Marta Ajmar

Reciprocal Design in Italian Renaissance Wood Intarsia: Patterns, Parasites, and Human/More-than-Human Making

This article explores how Italian Renaissance *intarsia* emerged from making practices sensitive to wood as animate material, and from a design correspondence with its environment. It argues that intarsia reconciled different modes: design-drawing, design *in* wood, and design *with* wood. These interconnected practices allow us to reconfigure intarsia as a technology created holistically from the correspondence of different human and more-than-human forces, including parasites – such as woodworm and fungi – and elemental factors – such as heat, water and air – all mobilised in active processes of pattern-making. It shows how this "Wood Age" craft is also an ecologically-rooted response to growing concerns about timber availability and forest sustainability. Finally, it proposes for intarsia the concept of *reciprocal design*, where patterns emerge from continuous correspondence and co-making between human and more-than-human agents.

Keywords: intarsia; Renaissance; making; reciprocal design; environmental art history; environmental design history

A magnificent, colourful rooster (fig. 1), a powerful Christian symbol of resurrection and of the hope coming with the new day, promenades in an open landscape on a reflective carpet of grass at the centre of one of the intarsia panels for the monumental sacristy of the church of Santa Maria dell'Organo in Verona. This is the work of one of the most distinguished *maestri intarsiatori* of the Renaissance, the Olivetan monk Giovanni da Verona (1457–1525), initiator of a manner of inlay that combined ambitious multi-layered design and execution with material experimentation involving heightened craftsmanship and sustained processes of correspondence with more-than-human actors. The feathers of the rooster (fig. 2) involved the creation of dozens of tight-fitting wooden tesserae where the different coloration relied on the use of a diverse range of woods, from bog oak for the black (*legname nero*), to walnut and possibly maple for the lighter shades of brown. The wooden pieces would be chosen for their inner design, for their intrinsic figuration and balance of light and shade. Once applied to the wooden support, the individual feathers would have also been designed *in*, with coloured pastes and possibly also wood filaments applied to thin incisions to generate a meshwork of patterns evoking the multicoloured and variedly textured effects of actual bird feathers. At the feet of the rooster, a large patch of silvery green grass (fig. 3), growing over bare rocks, adds special vibrancy to the composition. The grass, which would have originally been more variegated and a much more intense shade of green, was made using a newly-discovered wood type of Renaissance intarsia, *legname verde* or 'green wood', the result of an infestation by an emerald-coloured fungus, the *Chlorociboria* (fig. 4).[1] Crucially, *legname verde* had to be sourced at the right moment, because an excessively long exposure to the fungus would have eventually disintegrated the wood, making it unusable. A process of close

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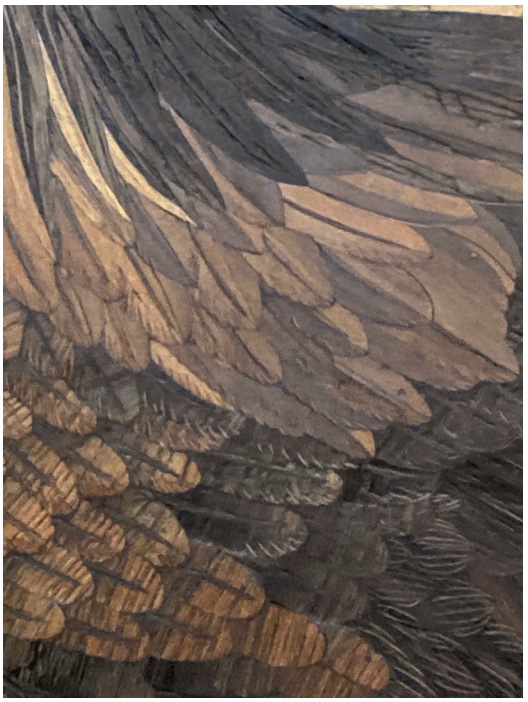
1 Giovanni da Verona, *Spalliera with Rooster and Landscape*, 1519–1523, wood intarsia, 58 × 99 cm. Verona, Santa Maria dell'Organo, Sacristy



2 Detail of fig. 1

correspondence, of co-making, between artist and this more-than-human 'parasitical' agent was then required in order to find and harvest the wood in a timely manner. It is proposed here to call this intimate, physical and temporal partnership between maker, material and environment designing *with*. This relationship of interconnectedness and reciprocity between human and more-than-human domains in the creation of patterns is, we will show, a distinctive feature of Renaissance wood intarsia.

This chapter explores how Italian Renaissance intarsia emerged from practices of manipulation sensitive to wood as a living, animate material, and from a deep design correspondence with its environment.[2] It argues that intarsia recon-

3 Detail of fig. 1

4 Cup-shaped, bright green coloured fruiting bodies of green elf's cup (*Chlorociboria Aeruginascens* sp.) turning rotting wood green

ciled different modes: design-drawing, design *in* wood, and design *with* wood, where reciprocality and eco- and bio-creativity emerge as significant factors.[3] This deeply interconnected set of practices allows us to reconfigure intarsia as a technology created holistically from the correspondence of different human and more-than-human forces, and ecologically rooted. Thus we will craft for intarsia the concept of *reciprocal design*, where patterns emerge from continuous correspondence and co-making.[4] Within this approach, form is not imposed aprioristically onto supposedly passive matter, but dynamically generated through reciprocal action, in a field of forces where the living wooden matter and its environment have a central role to play.

We will show how Renaissance intarsia belongs to the "Wood Age", but is also a response to growing concerns about the availability of timber and the sustainability of forests. Intarsia developed as a form of artisanal epistemology, where knowledge was generated through a sustained and self-reflexive engagement with material manipulation and making.[5] Situated at the confluence between different bodies of learning, ranging from agronomy to natural philosophy, this technology might be seen as contributing to a sphere of useful knowledge.

We will place intarsia within the long-standing epistemic system affirming a clear homology of pattern between humans/animals and trees, which are seen to be sharing a common morphology and animacy. By exploiting and making manifest the potential intrinsic within wood as a living substance, intarsia could engage with a material mimesis of nature and of its underlying processes of genesis. We will show how intarsia did not just aim to look like nature, but to embody and show

off nature's active generative forces, in a process whereby patterns expressed co-making. Whereby the inner, morphological properties of trees – such as the peculiarities found in their "skin, blood, flesh, sinews, veins, bones and marrow",[6] parasites from woodworm to fungi, and elemental factors affecting wood – such as fire/heat, water and air – were all mobilised in processes of pattern making, helping reduce waste and enhance material meaning. Thus technological innovation in intarsia went hand in hand with a heightened sensitivity for wood as a living resource requiring reciprocity in design. It might even be argued that intarsia relied on bio- and eco-creativity and on co-making as co-becoming, where design emerged from human and more-than-human agents working and developing together.

