giuliano da Sangallo, de Michel-Ange et de Baldassarre Peruzzi. Le tombeau de Jules II, les dessins pour la reconstruction de la basilique de Saint-Pierre, la restructuration de la cour du Belvédère, l'aménagement d'un appartement au château de Saint-Ange doté d'une loggia vers le pont, la tribune des chanteurs sur la place de Saint-Pierre furent au centre de l'intérêt. D'autres mutations eurent lieu au sein des demeures, Palazzo Caprini de Bramante et la Farnesina de Peruzzi, qui attirèrent l'attention du Florentin. Son deuxième séjour milanais et surtout les commandes de Charles d'Amboise et Gian Giacomo Trivulzio, révèlent clairement cette influence et la manière dont il assimile ses nouveaux modèles. Léonard adopte désormais une syntaxe à l'antique et un langage triomphal, marqué par des travées rythmiques, qui changent profondément la nature de ses projets architecturaux.

Vendredi 28 juin

Domaine national de Chambord

VII – Peinture

9h30 **Frank Zöllner**, Universität Leipzig

Leonardo's as innovative painter

My contribution begins with a discussion of the concept of “invenzione” in the art theory of the 15th century, including Leonardo's *Libro della pittura*. I will also consider briefly the importance of the art theoretical notion of “invenzione” for Leonardo's practice as a painter. Furthermore, I will discuss some examples from Leonardo's practice as a painter, especially his portraits, the *Last Supper*, the *Virgin of the Rocks* and the *Salvator Mundi*. Finally, I will argue that Leonardo was an innovative painter, not because he realized concepts from art theory in his paintings, but because he created new solutions to old problems.

10h **Laure Fagnart**, F.R.S.-FNRS, Université de Liège

Le portrait d'un 'musicien'

Only one male portrait by Leonardo survives. Kept at the Pinacoteca Ambrosiana in Milan, it depicts a young man who, in one of his hands, holds a folded sheet on which one can make out letters and musical notes. Due to the poor conservation of this part of the picture, the music is now illegible, but it is definitely mensural notation and thus in all likelihood polyphonic music. During this intervention, I would like to return on the general attitude of the model, that of a young man captivated by the music he had just composed or sung. The next paradox will also be pointed: why face the sheet of music towards the outer portion of the tableau when the young man seems so focused on his internal thoughts?

10h30 **Jacques Franck**, International Leonardo consulting expert, Paris

Montrer la forme dans la lumière. L'innovation technique dans l'art pictural de Léonard de Vinci

The theoretical grounds and the practical material that had first been conquered and subsequently transmitted by Leonardo's great predecessors constitute the overall context within which his unprecedented research has grown and developed. At the date when the Florentine master assimilated his century's essential innovations in the painterly field and when, further on, he examined them critically while offering new solutions, the 15th century had nearly ended. For this reason Leonardo stands as the agent of the Quattrocento's second revolution in the realisation of space in painting, precisely as one of the complex relationship between forms and light inside a more or less illuminated space continuum. Leonardo's innovative contribution lies essentially in the specific means he will use to render for the first time the volume of forms in a life-like fashion, namely by the combination of linear perspective, the perspective of colour, the perspective of disappearance. The young painter soon understood through practice that representing three dimensional objects on surfaces is a challenging paradox, given that no perspective system can help imitate in a painting the 3-D effects that are produced by binocular vision, from which faculty alone depends the perception of space and volume. His original contribution will therefore be seen to have rested on using geometric [linear] perspective (corresponding to monocular vision) to shape the forms schematically and then to use colour perspective and the perspective of disappearance to cover this basic [graphic]

shaping in order to simulate volume as exists in binocular vision. *Chiaroscuro* and *sfumato* became thus an essential part of the Leonardian creative process. By investigating Leonardo's masterpieces and their technical/scientific files closely, one can follow the master at work in his studio.

11h **Chrysa Damianaki**, Università del Salento

Antonio Tebaldeo e la Belle Ferronnière di Leonardo da Vinci

This essay attempts a reappraisal of the content and form of a Latin epigram attributed to Antonio Tebaldeo. It is dedicated to a presumed portrait of Lucrezia Crivelli by Leonardo da Vinci which some critics have identified with the famous Leonardo portrait of the *Belle Ferronnière* datable to 1493-1494 (Paris, Louvre Museum, now on loan at the Louvre in Abu Dhabi). As known, Tebaldeo's Latin text is handed down by two slightly different manuscripts: one appears in the *Codex Atlanticus* of the Biblioteca Ambrosiana (c. 456, formerly 167r.c) dated to the 1490s; the other, an early 16th century apograph, is comprised in the section "pictura" of the *Codex Ottobonianus* 2860, c. 160r (Biblioteca Apostolica Vaticana). So far, neither version has properly been investigated, and this has prevented us from reaching a correct evaluation of Tebaldeo's epigram. In an earlier essay (still unpublished), I made an endeavor to evaluate both versions: this may provide us with some clues to the *fortuna critica* of the epigram from the late 15th century onwards. In the present abbreviated paper I shall briefly investigate both poems with regards to notions of Beauty and Nature. Leonardo's inventiveness, his ability to portray Crivelli's likeness and convey immortality to it through his art, are exalted in both versions. Literally speaking, Tebaldeo's epigram highly praises Lucrezia's beauty, being considered a great gift of Nature to her which, however, is doomed to perish as a consequence of time. Yet, Lucrezia's physique will remain ineffaceable thanks to Leonardo's pictorial art, thus becoming timeless. The essay briefly explores both concepts contained in Tebaldeo's epigram: that of immortal beauty created by art and considered a real and threatening challenge to Nature; and that of human beauty perpetuated through art; in this case, Leonardo's marvelous pictorial invention.

