

The background of the cover features a photograph of the Leaning Tower of Pisa, partially obscured by the fronds of palm trees. A series of large, light-blue, semi-transparent geometric shapes, resembling diamonds or stylized 'X's, are overlaid on the image, creating a modern, architectural feel.

SUMMER SCHOOL ABSTRACTS & SPEAKERS' BIOS 2023



CSMBR
SUMMER SCHOOLS





Lectures' Abstracts

Tawrin BAKER

'Minima Naturalia' and Grades of Transparency in the Middle Ages

Within the Aristotelian tradition there was a struggle to reconcile Aristotle's various statements about transparency, colour, and the elements. In the *De sensu*, for example, Aristotle mentions that transparency is a quality shared by water, air, fire, and the uppermost body or celestial aether. One line of interpretation, which we see in Ibn al-Haytham, Averroes, and Latin medieval writers influenced by them, held that transparency was connected to the rarity—or, more properly, the potential *minima naturalia*—of the elements, with a ordered scale from the most thick or gross (earth) at the center and the most rare or subtle (aether) belonging to the heavens. This implied that a key sign of the elemental make-up of a mixed body is its transparency. Thus, when attempting to account for transparent stones, a body's degree of transparency was often taken to be a more reliable indicator of the ratio of its ingredients than heaviness, solidity, and so on. This scheme also suggested that, somehow, division or rarefaction alone might be able to transform one element into another—that, for example, by causing water to be more finely divided the form of water would pass away and the form of air would be received in the matter. What did authors make of this scheme, particularly if they maintained an Aristotelian plenum? How did this scheme affect accounts of the sublunar vs. the celestial realms? This talk explores the development of this idea and some of its uses and implications up through the sixteenth century.

◆ ◆ ◆

Density and Rarity, Colour, and Heat in Medieval and Early Modern Natural Philosophy and Medicine

This talk will discuss a number of interconnected issues among Medieval and Early Modern authors. The fortuna of the condensation theory of colour will be outlined, a colour scheme that united celestial and the terrestrial visibilia by appealing to the thickening of matter, rather than the elemental qualities, as the foundation for colour. This scheme was adopted, in various ways, by many writers on natural philosophy—including Averroes, Albertus Magnus and Roger Bacon, to Jacopo Zabarella. From a modern point of view, the density–rarity contrariety appears to be invoked to explain far too many properties at once; in addition to transparency this might include so-called second qualities of gravity/levity, liquidity/solidity

(and viscosity), luminosity, and translucency (or, less anachronistically, the ability for a body to shine from within due to the light of another). How, then, was density and rarity, perhaps the most important pair of qualities after the four elemental qualities, related to other properties of bodies? Heat plays a noteworthy role here given that the terrestrial heat could clearly be generated via the influence of the heavenly bodies without (following Aristotle) the heavens possessing any of the four elementary qualities. Heat was also crucial for another, rather messier scheme for generating colour held and taught by physicians and other medical writers. They sought the origin of colours in either the elementary bodies or the action of the elementary qualities on bodies (or their continuing presence); heat was of particular importance as a generator of colour in living bodies. The tension between these colour schemes appears to have been largely unresolved up through the sixteenth century.



Colour, Transparency, and Optics in Anatomy and Medicine: Early Modern Distinctions and Developments

When Ibn al-Haytham reversed Ptolemy's visual cone he effected another crucial, but overlooked, reversal. Ptolemy held that, in order for the visual power sent out from the eyes to bring back coloured impressions, it must be stopped by the density of the objects of vision; crassitude was essential for visibility. Contrarily, Ibn al-Haytham held that, in order for colour to be received within eye, the seat of visual sensation in the eye (the crystalline humour) must be dense in a very similar way; a degree of crassitude, which I term the species fixing property, became essential for the organ of vision. Towards the end of the sixteenth century, anatomists and physicians began to draw upon natural philosophy and mathematical optics in order to account for the action and uses of the eye, and to understand the colours of parts of the body and their significance for medicine. New accounts of colour, transparency, and light, along with new distinctions among density and rarity, were developed. Two consequences, emerging from Padua, will be explored. The anatomist and physician Hieronymus Fabricius ab Aquapendente wrote that nature made the eye primarily out of water is because water (unlike air) can be condensed in several ways: one sort alters its degree of refractive power, while another affects the latitude of species fixing. This distinction was crucial for later accounts in optics, including the early reception of the retinal theory of vision. Around the same time a new corpuscular account of colour and transparency arose, first promulgated in the seventeenth century by Santorio Santorio. Later in the seventeenth century this was used (successfully) to discredit Aristotelian accounts of colour in bodies; curiously, however, Santorio presented his corpuscular colour theory as continuous with Aristotelian natural philosophy and scholastic medicine.