Introducing Intarsia

In the Renaissance, wood inlay or intarsia was a technology of significant innovation and reinvention. As a form of veneering, its immediate antecedents have usually been found in Islamic Spain during the Nasrid period (1238–1492), where wood inlay was used for significant commissions, such as *minbars*, as well a wide range of smaller artefacts.[7] It is often assumed that boxes decorated with small wooden and bone tesserae such as this one attributed to Granada (fig. 5), might have been involved in the process of transmission into the Italian peninsula. Derived from the Arabic *tarsi'* meaning 'to stud, to inlay', the technology became *tarsia*, *tarsiamento* and more commonly *intarsia* or *commesso* in Italian.[8] The specificity of the technique that developed in Italy, when intarsia began to develop in the fourteenth century, makes the term 'in-tarsia' as 'in-crusting' very appropriate, as it involved applying a thin veneer or crust of wooden tesserae or tiles to a matrix, which was either flat, or in which a hollow had been carved to receive them, thus laying-in the tiles.

While the importance of the Medieval Islamic artefacts as immediate forerunners for Italian intarsia must be highlighted, as a technology wood inlay has a much longer history. It has been documented in ancient Egypt and in classical Rome, where its blossoming was recorded by literary sources, including Pliny the Elder. In his *Historia naturalis*, a book whose influence on Renaissance thought and artistic practice cannot be overestimated, and that continued to be a guiding light on natural matters throughout the early modern period, Pliny emphasises how the technology responds to economic interests, whereby veneers of more luxurious woods would be applied to more ordinary timber "in order to make a single tree sell many times over".[9] He singles out the woods best placed for cutting into layers and employed as a veneer for covering others, mentioning trees that would also be regularly used in the Renaissance, such as the different varieties of the maple, the box, the oak, the root of the elder, and the poplar.[10] Significantly, Pliny points out the regular use of the inner design

5 Casket from Granada (Spain), c. 1450–1500, wood covered in micromosaic decoration in wood and bone, 16.2 × 24.1 cm. London, Victoria and Albert Museum

of woods, for example parts with tuberosities, which became a distinctive feature of Renaissance intarsia, noticing that "it is the central part of trees that is most variegated, and the nearer we approach to the root the smaller are the spots and the more wavy".[11] Pliny shows a real engagement with wood as a material with intrinsic patterns, for example by highlighting how maple wood (*acero*) is noticeable for its "peacock tail" motifs and its "ondulated lines and stains", all features to be found extensively within Renaissance intarsia.[12] Although there is no suggestion that in Roman times intarsia would be figurative, the similarities between Pliny's description of ancient veneer and Renaissance inlay suggest that the latter might have to some extent be consciously reviving classical precedents, particularly with regard to giving prominence to wood as a material where patterns mattered. This potentially elevating connection with antiquity, however, did not seem to have registered significantly with the contemporary art discourse, as I will discuss in the following section.

Wood Intarsia: A Faulty Technology?

Renaissance wood intarsia is an art that has often been met with harsh criticism and even disdain. Its unique design requirements and its novel technological and material imperatives triggered negative responses already among its contemporaries. By the early-seventeenth century, we famously find the verb *intarsiare* used figuratively and derogatively by Galileo, to refer to clumsy poetic practice where the expression is incoherent, disconnected and broken and where "dry" and "raw" intarsia is opposed to "soft" and "round" oil painting, reliant on *sfumato*.[13] Giorgio Vasari is a good example of this attitude and offers some reasons for this intellectual disregard for intarsia. In the *Vite*, he devotes a not insignificant space to wood intarsia, but his attention to this *arte* carries a profound dislike for what is seen as a restrained design potential and essentially faulty materiality. Both, in his view, hinder the full expression of *disegno*:

> Because such a line of work consists only in the choice of designs that may be appropriate to it – those containing blocks of buildings and objects with rectangular outlines to which force and projection can be lent by means of light and shade – it has always been exercised by persons possessing more patience than *disegno*.[14]

Thus, in Vasari's view, intarsia's technological demands are seen to threaten, rather than enable and manifest, *disegno*. In addition, the specific material properties of wood intarsia are seen to conspire against *disegno*, as we learn from an anecdote in the life of the sculptor and architect Benedetto da Maiano, where Vasari recounts how the Florentine master abandoned his previous practice as a woodcarver (*intagliatore di legname*), where he had excelled in the art of intarsia work after an embarrassing episode involving a commission for the court of King Matthias Corvinus.[15] Mildew and humidity had softened the glue of Benedetto's intarsia chests during the journey to Hungary in such a way that almost all the pieces of intarsia had fallen off. In Vasari's words, the fault has resided "in the exercise [of intarsia], which was low, and not in Benedetto's ingenuity, which was high and rare".[16]

The other area attracting Vasari's criticism is intarsia as a form of painting. After placing it firmly under its umbrella, Vasari proceeds to dismantle intarsia's ability to compete with painting:

> Though many things have been produced in this line, such as representations of figures, fruit and animals, some of which are in truth most life-like, yet since it is a work that soon becomes black and does not do more than counterfeit painting, being less than painting, and is also of short duration because of worms and fire, it is considered time

> thrown away in vain to practise, although it may indeed be both praiseworthy and masterly.[17]

In other words, intarsia is seen as an *arte* fundamentally undermined by its own material and 'mechanical' nature, and whose durability and therefore prestige are affected by its vulnerability to environmental factors, from parasites to fire.[18] Precisely this perceived set of weaknesses provide the lens that allows us to turn Vasari's criticism on its head and instead consider Renaissance wood intarsia as an example of ecological, reciprocal co-design, bringing to the foreground the craftsmanship and empathy of intarsia makers in the creation of work carried out in partnership with more-than-human agents.

A Wood Craft for an Age of Environmental Loss

Intarsia is a "Wood Age" technology, to use Werner Sombart's phrase.[19] In his view, pre-industrial culture – from the Middle Ages to the eighteenth century – had a unity informed by its "decidedly wooden character".[20] Wood was the most important substance available for fuel, building and craftsmanship.[21] As Joachim Radkau points out, "a whole world may be seen under a wooden aegis – from woodcutters, rafters, charcoal-burners, potash-makers and glass-blowers, through salters, forgers and blacksmiths, carpenters, cartwrights, coopers and veneer sawyers, to the high art of woodcarvers and shipbuilders".[22] Intarsia makers might be added to this list, a niche occupation fitting well an age of perceptible timber scarcity in Europe.[23] The blossoming of Renaissance intarsia occurs as pre-industrial societies gradually moved from an energetic reliance on wood ("vegetal economy") to fossil non-renewables.[24] Wood shortages were already recorded in the sixteenth century, when timber was in the process of becoming a tangible measure of wealth.[25] Denunciation of deforestation as an "infinite damage" is recorded by Italian sixteenth-century documentary sources, as highlighted by Roberta Morelli.[26] Wooded areas had started to perceptibly retreat and mature trees were decreasing. Some species, including some traditionally employed for intarsia, such as chestnut and beech, were approaching depletion points because of their intensive deployment in the production of iron and other industries.[27] Increasingly, forests were becoming environments at the centre of resource-driven conflict, but also of political processes of regimentation, environments to be legally protected and nurtured.[28] Advances in contemporary practices of forest management, such as new ordinance law and systematic regenerative planting, demonstrate a new sense of measure and care, combining the need to join prudent use with the new imperatives of conservation. As Morelli argued, modern silviculture was born at this time.[29]