12h **Edoardo Villata**, Università Cattolica del Sacro Cuore

Le invenzioni giovanili di Leonardo e il ruolo di Lorenzo di Credi per il leonardismo a Firenze

Gigetta Dalli Regoli's fundamental monograph on Lorenzo di Credi (1966) brought together a large corpus, to which other paintings have been added: but since then lacks an up-to-dated philological analysis and a general reconsideration of Lorenzo's role in the context of florentine painting between the late 15th and early 16th centuries.

In his works we can recognise many themes originated in the workshop of his master Andrea del Verrocchio, and also specifically Leonardesque ones, some of which have already been highlighted by scholars; even though some surprising details are perhaps possible. Vasari expressly recalls the imitations made by Lorenzo of drawings by Leonardo, almost indistinguishable from the prototypes, but above all Lorenzo seems to guarantee Leonardo's inventions a continuity of existence and so to speak of fashion in Florence even during the long years spent by Vinci in Milan: moreover the status of heir of the prestigious Verrocchio workshop attributed to Credi a role even more central than that guaranteed by the quality of his works, not particularly rich in invention but of great pictorial refinement. It may not be a coincidence that some of the painters most receptive of Leonardo's lesson, at the time of his return to Florence, will be artists linked in one way or another to the solemn and geometrical figurative language developed by Credi at the end of the 15th century.

Entre texte et image : les “inventions” pour la peinture

Some capital statements on painting in the *Manuscript A* and some specific verbs that Leonardo frequently uses in his descriptions, allow to explore Leonardo's idea of invention, which widely exceeds the traditional themes of “History”, intended as a noble subject to be painted. The Artist and Writer continues to explore the infinite variety of phenomena, which offers, potentially, an immensely composite material to be painted, encompassing the observation of the infinitely small as well as what cannot be represented nor seen, such as the psychological rendering of the folds of the human mind and the variety of the atmospheric phenomena, including universal cataclysms.

This paper aims to study some excerpts from the *Notebooks* kept in the Institut de France, and focus on the evolution of Leonardo's writing, often urged by images, in the path going back from the reality to the imaginary.

VIII - Architecture et mises en scène

Leonardo's Modular Design

Leonardo's main selling point when he looked for a job at the Sforza court was his talent as a military engineer. He employed his prowess at inventing weaponry and portable bridges in his designs for temporary buildings. As court artist he also envisioned performances, replete with elaborate but temporary stage sets for the Sforza rulers. But it was for his patron's country leisure time that he produced innovative short-term architecture in the form of reusable, provisional pavilions. I propose that these mobile and panelized structures represented not only innovative modular design, but also a sense of permanence within a temporary use for high status owners. Leonardo designed new fabrications of ideal hardware for ease of construction and disassembly to flat panels. His novel structures prefigured modular building methods, which appeared only in the 20th century, whereas his modular design approach derived from ancient times. His components stored everything they needed for the operation of a building, rendering them multi-purposed portables. Alternative roofing designs might have included hipped and space frame or reciprocal structures that used force to find lightweight solutions to the need for portability. Producing different types of component structures that depended upon siting, type of event, and ritual illustrates his comfort with hybridity as well as modularity.

“Léonard de Vinci et l'architecture française”

La présence de Léonard à Amboise de la fin de 1516 à mai 1519 a-t-elle eu une incidence sur le développement de l'architecture française, engagée depuis une dizaine d'années dans un processus d'assimilation sélective des nouveautés venues d'Italie? On voudrait le croire, mais cette incidence est en réalité fort limitée, sauf à Chambord où l'idée de l'escalier central à plusieurs montées doit lui être attribuée. Aussi voudrions-nous adopter un autre point de vue et nous demander si Léonard s'est intéressé à l'architecture de son pays d'accueil et si cette expérience nouvelle n'a pas eu une incidence sur ses projets ou ses rêveries d'architecture. Plusieurs dessins révèlent ses curiosités, d'autres, plus anciens, prouvent qu'il a toujours regardé sans préjugés l'architecture gothique.

Léonard, les 'scale' et les 'lumache' : invention et faisabilité

L'escalier revêt notamment un rôle primaire dans les bâtiments, assurant la liaison entre les étages et, par cela, la vie cérémoniale, pratique et fonctionnelle de l'édifice.

Bien que Léonard ne lui consacre pas beaucoup de textes, son intérêt pour le sujet est témoigné par des nombreux croquis et dessins où il développe plusieurs variantes et solutions dans le domaine de l'architecture domestique et militaire. Souvent, forme et emplacement de l'escalier semblent étroitement liés à ses réflexions sur le mouvement et la dynamique.

L'objectif de cette communication sera d'étudier les systèmes de circulation esquissés par Léonard et de les comparer aux solutions courantes utilisées à cheval entre XV^e et XVI^e siècles ainsi qu'à la théorie architecturale du XV^e siècle, afin d'en évaluer à la fois l'invention et la faisabilité.



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