Fabrizio BIGOTTI

Far and Near: An Introduction to the Premodern Cosmos

In an age when connections are global, distances have shortened and news travels around the world with the speed of a mouse click, it is easy to forget that this progress takes up less than a fraction of a second in human history. Two major innovations mark the difference between before and after: the industrial revolution, with the replacement of animal labour by automated work, and the decentralisation of human perception, which, from the 17th century onwards, began to be mediated, if not replaced, by instruments. Consequently, while for us the problem of overcoming distances is simply a technical problem of finding the right instruments, in the pre-modern world it means coping with the limited capacity of our sense perception and the fatigue of manual labour. Nature implies limits, and so does the cosmos, which is the ultimate limit of all that exists and can be known. In such a cosmos, “far” and “near” refer to objective limitations in the capacity to see, hear, grasp, manipulate, and ultimately to achieve a result. Everything exists within maximum and minimum limits (*minimum/maximum naturae*) of matter, time, and space, against which the intensity of human effort (*potentia/capacitas*) and the priority of goals must be carefully gauged, lest we overwhelm man with impossible tasks and set ourselves up for failure. In this talk I will explore some of the conceptual and practical implications of reaching the limits of natural capacity in the pre-modern world, and what lessons we can learn from it today.

◆ ◆ ◆

Diagrams of Intensity in Medicine and Natural Philosophy

Diagrams of intensity, that is, the visualisation in the form of lines or geometric shapes of the ratio between opposite qualities in a given compound, had different uses and covered different applications in medicine and natural philosophy. Historically, the earliest diagrams of intensity are found in the commentaries to Galen’s *Ars Parva* (also known as *Ars medica* or *Microtegni*). They were used to represent the persistence over time of a given condition, health or disease, and its progressive deterioration or restoration, depending on the initial state of the subject. The human subject was supposed to have the ability to resist the causes that gave rise to morbid conditions (*potentia resistendi aegritudinis causis*), and thus the deterioration of health was seen as a weakening of the inner strength that allowed the body to remain in balance (*aequalitas*). A greater “latitude” (*latitudo*) from the point of equilibrium corresponded to a greater intensity of the morbid causes, so that the greater the distance from the point of equilibrium, the more severe the patient’s condition. From medicine, the use of latitudes spread to theology and natural philosophy, where it was used to evaluate virtues such as charity or light, speed and heat. This talk will present and discuss a variety of such diagrams, contextualising their purposes and applications in medicine and natural philosophy, as well as their importance in the quantification of properties.



**The Invention of Dynamics:
'Piano' and 'Forte' in Sixteenth-Century Polychoral Music**

One of the most striking applications of intensity in music can be found in the practice of chori spezzati ('split choirs'), the use of two or more choirs, separated in different spaces, which were used together or alternately to create a grandiose effect. The practice reached its peak in Venice at the end of the 16th century with the work of Andrea Gabrieli (c.1533-1586) and his nephew Giovanni (c.1566-1612), and from there spread throughout Europe via Giovanni's German pupils such as Hans Leo Hassler (1564-1612), Michael Praetorius (1571-1621) and Heinrich Schütz (1585-1672). At St Mark's, where they both worked, the two Gabrieli made the most of the spatial characteristics of the basilica, experimenting with the dynamics that could be created by multiplying the masses of sound in the various corners of the building. Historically, this led to one of the very first documented uses of dynamics in music (piano and forte), as can be seen, for example, in the *Sonata Pian e Forte* (Venice 1597) by Giovanni or even before in the *Aria della Battaglia* by Andrea (1590). As organists, Andrea and Giovanni were also keen instrumentalists, writing canzoni da sonar and consolidating the practice of substituting certain voices in the chorus with specific instruments: violins, trumpets, cornets for the higher voices as opposed to viols, bassoons and trombones for the lower ones. This innovation allowed the musicians to add colours (dark or bright) to the instrumentation in order to emphasise the mood of certain passages. In this lecture we will analyse and listen to several compositions by Gabrieli and their contemporaries. No previous knowledge of Renaissance or Baroque music is required, only a willingness to engage with early music.

Amalia CERRITO

**Palms, Pygmies, and Other Borderline Species:
Late Medieval Scholastic Views on the 'Scala Naturae'**

In this lecture, I will examine how 13th-century thinkers treated 'borderline species', i.e., living beings which were perceived as halfway between two steps of the so-called scala naturae. Pygmies, with their rudimentary language, and palms, with their partial local movement, challenged the conventional macro-categories, which established neat boundaries between human, animal, and vegetative realms. In fact, palms' and pygmies' souls perform activities that usually pertain to the living being of the superior step of the scala naturae. Differently from other plants, the palms exercise the local movement (traditionally ascribed exclusively to animals) in order to fulfill reproductive functions. The pygmies' ability to communicate basic information and emotional states through a sort of rudimentary language challenges the idea that language is the prerogative of the animal perfectissimum, i.e., the human being. Are these borderline species to be taken as the most 'evolved' of animals and plants kingdom? Are they evidence of a psychological continuity between living beings? What is the nature of their distinctive functions? Answering these questions, 13th-century authors, such

as Albert the Great and Thomas Aquinas, tried to harmonize ‘borderline species’ within the Christian Neoplatonic outlook, by interpreting natural dynamics as degrees of perfection. On the one side, the comparison between human perfection and animal imperfection allowed to determine the boundaries of pygmy’s cognitive skills; on the other side, animal perfection (in relation to plant imperfection) provided a template to investigate plants’ life, and go deeper into the powers of vegetative soul.