Developing at a time of increased environmental loss when it came to renewable reserves, and forests in particular, Renaissance intarsia can be seen as a technology sensitive to concerns about wood supply and regeneration.[30] A versatile veneering technique such as intarsia offered an economically and environmentally sound response to shortages of particular kinds of wood.[31] Intarsia's ability to work with very thin layers of timber and to manipulate wood in order to expand its decorative range through other technologies such as dyeing, made it a resilient and versatile craft. In addition, its capacity to employ wood ill-suited for other uses and redeploy waste could be a significant advantage for a technology of relatively recent introduction, developed at a time of material and environmental decline. A prominent example of how wood waste could be repurposed and shaped into a man-made material of prestige is chipboard (*legno composito*), an innovation that was given prominence within Renaissance intarsia.[32] The panels that frame the imitation marble alcove in Antonio Barili's intarsia self-portrait (fig. 6) are a reminder of his

early employment (or possibly invention) of this novel man-made wood substitute, where shavings are turned into a usable substance of remarkable vibrancy.[33]

The Renaissance intarsia ecosystem is far too wide and complex to be captured here. Significant numbers of workshops were recorded in *botteghe* within urban centres, and others were rooted within religious institutions or courts, often set up in situ for specific high-prestige commissions. The sophisticated supply and demand systems underpinning intarsia – involving many other local and cross-regional trades, from woodcutters to shippers, merchants to carpenters and veneer sawyers – have not been studied systematically enough to be able to outline their main features. However, one of the key aspects that is sufficiently documented is the diverse deployment of wood types within the different contexts of intarsia production. Two examples will help us trace these key differences, the work of the Canozi da Lendinara, mostly executed by the brothers in the second half of the fifteenth century, and the activity of fra' Giovanni da Verona, active roughly between 1494 and 1523.

Working for courtly patrons as well as important religious commissions, over the course of their long and productive career Lorenzo and Cristoforo Canozi made use of an extensive range of different woods for their work, with over twenty different woods recorded, including mostly local types, in addition to the occasional non-indigenous species.[34] Walnut, maple, cypress, oak and bog oak, fir, willow, lime, elm, spindle, poplar, box, sandalwood, cherry, plum and pear all feature significantly, in a list that underpins the extraordinary chromatic and figurative range of their intarsia.[35] An intimate relationship with wood emerges from documentary evidence which points to the Canozi sourcing particular timber directly and travelling to the location where the intarsia was made, taking with them their own repository of wood fragments. Lorenzo and Cristoforo's cart carried

6 Antonio Barili, *Self-portrait*, 1502, wood intarsia from the Chapel of Saint John the Baptist in the Duomo of Siena, later held in the Kunstgewerbemuseum, Vienna (lost in WW2)

to the Este villa at Belfiore, the site of a now lost intarsia cycle for the studiolo of Leonello d'Este, their own woods. Fra' Giovanni da Verona, on the other hand, operating almost exclusively in and for religious contexts, utilised a smaller spectrum of woods, ranging from walnut, maple, spindle, *legname verde*, bog oak, and a few others, not yet fully documented. This colour range was expanded by making significant use of other processes of alchemical manipulation, such wood dyeing.[36] Both approaches – one reliant on an extensive range of wood types and the other on the ability to manipulate the chromatic

appearance of wood – reveal intarsia as a craft of material strategy and heightened artisanal epistemology. The ingenious and tactical use of timber highlights intarsia as a technology well suited for a time of material waning, ideally positioned to support artistic experimentation through a medium whose full potential and versatility were being significantly explored and expanded.

It is perhaps not surprising that the decline of forests and a novel concern about the supply of timber went hand in hand with a new flourishing of publications about the nature, management and use of trees and wood. Different genres of written and visual sources gave central importance to such matters, most notably agronomical and natural philosophical treatises, both genres in fast ascent, with vernacular editions appearing at a steady pace, expanding a readership without knowledge of Latin. Here we will only touch briefly on agronomical treatises, as they often absorbed knowledge from other genres – including the discussion of arboreal topics stemming from natural philosophy, medicine and healthy living, building and furniture making – and treated matters pertaining to trees and wood in accessible, non-technical ways. Agronomical literature experienced a period of exceptional blossoming in the fifteenth and sixteenth centuries, fuelled by many factors including the rediscovery and translation of classical texts, the publication of late-Medieval works, the growth of suburban villa culture and a return to investing in the land by the elites.[37] Far from being just the reserve of erudite learning, agronomical treatises are very likely to have contributed to a culture that could bring together artisans and their patrons in the appreciation, selection and even management of vegetal resources.

An influential text was the *Liber ruralium commodorum*, written at the start of the fourteenth century by the Bolognese jurist Pietro de' Crescenzi (1233 – c.1320). Translated from the original Latin in different European languages, with a first Italian edition published in Vicenza in 1490 under the title *Il libro della agricultura*, the text combined classical learning with modern agronomical knowledge and was regularly reprinted and updated. During the sixteenth century prestigious illustrated editions appeared, including one translated by the polymath Francesco Sansovino, son of the artist Jacopo Sansovino, published in 1561. Drawing on a wealth of ancient and medieval sources, including Pliny, Palladius, Avicenna and Isidore of Seville, de' Crescenzi's treatise typically offered a variably detailed discussion and illustration of trees from the perspective of their agricultural value and their deployment, including for timber, food and as remedies for common ailments. For example, the cypress is described as a large evergreen, typically growing in cloisters. De' Crescenzi remarks how cypress wood is beautiful, scented and suited to making musical instruments and other "delicate works".[38] Appealing to Avicenna, the tree is mentioned in the context of humour theory. The leaves and fruit of the cypress are praised for their healing properties and can be used in the treatment of wounds and toothache. This articulation of the properties of cypress wood allows us to suggest a correspondence between the concerns of agronomical culture and the priorities of intarsia.[39]


LIBRO QVINTO. 96

Noce. Cap. XVIII.

Il Noce è così detto da questa noce nocendo, perciochel'ombra sua nuoce a gli altri arbori, & è arboro noto. Non ricusa acre nessuno, ne generatione alcuna di terra, avegna ch'in terren grasso & soluto, diuenti più allegro, & maggiore. Si pianta nella fin di Gennaio con le sue noci, in quel modo che si pongono le mandorle, et ne mesi medesimi, ma quelle che tu porrai di Nouembre, seccale alquanto al Sole, acciochè si secchi il nocciuo ueleno dello humore: ma quelle che tu uorrai porre del mese di Gennaio & di Febraio, macerale nell'acqua un dì innanzi. Si debbon por per trauerso, sì che il lato, cioè la conca del guscio, si fiechi in terra: & quando si pongono nel semenzaio, o in qualunque al-

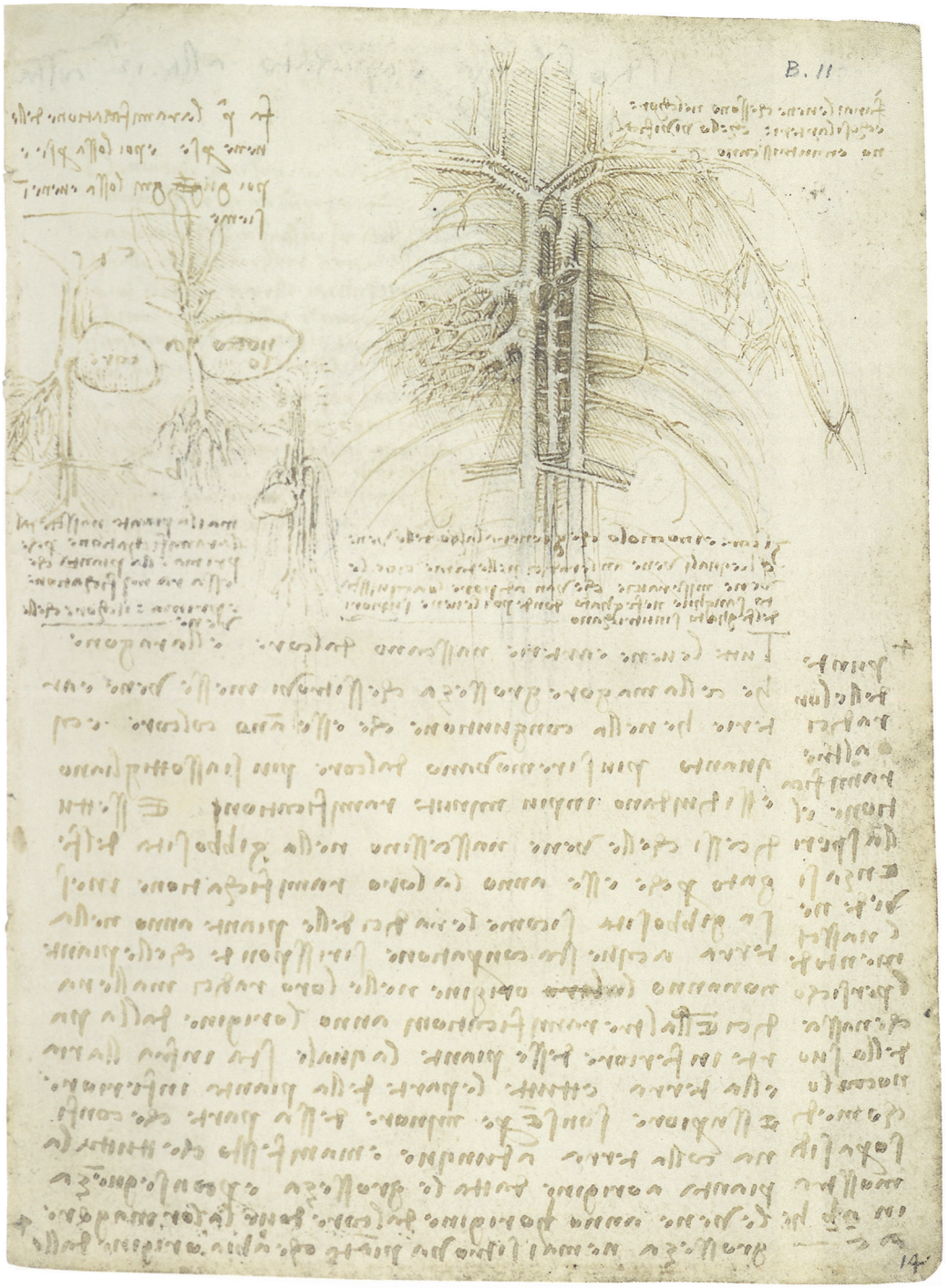
7 *Walnut (Noce)*, woodcut from *Pietro Crescentio Bolognese tradotto nuovamente per Francesco Sansovino, nel quale si trattano gli ordini di tutte le cose che si appartengono a commodi e a gli utili della villa*, Venice 1561

Walnut – whose beauty, durability and usefulness had been long celebrated – was a tree fundamental to many Renaissance technologies, including intarsia. De' Crescenzi (fig. 7) highlighted its many virtues. Not only its fruit was nutritious, the oil derived from it was pleasant and good for human consumption. He recommended walnut wood for making "beautiful and durable chests", cart wheels and many other utilitarian artefacts.[40] *Intarsiatori* employed it extensively, not just for its mechanical properties, but for walnut's peculiar variations in colour and texture.[41] According to the seventeenth-century Bolognese agronomist Vincenzo Tanara, walnut was a "very dark" (*negrissimo*) wood able to produce "beautiful varieties of a miraculous kind" that craftspeople fully exploited by making furniture of all sorts.[42] The combination of environmental forces including winds "shaking the plant" and humidity in the air, were seen to produce "a diversity in the veins, and colours, especially in the roots" (*radiche*) and inner figurative patterns.[43] These natural factors had the power to generate images of "mountains, houses, villages, heads of men, animals […] and other similar things pleasing to the eye".[44] This *topos* about material mimesis and animacy, that Leon Battista Alberti and other Renaissance art theorists had applied to materials such as marble, was here applied to wood too.[45] Employing walnut within intarsia thus meant submitting to environmental forces and recognising the generative powers of nature within wood.

Humans and Trees: Homology, Temporality and Animacy

"The tree (as Plato says) is similar to the figure of a man upside down, that is with the head at the bottom; because its roots are similar to a mouth, though they spread around it in order to obtain nurture."[46] Using a well-established analogy, with this statement Pietro de' Crescenzi affirmed a fundamental affinity between trees and people. This homology between the animal and the vegetal world was explored by reflecting on their parallel structure. For example, de' Crescenzi observed how both animals and humans have skin, and trees have an equivalent outer protective layer in their bark. Veins and nerves are also to be found in both. This was not a new epistemic approach. Pliny's *Historia naturalis* was just one of the ancient sources that had made the idea of a deep structural and physiological correspondence between the vegetal, animal and human worlds a central tenet. Pliny had famously suggested that "in general the bodies of trees, as of other living beings, have in them skin, blood, flesh, sinews, veins, bones and marrow".[47] For him, the body of the tree and of man/woman were structurally analogous, linked through corresponding patterns of embodied design that could be made manifest. This fundamental consonance was the guiding principle of his extended discussion around the nature of vegetation, which was treated throughout the treatise as a living being, carrier of vital spirit or *anima*.[48] This correlation was the underlying impulse for processes of material mimesis between different domains. It explained how images of people or animals might appear within plants, or of plants within rocks. This concept resonated with humanists like Leon Battista Alberti. Referring to Pliny, in *De pictura* Alberti pointed out how "nature herself seems to delight in painting, for in the cut faces of marble she often paints centaurs and faces of bearded and curly-headed kings".[49] A notion of nature as deeply interconnected emerged, a universal productive force underpinning the animal, vegetal and mineral kingdoms, drawing them together through an incessant activity that revealed the hidden mimetic correspondences between them.