Georgiana HEDESAN ‘De Gradibus’ (c. 1527-1528): Paracelsus on the Grades of Medicine

De gradibus is one of the early tracts of Theophrastus von Hohenheim, called Paracelsus (1493-1541), the ‘notorious’ Renaissance physician and philosopher. *De gradibus*, which was never published during Paracelsus’s lifetime, is dated to his teaching at the University of Basel (1527-1528), which ended with him being cast out of town. In *De gradibus*, Paracelsus was still working with the scope of Galenic humoralism, but began to modify it by collapsing the four traditional qualities (hot-cold, dry-wet) into two: hot/dry and cold/wet. In doing so, he divided all things (‘simples’) into either hot or cold. This may seem like a simplified way of looking at the properties of things, but was complicated by Paracelsus’s peculiar theory that each simple originated from a specific element: for instance, crystals and ice evolved out of the element of fire while lead came from the water element. My talk will emphasise how this Janus-faced treatise sought to reform ancient medicine and solidify new concepts, many of them evolved from his earlier treatise, *Archidoxis* (1525).



Jan Baptist Van Helmont on the Power of Medicines

In this talk I will highlight Jan Baptist Van Helmont (1579-1644)’s perceived hierarchy of medicines. Like many of the medical reformers of his era, Van Helmont emphasized the value of simples in curing. In particular, he advocated the use of minerals and plants. At the same time, at a superior level of efficacy he placed what he called ‘the Arcana of Paracelsus’, specific medicines that had been advocated by the Swiss physician Paracelsus in his works. Although most of these were drawn on Paracelsus’s early work *Archidoxis* (1525), Van Helmont also adopted other key medicines from other parts of the Paracelsian corpus. He further claimed that these were powerful medicines that could master any disease, but they were still inferior to the Universal Medicine (lapillus) that he had witnessed in the possession of a contemporary Irish alchemist named Butler. At the top of his hierarchy, however, Van Helmont placed what he called ‘The Tree of Life’ (*Arbor vitae*), the only medicine that had properties of radical life extension.

Linda KARSHAN

Sound, Heat and Colour: the Performative Drawings of Linda Karshan

Considering our topic, heat, colour and sound in the early modern period, I will approach SOUND from my experience of performance drawing in the studio, and historic spaces. With the students, we'll pay close attention to two new, acoustic drawings made in NY, 2023, called 'In Moccasins' and 'In Taps.' Having studied grades and shades of colour as WEIGHT at Skidmore College, as part of my Bauhaus training, I'll bring a knowledge of 'colour weight' to SOUND as it plays out in my performance drawing today. There must never be 'too much colour'. Beckett, to Billie Whitelaw, rehearsing Not I. The acoustic drawings should come across as 'found objects'--something one has always heard. Something familiar. 'Performance Drawing': it's a case, as Frances Bacon wrote about 'Essay', 'the word is new; the thing is ancient.' As long as man has made a mark of himself, he has done so through the movements of his body, and mind. My marks and moves are triggered by an inner choreography of numbers, rhythms and the necessity to turn my sheet, or body, 90% counterclockwise before beginning anew. 'I listen; just listen' to the sounds of my choreography. 'Listening to the sound is a sculptural act; the ear is the genuine sense of sculpture.' Josef Breuys: 'One sees, and hears, this clearly in all the Walked Drawngs. An original genre, the Walked Drawings are filmed and recorded. From the third drawing of this genre, I have been miked. This, so that the audience can hear the drawing even when I am out of sight. Attention must be paid to the sound. This experience is heightened in the new acoustic work. We'll begin the workshop by viewing together the first Walked Drawing, Linda's Room, A Moth Will Turn the Balance, performed in the Chapter Room of The Abbey of San Giorgio Maggiore, Venice, August, 2018. I wore trainers; the acoustics of the Chapter Room gave voice to my movements, which we'll SEE and HEAR. 'The moving figure assigned to me' comes to life. Linda's Room will thus set the stage, in the mind's eye, for 'In Moccasins' and 'In Taps', performed and recorded in the Judson Memorial Church, 3 February, 2023.

Martin KEMP

Leonardo's Eye and What Lies Outside the Range of "Moderateness".

Leonardo begins his optics of the eye by assuming in an Albertian manner that the eye is designed to work geometrically with the visual pyramid according to Euclidian rules. By the time of MSD, "On the Eye" from c.1507, his knowledge of Mediaeval and Islamic optics results in his technique of optical uncertainty, not only in conditions of high intensity but also in normal sight. The implications extend beyond acts of seeing and into issues of negative theology.