Leonardo da Vinci complicated this knowledge system. He famously discussed and illustrated the analogy between plants and the human venous system by comparing the human



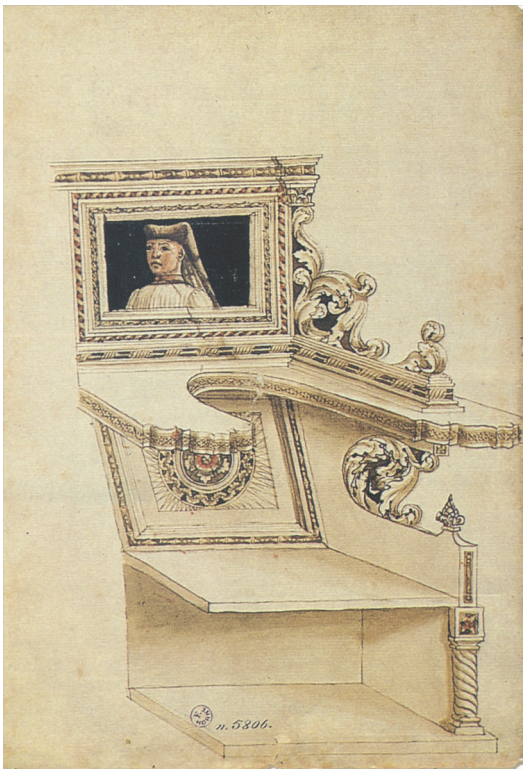
8 Leonardo da Vinci, *The Heart Compared to a Seed*, c. 1508, pen and ink over black chalk, 19.2 × 14 cm (sheet). London, Royal Collection

heart to a sprouted seed (fig. 8).[50] And while he was also intent in putting forward a series of carefully observed morphological differences between the vegetal and human domains, the process relied nevertheless on this long-standing human/tree comparison. Leonardo noticed another central affinity between humans and trees: temporality and its power of transformation. "The youngest part of the plant will have the bark finer and smoother than any other part. […] That part of the tree which will be of older age, will have a rougher and coarser bark. The rings of sewn branches show the number of years, and which [years] were wetter or drier depending on their bigger or smaller size."[51] In other words, Leonardo examined out how, in wood, time becomes substance. Environmental conditions were also deemed of great significance, for both humans and trees.[52] Insights into how to understand the appearance of a tree, and its relationship with the environment, are disseminated throughout Leonardo's writings. At various points, he combined observations on how to reflect pictorially the appearance of the different components of a tree, with how timber behaved depending on its environmental conditions. For example, the location of a tree within a forest was seen to have a direct impact on its sensitivity to breakage while being sawn and for this reason a change in environment could help avoid cracking: "When you want [to ensure] that the wood being sawn doesn't splinter, soak/boil it for a long time in ordinary water, or keep it in the bottom of a river for a long time, so that it consumes its natural vigour."[53] Thus with Leonardo, considerations about the look of trees are often intertwined with reflections on the nature of timber and the impact of ecological factors, where design and matter are in a relationship of mutual dependence and visual knowledge combines with material, useful knowledge.

It is argued here that in Renaissance intarsia the human-like appearance of trees, the inner animacy of wood and the fact that as a material it continues to live, and be lived in, well beyond the moment when it is felled, were recognised and exploited. Instead of approaching wood as a faulty and somehow lacking material, intarsia makers developed an approach built on reciprocal design, establishing a central partnership between human and more-than-human agents whereby the distinctive properties of wood as an animate material were fully put to use and given semantic resonance. This approach fundamentally questions assumptions around the primacy of human-led *disegno*, offering instead a model whereby design happens through a reciprocal correspondence between maker(s), material(s) and environment(s):[54] where wood patterns might be informed by parasites – from woodworm to mushrooms – as well as by other natural forces, from fire to water and wind, in processes of human and more-than-human co-making.

Designing Patterns

When applied to Renaissance intarsia, design involves a complex set of different though interconnected practices, ranging from creating purpose-made design drawings, designing *in* the wood and designing *with* the wood. Design drawings produced by intarsia makers or other artists who would not be directly involved in the making were a common occurrence for compositions of some complexity, and some still exist. Those that carry an unquestionable link with the technology tend to give priority to the wider setting, such as the stalls hosting the intarsia, or to ornamental patterns and the chromatic range of woods needed, as can be seen in this presentation drawing (fig. 9) by Cristoforo Canozi for a choir stall in the in the Duomo of Parma.[55] Here we can speculate that the black background would have been interpreted as requiring bog oak, the head of the figure a blonde coloured wood such as boxwood, and the dress both dark



9 Cristoforo Canozi, *Drawing for a Stall of the Choir for Parma Cathedral*, c. 1469, watercolour on paper. Florence, Fondazione Horne

and light woods, such as walnut and ash or maple. However, this kind of drawing was only a small step towards what was really required to create a visually successful intarsia panel: the expert knowledge of a maker able to break down the design and identify within the woods themselves those particular sections that would truly manifest it thanks to factors that no paper drawing could ever represent, such as the particular patterns in the internal figuration of the wood tile or the angle of the cuts.

Spatial composition was also of central importance in intarsia design and evidence from panels that survive in a damaged state (fig. 10) reveal the rigorous armature of perspectival drawing incisions that preceded the application of the wooden tesserae, most likely executed with the help of a design drawing or cartoon applied to the matrix. This kind of survival also shows that the intarsia design was achieved with the help of a tool unique to this technology: the shoulder knife.[56] *Intarsiatori* were aware of the distinctive, precise and arduous physicality of this process, as articulated in a now lost panel by the Sienese distinguished architect, engineer, sculptor in wood as well as intarsia maker, Antonio Barili (fig. 6).[57] The panel was once part of an intarsia cycle made by Barili between 1483 and 1504 for the chapel of St. John the Baptist in the Duomo of Siena. A highly self-reflexive self-portrait, it represents Antonio in the act of incising with a shoulder knife an inscription on a plaque that simultaneously proclaims his authorship of the artwork and underlines its arduous physicality. The inscription reads "HOC EGO ANTONIVS BARILIS OPVS COELO NON PENICELLO EXCVSSI AN DN MCCCCCII" ("I, Antonio Barili, have extracted this work with the knife/chisel, not the little brush, AD 1502"). Celebrating an energetic relationship with the wooden matter and the role of wood inlay's most distinctive tool, the panel sets a *paragone* between intarsia and painting. Here the shoulder knife manifested the uniqueness of the intarsia maker's skill in its engagement with wood as a material substance that had to be sliced into, where pattern and design were painstakingly extracted and obtained from within the material, rather than just imposed over it.[58]

An intriguing drawing seems to recognise the distinctive design demands of intarsia when involving the human head (fig. 11) and signals where the shoulder knife would have to make an incision.[59] The drawing bears some resemblance with the set of anatomical conventions for representing human facial physiognomy found in intarsia work by Cristoforo Canozi, for example this figure of St Mark in the cathedral of Modena (fig. 12). The clearly defined patterns outlining the different volumetric zones of the face, such as the triangular shape positioned just

10 Cristoforo and Bernardino Canozi, *Damaged Sacristy Panel Showing Design Marks*, c. 1487–1490, wood intarsia. Parma, Duomo, sacristy

under the mouth, the curved area just above the nostril, the circles around the eyes and the slicing of hair into compact strands reflect a set of visual conventions and might have been a way to help guide the selection and cutting of individual wooden tesserae, highlighting the potential intrinsic within wood to embody matter and reflect light. Even in this case, however, the gap between the design drawing and the actual intarsia tesserae is very significant.

With intarsia, the relationship between the artisan and the material becomes one of intimate correspondence, a process of co-making. Thus intarsia design goes beyond the surface, cutting through and into the wooden flesh, where designing occurs also *in* rather than just *on* the material and involves finding and extracting an image and/or incising within it rather than just mechanically applying a design to it.[60] Within intarsia where the individual wooden pieces are sizeable and where an inner design can often be detected within, the anatomy of wood is fully exposed, in a way that resonates with the sensitivity to the animacy of the material mentioned above, and with the *topos* of a human-tree homology. Therefore overemphasis on design drawing can be misleading. At a fundamental level, intarsia design and pattern making are intrinsic, materially engaged activities. In the St Mark panel by Cristoforo Canozi (fig. 12), design is occurring to a considerable extent *in* the wood, in the sense that it is innate within the material. The role of the maker here lies significantly in the selection and cutting at the right angle a wooden fragment that already contains within itself the desired design element, for example the parallel strands of a beard. Design *in* the wood can also involve an active process of addition or removal of matter. It might include, for example, applying small incisions in the tessera, and filling them in either with a black paste or with wood filaments, as can be seen on the blonde strands

11 Circle of Cristoforo da Lendinara, *Head of a Man*, c. 1470–1490, pen and ink with wash, 21 × 18.8 cm (sheet). London, Royal Collection

12 Cristoforo Canozi, *Saint Mark*, c. 1477, 113 × 86 cm, wood intarsia. Modena, Duomo di San Geminiano

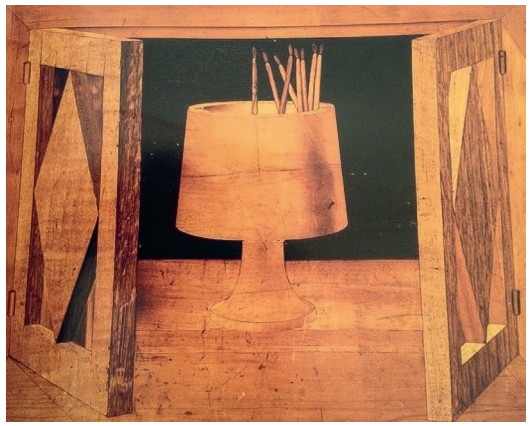
of hair above St Mark's forehead, where parallel hatchings are visible. And as we have seen, the co-making of patterns can go even further and involve a process of sourcing and manipulation of the material that is in full association with more-than-human agents. This is reciprocal design, or designing *with*. In order to address these questions we will now explore some of the different strategies employed to actively engage with the potential of wood for environmental transformation, leading to processes of reciprocal design.

Reciprocal Design: Woodworms, Mushrooms, Fire, and Water

What is especially striking and novel about intarsia, particularly in the idiom spoken by some of the Northern Italian Renaissance *maestri* discussed here, is its embracing of wood's materiality in all its variations and 'states' – both natural and artificial – to new creative effects. This reveals an epistemologically driven attitude, where making and material knowledge are in symbiosis. This new approach fostered the regular deployment of wood that would have normally been left out of the productive process. This might be wood whose irregularities, abnormalities or undesirable structure, due to a variety of factors – from woodworm and fungal attacks, to unusual patterns of growth, to semi-fossilisation processes – would have usually meant having the piece discarded. What we see at play instead is a process whereby the intarsia master is expected to understand at a deeper level the material and to develop a distinctive ability for sourcing, selecting, classifying, preparing and applying the very particular wood fragments involved in each design. The patient, passive attitude ascribed by Vasari to the *intarsiatore* is at odds with the artisanal figure outlined here, who is an active

knower and manipulator of matter and making. The engagement with wood's materiality and biology is so close that it involves a process of reciprocal design, where making is a continuous correspondence that takes into account temporal and environmental factors. In this context, designing *with* more-than-human actors becomes the norm. To guide the selection of relevant case-studies we will return, provocatively this time, to Vasari's list of wood's afflictions: its vulnerability to parasites, its tendency to blacken and burn and its reduced durability when exposed to water and other environmental factors.

Let's begin with parasites. Wood's perceived vulnerability to parasites – being they woodworm or fungi – was well known and is documented since classical times. This alleged defenselessness is in fact at the heart of the evaluation system used to select woods for particular uses. So, for example, in Pliny, scented woods such as cypress are highly valued because they are known for their resistance to parasites.[61] Other woods, like beech, are singled out by De' Crescenzi as being particularly vulnerable to woodworm.[62] However, it is argued here that this in-depth knowledge of wood's properties, strengths and weaknesses as a material, was also used to engage positively with it and would occasionally lead to experimentation. In other words, parasites could be put to work. Oak that had been attacked by woodworm (*Anobium punctatum*) is likely to have been used by the Canozi brothers to design-with the vertical part of the left alcove shutter (fig. 13), because its state of relative decay would have produced the desired darker hue in the wood consistent with it being in the shade.[63] These insects thus moved to a position of co-operation in the making: no longer freeloaders, but in some way co-workers. This approach reveals an ecological mind at work, opening a window into the biological and environmental circumstances in which wood grows and decays, where its life cycle is embodied and traceable in the material itself.



13 Cristoforo and Bernardino Canozi, *Footed Vessel Filled with Candles*, c. 1487–1490, wood intarsia, detail of panel. Parma, Duomo, choir, *Banco dei celebranti*

This attitude involving working in partnership with natural actors is exemplified even more powerfully in the pervasive use of the type of wood mentioned at the start, and that contemporary sources refer to as *legname verde*, or 'green wood', possibly also known as *baretino*.[64] This spalted wood has been detected in a significant number of Renaissance intarsia from the fifteenth century onwards, including panels in the church of Santa Maria Novella and Santa Maria del Fiore in Florence, in the Gubbio studiolo (now at the Metropolitan Museum in New York) and in other significant cycles.[65] This attractively coloured wood was not a particular species of wood, but rather the result of an attack by the *Chrolociboria*, a common fungus in Northern and Central Italian woods infesting both living and fallen trees and affecting trees indiscriminately. *Chrolociboria* is a beautiful blue-green cup-fungus (fig. 4) whose infestation leads to permanent staining, turning woods such as poplar, ash, aspen and oak a brilliant and variegated green-blue.[66]

As mentioned above, timeliness was key, as excessive exposure to the fungus made the wood unusable. This close correspondence with the timeline of biological processes involved in the life cycle of wood and its parasites points in

14 Giovanni da Verona, *Spalliera with Amphitheater*, c. 1519–1523, wood intarsia, 58 × 99 cm. Verona, Santa Maria dell'Organo, sacristy

15 Giovanni da Verona, *Spalliera with Cupboard*, c. 1519–1523, wood intarsia, 58 × 99 cm. Verona, Santa Maria dell'Organo, sacristy

the direction of a particular idiom of artisanal epistemology, infused with a proto-scientific engagement with matter and with an ethos of reciprocality with the material and its environment. Nature becomes the dynamic co-maker. It is not coincidental that this wood was very often used by intarsia makers in a naturalistic way, applied to things that would have been *naturally green*, such as grass, foliage, the plumes of birds or green stone, recognising in this material an apt way to embody the generative power of nature and opening a self-reflexive dimension that fits in well with the idea of wood-centred knowledge.