**Beyond Intensity: Extreme Visual Effects in Dante, Piero della Francesca, Raphael and Others.**

Dante's "Paradiso" is less obviously "picturesque" than the two preceding canticles. It poses extreme problems for painters who have only pigments to represent divine dazzle, which visually predominates in the heavenly realm. The great master of divine light in the Renaissance art is not Leonardo or Michelangelo but Raphael, whose brilliant portrayal of ineffable radiance, set the standard for Correggio, and for dome and vault painters in the Roman Baroque

Andreas LAMMER**Avicenna on the Metaphysics of Mixture.**

Mixture is a peculiar phenomenon. On the one, hand it is intrinsically intuitive: most substances (in the modern, non-Aristotelian sense) we encounter everyday are not pure but, in one way or another, mixtures. We add sugar and milk to our coffee and salt to our soup. On the other hand, however, mixtures are difficult to explain, especially from the perspective of a Peripatetic philosophy, even if we allow for a certain latitude of forms, such that intricate questions tend to remain: which mixed substances have forms – and which forms do they have? Alongside these questions we find other ones about the potential recovery of the ingredients of a mixture or that about the ontological status of artefacts. Avicenna is one of the most vehement supports of Aristotelian hylomorphism in history and a keen observer of the natural world. In this lecture, we will consider his position on the vexed question of the metaphysics of mixtures and attempt to understand his views on both how mixtures come about and how they should be explained vis-à-vis his ontological commitments. What is more, Avicenna's theory of drugs in his medical writings will also be explored as a means to understand how his theory of mixture finds its actual implementation of practice and does not remain pure theory.

**Canonical Elements for Physicists and Physicians**

Avicenna was not only one of the greatest philosophers of all times, he was also one of the greatest physicians. According to his conception of science, one way to classify medicine is in fact to regard it as a kind of "applied natural philosophy". In fact, Abū Sahl al-Masīhī, one of Avicenna's teachers and a distinguished physician and philosopher in his own right, explicitly distinguishes logic from theoretical (*'ilmi*) sciences and both from applied (*mihnī*) sciences, the latter of which include mechanics, agriculture, and alchemy alongside medicine. Consequently, it is hardly surprising that Avicenna begins his celebrated *al-Qānūn fī l-Tibb* ("The Canon of Medicine") with a short but detailed account of the basic elements of natural philosophy and physics. In this presentation, I will attempt to outline the core of his

account from *al-Qānūn fī l-Tibb* and to show how it is implemented later in his medical theory, especially in such chapters that deal with the diagnostic aspects of a practicing physician, i.e., in those chapters that speak of degrees of symptoms, including colour, texture, odour, density, and temperature of, for example, urine, sweat, hair, or the skin. I hope to underscore the natural philosophical foundation of medicine and demonstrate in what way – from the viewpoint of Avicenna – natural philosophical views about intensity and latitude as well as the fundamental assumption of hylomorphism bear on medical practice.

Alexander MARR Increasing Intensity: Burning Mirrors

In the 1620s, the German merchant Peter Linder and Italian mathematician Mutio Oddi sat to their mutual friend, the painter Daniele Crespi, for a double portrait. It depicts the two friends in a studiolo, discussing a diagram amidst mathematical instruments and a framed concave mirror. Taking this portrait as its starting point, this lecture will consider the subject these two virtuosi were addressing—the geometry of parabolic reflectors—in the context of late Renaissance efforts to increase the intensity of the sun's rays through the manufacture of 'burning mirrors'. These purportedly powerful magnifying devices had a long story in history and myth, stretching back to Archimedes' legendary technological wizardry in burning the ships of Marcellus at the siege of Syracuse. Ca. 1600, efforts focused on new technologies of mirror polishing combined with refined understanding of conics, which aimed not only at increasing intensity of light and heat, but also forging new knowledge of nature. The lecture will touch on the material culture of mathematics; *amicizia* (friendship) in the pursuit of natural knowledge; the invisible and the real in optical experiments; myth and reputation in 'mathematical humanism'; portraiture and the visual culture of diagrams in Renaissance art and science.



'Others See It Yet Otherwise': Debating the Pre-Modern Cosmos with 'Disegno' and 'Pittura' in a Picture Gallery

This lecture, spread over two sessions, examines a unique pictorial meditation on one of the early modern period's most important and contested subjects—the cosmic system—in a painting that connects aesthetic theory and practice to natural philosophy. The work in question, a masterful but anonymous example of the Flemish 'pictures of collections' genre, depicts personifications of *Disegno* (design) and *Pittura* (painting) in a richly decorated gallery filled with paintings, sculptures, books and instruments. Commissioned by the German merchant Peter Linder—aided by his friend and tutor, the mathematician Mutio Oddi—its allegory revolves around a diagram of the three competing cosmic systems (of Ptolemy, Copernicus, and Tycho Brahe) with the motto 'Aly et alia vident' ('Other people see it otherwise', or 'Different people see it differently'). We will explore the ways in which this

remarkable painting vividly staged the debate between these competing systems of ordering the cosmos, in relation to arguments about vision, measurement, and the nature of credibility. In particular, we will think about the picture's claims for a profound link between art and science: namely, the respective roles of (mathematical/metaphysical) *disegno* and (sensorial/natural) *colore*, who appear in the gallery in the guise of an old sage and young woman. In the context of the objects strewn about the gallery—artworks by ancient and modern masters, mathematical and optical instruments, books on music and astronomy by Johannes Kepler—the painting presents in microcosm the 'bigger world' of aesthetic and cosmic theory and practice. Challenging the viewer to interrogate how they 'see' the world, its principles, and its artefacts, the painting invites reflection on the most intense debates of the early modern era. Which was more reliable: mathematics or observation? What is the best route to truth: art or science?