Giovanni da Verona made systematic use of *legname verde* in his monumental inlay cycles created over several decades. A choir (1493–1499) and (1519–1523) sacristy entirely decorated with intarsia were created for the monastery church of Santa Maria in Organo in Verona in collaboration with a large workforce of other artisans. Situated by the Acqua Morta, a branch of the Adige river where wood traffic from the nearby mountainous region was intense, the monastery traded with the rafters (*radaroli*) that transported timber from Trentino downstream. This partnership resulted in a chapel within the church being dedicated to the *radaroli*.[67] The monastery managed and cultivated nearby lands, which included extensive orchards, which might have supplied smaller, *ad hoc* provisions of wood. In this church cycle, green-stained poplar is used strategically throughout. *Legname verde* features in the foreground of a view of the ruins of an amphitheater (fig. 14), where the brilliantly

16 Detail of fig. 15

17 Lorenzo Lotto and Giovanni Capoferri, *Magnum Chaos*, c. 1523–1533, wood intarsia (spalliera cover). Bergamo, Santa Maria Maggiore

green grass proclaims the conquering power of nature over the ancient, fading, man-made world. Interspersed with micro-incisions filled in black and other colours to obtain a pictorially more vivid and multilayered design, these sections have a magnetic force because of their fungally-generated chromatic intensity. This wood is also scattered in many other positions of prestige within the intarsia cycles: from numerous green imitation-porphyry roundels – such as those on the sides of the arch above the rooster – to the background of prominent holy figures such as San Zeno.[68] Records show that *legname verde* was bought in 1504 for another important intarsia cycle made by fra Giovanni in the Tuscan abbazia of Monte Oliveto, for the considerable price of 14 soldi, pointing to the reliance on an external supplier.[69] That this fungally-stained wood had an established market and supply system is not surprising given its unique and long-lasting chromatic properties – impossible to achieve artificially at the time.[70] For Santa Maria dell'Organo, where the surviving accounts do not list *legname verde* among the woods ordered for the commission, but where it is found throughout, we can speculate that it might have been obtained through a supplier or directly from the lands surrounding the monastery, though the missing documentation does not allow to say anything conclusive in this regard.

Rather than just a hazard, for intarsia fire/heat was another more-than-human agent that played a key role in processes of reciprocal design. The use of blackening effects in Renaissance intarsia was distinctive and widespread. The systematic use of heat in the shaping of tesserae and definition of contours can be exemplified by a vivid bunch of ripe grapes, bursting out of the cupboard of this panel (figs. 15–16). Here Giovanni da Verona fully exploited the potential of fire to create the gradual, rounded chiaroscuro effect of the individual grapes. Whether achieved using a purpose-made burning tool (*cauterio*) or hot sand, heat is used here in a process of cor-

respondence with each wooden tile, whose inner, physical structure is transformed as a result. This process requires precision and timeliness, an intimate form of reciprocal design. Thus in practice the vulnerability of intarsia to fire lamented by Vasari is reversed, and a virtue made of this process of generative co-making.

Water is also an environmental agent of key significance, central to the understanding of another important type of Renaissance intarsia timber implicated in reciprocal design: semi-fossilised, bog wood. With bog oak, often used in partnership with other woods, we can fully appreciate the potential of wood as a meaning-making material, as in the case of intarsia made for the basilica of Santa Maria Maggiore in Bergamo. The monumental sixteenth-century cycle decorating the presbytery and choir of this church epitomises the challenges involved in creating a programme of wood intarsia where exceptional levels of iconographic and narrative complexity are reconciled with extensive material manipulation and reciprocal design.[71] Realised between 1523 and 1533, the ensemble emerged from an extended and at times tense collaboration between the intarsia master Giovan Francesco Capoferri, the painter Lorenzo Lotto, the Franciscan theologian Girolamo Terzi, and a large team of wood specialist craftsmen including sculptors, carvers and carpenters. The cycle exemplifies the eventful journey undertaken by Renaissance wood intarsia, where patterns could rely as much on fit-for-purpose graphic input as on materially, and alchemically, generated design and aesthetics. It might also be seen as a quintessential example of the development of intarsia as a technology making the most of the intrinsic, natural and reciprocal qualities of wood, while also relying extensively on transforming the appearance of timber through alchemical means, such as dyeing.

The surviving documentation for the Santa Maria Maggiore commission is extremely rich and records the purchase of a significantly wide range of woods carried out over nearly a decade. Timber was acquired from as early as 1522 and involved firstly the purchase of larch (*larice*) and fir (*abete*), followed by the wood that was most widely used, walnut (*noce*).[72] Oak, including bog oak (*rovere affogato*), maple (*acero*), pear (*pero*), boxwood (*bosso*), poplar (*pioppo*), olive (*ulivo*) and elder (*sambuco*), occasionally appeared too.[73] It is very likely that sandalwood (*sandalo*), apple (*melo*), ash (*frassino*) and plum (*susino*) were also used in small quantities.[74] In addition to the acquisition of this wide spectrum of wood species, throughout the period of realisation of the work purchases of alchemical substances used to artificially dye the wood were made on a regular basis, adding greatly to the potential for new chromatic effects, something that is very difficult to perceive today given the natural decay of such colourings and the successive restorations. Payments for substances used to dye the wood essences included verdigris (*verderame*), orpiment (*orpimento*), white lead (*biacha*), saffron (*zafferano*), indigo (*indaco*), oak galls (*galle di quercia*), cinnabar (*cinabro*), mercury (*mercurio*) arsenic (*arsenic*) and many other substances from "*spitiaria*", apothecary's goods, revealing a wide chromatic spectrum achieved through alchemical manipulation.[75] This would have been enhanced by the application of particularly lucid and reflective varnishes, including amber-based ones.

Although this ensemble maximised the potential of chemically-achieved effects within wood, it also employed techniques where the natural inner design of a wooden tessera was fully exploited and reciprocal design allowed to resonate. An eloquent example of this approach is provided in the stalls, which host an expansive series of Biblical narrative panels. These stories are protected by accompanying covers carrying symbolic images, sometimes incorporating enigmatic inscriptions and referred to at the time by Lotto as *imprese*.[76] Two overlapping intarsia panels, the cover representing *Magnum*

Chaos (fig. 17) and the back rest panel underneath with the *Creation* (fig. 18), offer an exemplary combination of woods with potent intrinsic patterns selected and positioned in such a way as to maximise meaning-making. Designed by Lotto in 1523 under theological guidance, the panel depicting the *Creation* was jointly realised with Capoferri in the same year and probably used as a way to secure the commission. Another version of it, made by Capoferri and set in place in the 1530s, is what we find in the presbytery stalls today. Associated with it is the *impresa* cover depicting the *Magnum Chaos*, whose design Lotto made in *chiaroscuro* in 1524 to protect the *Creation*. The duo exemplified the correspondence in meaning between the covers and the panels underneath that Lotto used as a trademark for the whole series.[77] The *Magnum Chaos* intarsia is a visually arresting, newly conceived *impresa*, whose intended orientation is contested, with some publications presenting it tilted by 180 degrees, as we find it in the current arrangement in the choir.[78] God's magnetic eye, open arms and vigorous feet emerge from the nine concentric spheres of the flaming sky, in numinous movement towards the viewer. The panel is probably inspired by a mystical text attributed to St Jerome,[79] in which God's divine mind is engaged in ordering the universe and mankind, freeing them from the gloom of primordial chaos. Designed to support meditation, the forty radiant flames of the impresa evoke the forty days spent by Moses on Mount Sinai, and by Elijah in the desert, before God's shimmering apparition would rupture the primeval darkness.