Vivian NUTTON

Measurement, Precision, and Certainty in Humoral Medicine

One of the accusations commonly levelled against pre-modern medicine is its lack of interest in measurement, by which I mean the representation of physical states by means of numbers. Instead, the focus was on qualitative changes related to some form of imbalance, whether in the form of humours and elements, as in the Hippocratic-Galenic tradition, or in the atoms and void of the Methodists. A third group, the Empiricists, rejected any search for the causes of illness in favour of an emphasis on deploying therapies that had worked in similar cases in the past. Measurement, where it occurred, was, with one exception, confined to therapy rather than diagnosis. Drug handbooks often, but not always, specified the quantity of substances that made up a compound remedy and, less often, prescribed the amount that should be taken by the patient. This was not at all easy, given the proliferation of ancient weights and measures: perhaps the earliest of our surviving medical texts, the Hippocratic Epidemics I and 3 knows both an Aeginetan and an Athenian system of weights and measures. And how large was an Egyptian bean, a common denomination of quantity? Not surprisingly, we find metrological handbooks attempting to collate different systems. Diagnosis is different from therapy. Compared with, for instance, the subtle variety of surgical instruments, some devised by doctors to deal with specific injuries, we know of only one instance of an instrument used for diagnosis. Herophilus, ca. 280 BC, in Alexandria is said to have devised a portable water clock to time the pulse, which he was among the first to use as a criterion for diagnosing illness. Although modern scholars believe that it was constructed and could have worked, there is nothing to suggest that anyone followed him. But this did not mean that premodern doctors did not wish to form as accurate a diagnosis as possible of their individual patient. Galen's whole oeuvre is characterized by words such as certainty, precision, and solidity that he believed could be achieved by a combination of observation and logic. His case histories are meant to

depict him as a master of differential diagnosis, working from observation of as many things as possible, and gradually eliminating those that were irrelevant until he reached a conclusion about the causation of a condition. His opponents, the Methodists, stressed how observing the patient allowed one to set his or her condition into one of several general categories, which might then be modified as treatment progressed. Galen often invokes geometry as the model for accurate logic, and sometimes resorts to geometrical explanation in describing the eye or the workings of parts of the body. Galen himself wished to go further in his therapy, devising several schemes dividing illness into categories and then seeking to correlate their severity with the effectiveness of drug action. The fact that none of his schemes was ever fully completed – that was left to Arabic authors in writing about Grades of drug action – should not hide his wish for precision. Galenism also stressed the individuality of illness as the greatest challenge to a precise diagnosis, something that we are on the way to overcoming thanks to DNA, with its revelations about our individual genetic predispositions, and it is unfair to blame earlier doctors for their failure to achieve the impossible. But know your patient in health as well as sickness is still a good motto, as well as being the staple of medical practice for centuries. Premodern diagnosis was, on the whole, concerned with qualitative changes that could be perceived not just by sight, hearing or smell, but by taste (of sweat or urine) and in particular by touch. The hand is the most wonderful work of creation, as well, in Galen's view, the most precise diagnostic instrument. It not only allowed judgments about hot and cold, wet or dry, the primary qualities in Aristotelian element theory, but also could be trained to become more effective a guide. Palpating is a skill even depicted on grave monuments of doctors. This was most evident in taking the pulse, something that was fundamental in medicine from the late 4th century BC onwards, and was regarded well into the 20th century as something not abolished by technological aids – and is viewed as crucial in many non-Western medical cultures. Classifying the pulse presented its own difficulties, and some, from late Hellenistic times onwards, employed the language of music: the music of the pulse links with ideas of the music of the spheres and reminds us that music down to the renaissance and beyond was a mathematical art and as such capable of precision. Galen's pulse books, which the second part of the paper will discuss, provided the foundation for all subsequent studies of the pulse. They set out his ideas on pulsation (largely, but not entirely, overturned by Harvey's discovery of the circulation of the blood), his recommendations for taking the pulse, and the varied ways in which he sought to relate his findings to dealing with illness.

Sylvain ROUDAUT

Degrees of Being and Degrees of Species

The perfection of species is one of the most fascinating topics discussed by medieval philosophers where the notion of degrees was involved. Late medieval thinkers, from the mid-14th century onward, started to conceptualize the series of species composing

the natural world as degrees of a ‘latitude of being’ (*latitudo entis*). This move enabled them to apply quantifying techniques to the metaphysical structure of the created universe that were originally conceived for calculating degrees of sensible properties like color or heat. After having presented the origins of these reflections, the lecture will aim at explaining how this topic evolved during the Renaissance and became gradually associated with various cosmological speculations until the time of Galileo. The evolution of the theme demonstrates the importance of the metaphysical background of late medieval discussions about degrees through the Middle Ages and the Renaissance.



‘Minima naturalia’ and ‘Atoms of Intensity’

This lecture will focus on the status of intensive degrees in late medieval and early modern thought. A common assumption shared by an overwhelming majority of philosophers in the earlier medieval tradition was that degrees of intensity are essentially divisible entities. Degrees, in other words, were conceived like other magnitudes (space, time, motion) as continuous properties which cannot be decomposed into atoms or indivisible parts of intensity. Yet, an important shift in the conception of degrees took place at the turn of the 16th century, leading different thinkers to offer a competing conception of degrees in terms of atoms of intensity. The positions defended on the topic by members of the John Mair circle (Luis Coronel, Juan Celaya, Diego de Astudillo), who defended such views, will be explained. The last part of this lecture will discuss the influence of this change of paradigm on Galileo and, more generally, on the modern conception of measure.



Measuring Degrees of Intensity in 14th-Century Natural Philosophy

The 14th century witnessed a massive tendency initiated by philosophers, theologians and physicians to quantify different types of phenomena. This tendency to quantify phenomena led natural philosophers to investigate the means to measure different properties like speed, heat, light, material density or color. The concept central to these attempts to quantify natural properties was the notion of degree of intensity. Apart from the case of motion, which could be described quantitatively with some units of measure (distance in feet traversed during an hour, for instance), philosophers and physicians had no units of measure for calculating properties like heat, light or color. How was it then possible to quantify the degrees of intensity of these properties? This lecture will offer an overview of the way natural philosophers in the 14th century tried to ‘measure’ such properties by using the mathematical theory of proportions available at that time. It will be shown how these philosophers managed to define different possible conventions for measuring degrees of natural properties and the different problems raised by these conventions. This overview will provide material to address a more general questions about medieval science: Was the medieval project of quantifying degrees of intensity

doomed to failure? Are there limits, and if so which ones, to a quantitative approach of qualities?

Alain TOUWAIDE Taste, Intensity, and Efficacy of ‘Materia Medica’.

A fundamental question in the management of a remedial therapeutic strategy is the right amount of the medicine to be administered and, more than anything, the right intensity of the action expected from a remedy to efficaciously counteract the action(s) of the pathogen(s). This question has rarely been addressed, if at all. This presentation will try to lay down the basis for its study. It will link taste, intensity and efficacy to check whether they might correlate positively. It will use as a basis the largest collection of information on materia medica of Antiquity that has been preserved, *De materia medica* by Dioscorides (1st cent. A.D.) and will compare resulting data with available contemporary pharmacological assessment of traditional materia medica. This presentation is expected to highlight the role of taste (both flavor and intensity) as a heuristic element for the prediction of efficacy according to the ancient nosological system.

Giulia Martina WESTON Pigments and their Market in the Italian Renaissance

As recently shown by the exhibition *Chroma: Ancient Sculpture in Color* (New York, The Metropolitan Museum of Art), colour helped convey meaning since antiquity. Subsequently, the role it played in shaping the viewer's reception of art was formalised in the writings of Cennino Cennini, Leon Battista Alberti, and the advocates of Venetian *colore*. By means of exploring both the materiality and symbolic meaning of pigments, this lecture wishes to cast brighter light on the wider social history of colour, scanning the Italian Renaissance art market and identifying its actors. A set of comparisons between Central-Italian painters (Gentile da Fabriano, Masaccio, Fra Angelico) and Northern-Italian masters (Lorenzo Lotto, Titian, Veronese) will illuminate our enquiry. Which is the difference between azurite and ultramarine blue? How could artists obtain different shades of black? Which socio-economic status was associated with the profession of colour seller (*vendecolori*) in 16th-century Venice? These are some of the issues that will be addressed with the aid of technical data and archival records. Taking our cue from Michael Baxandall's assumption that 'painting was too important to be left to the painters', we shall map the presence and weight of colour in artists' contracts and preparatory drawings, discussing the role of patronage and the boundaries between craftsmanship and the liberal arts.



**A Brief History of Ultramarine Blue:
Making, Meaning, and Conservation Issues**

The intensity of blue has long been a serious business in artistic matters. Although archaeological evidence and accounts in early literature have shown that lapis lazuli

was used as a semi-precious stone and decorative building stone from early Egyptian times, and the mineral is accurately described by such classical authors as Theophrastus and Pliny the Elder, it especially from the 15th century that it was used ground as a painting pigment. A sign of distinction and the emblem of spiritual perfection, ultramarine blue may have been perceived as a status symbol, with its cost generally being twenty times higher than any other pigment. Lapis lazuli were imported from modern-day Afghanistan via Baghdad and Constantinople, and the costly ultramarine pigment was obtained through a labour-intensive process. Visual analysis will especially focus on the output of 17th-century artists Carlo Dolci and Sassoferrato, in an attempt of grasping the meaning of their idiosyncratic use of ultramarine blue in the light of Baroque ethics and aesthetics. Lastly, we will consider the peculiar conservation issues posed by ultramarine blue pigments, and how technical analyses of this pigment may assist art historians in the process of authenticating and dating a painting.





Speakers' Biographical Outlines

Tawrin Baker is Visiting Assistant Professor in the Program of Liberal Studies at Notre Dame University. He received his PhD in the History and Philosophy of Science from Indiana University, Bloomington. He has been a Mellon Postdoctoral Fellow in History and Philosophy of Science at the University of Pittsburgh, a Dibner Long-Term Fellow in History of Science and Technology at the Huntington Research Library, and a Postdoctoral Fellow in Visual Studies at the University of Pennsylvania. His research focuses on the intersection of anatomy and medicine, natural philosophy, and mathematics in the early modern period. Projects include a monograph, currently titled *Chiasmata: Visual Theory in the Intertwined Histories of Anatomy, Natural Philosophy, and Optics, 1500–1650*, as well with a complementary project examining the (related, but independent) history of diagrams and pictures of the eye during roughly the same time period. He is also in the early stages of a project investigating shifts in the methods in comparative anatomy during the sixteenth and seventeenth centuries, and the relevance of this shift for debates concerning human vs. animal speech.

Fabrizio Bigotti is DFG Fellow at the Institut für Geschichte der Medizin, Julius-Maximilians-Universität Würzburg, Honorary Fellow at the University of Exeter (UK) and Founding Director of the Centre for the Study of Medicine and the Body in the Renaissance (CSMBR). He is co-editor of the series *Palgrave Studies in Medieval and Early Modern Medicine* (PSMEMM, Springer Nature) and has published extensively on all aspects of the history of science, medicine and technology (1300-1700), with a focus on the emergence of quantification and the invention of precision instruments. He is currently Principal Investigator (Eigene Stelle) on the project “Measuring the World by Degrees. Intensity in Early Modern Medicine and Natural Philosophy (1400-1650)” funded in 2022 by the German Research Foundation (DFG - Project no: 461231785).

Amalia Cerrito is an Associate Member of the Centre for the Study of Medicine and the Body in the Renaissance (CSMBR). She studied history of medieval philosophy at the Universities of Pisa

and Florence and has published journal articles on the interaction between natural philosophy and the biblical exegesis of Albert the Great. Amalia's recent publications are devoted to the theoretical background of Albert the Great's natural philosophy and Neoplatonism's influence on his theories of zoology, botany, and embryology.

Georgiana (Jo) Hedesan is Departmental Lecturer in History of Science at the University of Oxford, specialising in the history of alchemy and alchemical medicine. Her first book, *An Alchemical Quest for Universal Knowledge: The 'Christian Philosophy' of Jan Baptist Van Helmont (1579-1644)* was published in 2016 by Routledge. A co-edited book (with Tim Rudbøg, Copenhagen), *Innovation in Esotericism from the Renaissance to the Present*, was published in 2021 by Palgrave Macmillan. Prior to this, she was Wellcome Trust Postdoctoral Fellow in Medical History and Humanities at the University of Oxford (2013-2017). In the past, she has also held short term fellowships at the University of Amsterdam, the Science History Institute, the Warburg Institute, Science Museum London, Worth Library Dublin and Herzog August Bibliothek Wolfenbüttel. She concluded her PhD in History at the University of Exeter in 2012, holds two Masters degrees (Exeter and Leeds), and two BAs in History and Economics from the University of Nevada, USA.

Linda Karshan was educated at Skidmore College, Saratoga Springs, NY; the Sorbonne, Paris; and the Slade School of Art, University College London. She earned a Masters in Humanistic Psychology from Antioch Centre for British Studies, London. Karshan's solo museum exhibitions include those at Museum Pfalzgalerie Kaiserslautern; Kettle's Yard, Cambridge, UK; Sir John Soane's Museum, London; and Institut Valencia d'Art Modern, Valencia. Her works were featured in group exhibitions at the Courtauld Gallery, London, Kettle's Yard, Cambridge, UK, Kupferstichkabinett, Berlin, The British Museum, London, Graphische Sammlung, Munich, and Folkwang Museum, Essen, among others. Karshan's drawings, prints and artists' books are held in major public and private collections in Europe and the United States. In July 2022, Karshan was awarded an Honorary Fellowship by The Courtauld Institute of Art in London. Later that year, an exquisite selection of her drawings and prints was exhibited at the show *The Universe on Paper: The Art of Linda Karshan* (Pisa, Domus Comeliana), hosted by the Institutio Santoriana – Fondazione Comel. Linda Karshan is the first Artist in Residence of the Centre for the Study of Medicine and the Body in the Renaissance.

Martin Kemp is an Emeritus Professor of Art History at the University of Oxford, and one of the world's leading authorities on the life and works of Leonardo da Vinci and the author of many books on Leonardo. He has also written about visualisation in art and science, particularly anatomy, natural sciences and optics. As well as a fellow of the British Academy, Martin holds

honorary fellowships at Trinity College, Oxford, and Downing College, Cambridge.

Andreas Lammer is Assistant Professor in History of Philosophy at Radboud University Nijmegen. He studied philosophy and German language and literature at the University of Würzburg, received his master's degree in philosophy from King's College London, and obtained his PhD in philosophy and Arabic studies from LMU Munich. Before his appointment at Radboud University, he worked as a research associate at the LMU and the Thomas Institute of the University of Cologne, and was Junior Professor of Arabic Philosophy, Culture, and History at Trier University. His primary research interests are in Greek, Arabic, and Latin natural philosophy in both the Aristotelian and the Avicennian tradition, and more broadly in the transmission of philosophical and scientific literature from Greek into Arabic and from Arabic into Latin.

Alexander Marr is Professor of Renaissance and Early Modern Art at the University of Cambridge and a Fellow of Trinity Hall, where he is Dean of Discipline. He specializes in European art and architecture ca. 1400-ca. 1800, especially their intellectual, literary, and scientific aspects. Between 2014 and 2019 he directed the interdisciplinary research project *Genius before Romanticism: Ingenuity in Early Modern Art & Science*, funded by an ERC Consolidator Grant. His books include *Rubens's Spirit: From Ingenuity to Genius* (2021); *Logodaedalus: Word Histories of Ingenuity in Early Modern Europe* (2018); *Between Raphael and Galileo: Mutio Oddi and the Mathematical Culture of Late Renaissance Italy* (2011); *Curiosity and Wonder from the Renaissance to the Enlightenment* (2006). He is currently writing a monograph on Hans Holbein the Younger and ingenuity (Holbein's Wit) and editing Richard Haydocke's translation of Lomazzo's *Trattato* for the MHRA.

Vivian Nutton is an Emeritus Professor at the Centre for the History of Medicine, University College London, and current President of the Centre for the Study of Medicine and the Body in the Renaissance (CSMBR). Nutton acquired a BA in Classics at Cambridge in 1965 and subsequently taught there as a Fellow of Selwyn College (1967–77). He received his PhD in 1970. Since 1977 he has worked at the Wellcome Trust Centre for the History of Medicine as a Lecturer, and since 1993 as Professor. He is a member of several international learned societies and a Fellow of the British Academy. Since 2015 he has worked at I.M. Sechenov First Moscow State Medical University (1st MSMU). His main field of research is the Greek physician Galen. Beyond that, his work comprises the whole of the ancient history of medicine and its reception history, in particular during the Renaissance and in the Muslim world.

Sylvain Roudaut (PhD, 2017) is a postdoctoral researcher at Stockholm University. His research focuses on the history of medieval philosophy and, more precisely, on the interactions between metaphysics, natural philosophy and mathematics in the Latin and Arabic traditions. He is

particularly interested in how mathematical concepts were applied in the Middle Ages to different physical problems (motions, qualities, mixtures) and metaphysical themes (species, perfections, transcendental properties). His recent publications include *La mesure de l'être. Le problème de la quantification des formes au Moyen Âge* (ca. 1250–1370), Leiden/Boston, Brill, 2021.

Alain Touwaide is a US historian of medicine and sciences of Belgian origin. He earned a PhD in Classics at the University of Louvain (Belgium, 1981) and a Habilitation à diriger des recherches in Ancient and Medieval History at the University of Toulouse (France, 1997). He researches the history of ancient science, particularly botany, medicinal plants, medicine and therapeutics in the Mediterranean World from archaic Greece to the Ottoman Empire. To foster the development of original research in this vast and complex field of research he has co-founded the Institute for the Preservation of Medical Traditions in 2007. The most recent of his multiple publications is *A Census of Greek Medical Manuscripts* (London and New York: Routledge, 2016) published in the series Medicine in the Medieval Mediterranean that he has created.

Giulia Martina Weston holds a PhD from The Courtauld Institute, where she has been Associate Lecturer since 2016. She is Consultant Lecturer at Sotheby's Institute of Art and a member of several editorial boards. Giulia Martina authored the monographs *Niccolò Tornoli (1606-1651). Art and Patronage in Baroque Rome* (2016) and *Siena Circa 1630. A «Paragone» Between Rutilio Manetti And Niccolò Tornoli* (2022), and co-edited the volumes *I Pittori del Dissenso* (2014) and *'A tale of two cities': Rome and Siena in the Early Modern Period* (2020). Her forthcoming book focuses on Salvator Rosa's afterlife and influence in Britain. She is Delegate for Art and Visual Culture and member of the Governing board of the Centre for the Study of Medicine and the Body in the Renaissance (CSMBR) – Fondazione Comel (Pisa). In 2022 she curated the exhibition *The Universe on Paper. The Art of Linda Karshan* at the Domus Comeliana in Pisa, and organised its accompanying international conference at the Opera della Primaziale Pisana.



csmbr.fondazionecomel.org

info@csmbr.fondazionecomel.org