Significantly, for visual impact, the *Magnum Chaos* panel relies as much on an arresting iconography and title as on its material make up. In the cycle, it is the only example in a cover of the use of one of the darkest woods available to the Renaissance intarsia maker: bog oak or *legno nero*, sometimes referred to also as *rovere di palude* or *quercia affogata*.[80] Bog oak is an archeobotanical wood on its way to coal-like petrification, generated after hundreds of years spent in the absence of oxygen, soaking in acidic and wet conditions such as those found in the muddy beds of rivers in Northern Italy.[81] Over time, the "colour turns to dark brown/black, and its density and mechanical strength, in particular its hardness, increase" so that the external surface can appear cracked and charred.[82] *Legno nero* could also be artificially generated by suspending wood for a significant period of time in a special bath, but possibly with less long-lasting effects. It is likely that intarsia makers knew about the natural, watery origins of this semi-fossilised wood, and possible that they participated in the lengthy process involved in making it usable, which included delicate processes of gradual drying. This turned it into a workable wood of an almost supernatural black hue. *Intarsiatori* might have been aware of the temporal dimension of this transformation. Fully-fledged fossil wood in a stone-like status was described and illustrated later in the sixteenth century by the Neapolitan apothecary and collector Ferrante Imperato in a section on fossil woods of

18 Lorenzo Lotto and Giovanni Capoferri, *Creation*, c. 1523–1533, wood intarsia (spalliera). Bergamo, Santa Maria Maggiore

his *Historia naturale* (1599) as "wood converted into black stone", pointing in the direction of a material with added natural philosophical significance.[83] Coloured by environmental factors over time, bog wood was popular in the Renaissance for its intensely black hues and its hardness. It is also likely that intarsia makers were actively seeking the particular vibrancy created by the reflectiveness of this wood and its subtly fractured, shimmering effects. In the *Magnum Chaos* panel, those effects would strongly resonate with the temporally momentous, dynamic nature of the theme depicted, showing the light of God breaking out of the uttermost darkness of chaos. In this context, the choice of bog oak made a particularly strong statement, reinforced by the fact that all the other covers in the cycle were made of a lighter brown wood, and the staple of intarsia, walnut.[84]

In Bergamo, the theme of the *Creation* is realised through a careful, meaning-making selection of woods and other materials – ranging from walnut, boxwood, ash, red sandalwood, pear, with added coloured stucco. Walnut stands out in the panel because of its strategic location and potent inner figuration. In the *Creation* panel, a highly variegated walnut root wood is used consistently in the background to highlight the slow, gradual, almost tactile dissolving of the darkness of primordial chaos – where a set of barely perceptible, monstrous eyes within the walnut pattern are fading away to give room to the emergence of the new, wondrous world being created, recognising this wood's power of reciprocal design.

Conclusion

As we close, let's return to Antonio Barili's mesmerizing self-portrait (fig. 6), an hymn to intarsia and its multi-species, animal-vegetal-mineral ecosystem, where everything is alive. Here the intarsia master is set within a microcosm where interior and outdoor blend together and where humans, animals, plants and other matter (natural and artificial) work in partnership across domains. He is at one with the animate wood-based world that he is crafting: his bodily posture and prominent features suggest a total sensorial immersion. Making intarsia is not just the work of his intent eyes and synchronized, expert hands, and engaged shoulder holding the knife, his hearing is also involved, guiding good practice, and the emphasis placed on his nose reminds us that working with wood is a deep olfactory experience too.[85] Taste is evoked by the lively parakeet, probably made of vibrant *legname verde*, engaged in nibbling on a fruit, possibly a pear (pear wood being a familiar presence within intarsia), directly from the young tree growing against a dynamic, variegated sky. Man as maker, animal, plant and the wider environment intertwine, through their commonality in wood, in a process of joint becoming.[86]

Scholarship has tended to depict intarsia as a technology where design and pattern are created solely through human action.[87] Here we have shown instead that Renaissance wood intarsia was aligned with a culture of eco- and bio-creativity. This approach fundamentally questions assumptions around the primacy of human-led *disegno*, putting forward instead a model whereby design happens through a reciprocal correspondence between maker, material and environment. Whereby wood patterns might be informed by parasites turned co-workers – from woodworm to fungi – as well as by other natural, elemental forces, from heat to wind and water. This might be extended to other technologies reliant on multi-species, "fellow travellers" alliances and wider ecological partnerships.[88] We have argued that this interaction between human and more-than-human making profoundly affected this genre of artistic production, requiring us to forge the concept *reciprocal design*, where pattern occurs *in* and *with* the material,

within an environment, and making is expanded co-making.

MARTA AJMAR works on Renaissance and Early Modern global histories of design, craft and making, and higher education experiential pedagogies. She has published extensively on Renaissance and Early Modern material culture. Forthcoming publications include a monograph (supported by the Leverhulme Trust) exploring early modern transcultural wood- and ceramic-based technologies; and the co-edited volume *Making and Hands-On Learning: Interdisciplinary Perspectives* (with Catherine Speight, UCL Press/V&A, 2024). | email: marta.ajmar@warwick.ac.uk

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1 Museum- and science-led research has been central to the discovery and identification of spalted woods in Renaissance intarsia. For a seminal discussion of Renaissance intarsia and of *legname verde* within it, see Antoine Wilmering, *Italian Renaissance Intarsia and the Conservation of the Gubbio Studiolo* (The Gubbio Studiolo and Its Conservation, vol. 2), New York 1999. An important scientific discussion and survey of the historical uses of spalted wood, including *legname verde*, is provided by Sara C. Robinson, Hans Michaelsen, and Julia C. Robinson, *Spalted Wood: The History, Science, and Art of a Unique Material*, Atglen 2016.

2 See Marta Ajmar, Looking into Renaissance Wood Intarsia: Material Mimesis and Embodied Design, in: Marjolijn Bol and Emma C. Spary (eds.), *The Matter of Mimesis: Studies on Mimesis and Materials in Nature, Art and Science*, Leiden 2023, 54–86.

3 For the concept of reciprocity as a form of partnership and mutual nurturing connection between plants and people, see Robin Wall Kimmerer, *Braiding Sweetgrass: Indigenous Wisdom, Scientific Knowledge and the Teachings of Plants*, London 2020. For an expanded, neo-materialist approach to creativity see Timothy Le Cain, *The Matter of History: How Things Create the Past*, Cambridge 2017.

4 For the concept of correspondence, see Tim Ingold, *The Perception of the Environment: Essays on Livelihood, Dwelling and Skill*, London 2000, pt. 3 ("Skill").

5 For artisanal epistemology, see Pamela H. Smith, *The Body of the Artisan: Art and Experience in the Scientific Revolution*, Chicago 2004, and Pamela H. Smith, *From Lived Experience to the Written Word: Reconstructing Practical Knowledge in the Early Modern World*, Chicago 2022.

6 Pliny the Elder, *Natural History*, transl. by Harris Rackham, vol. 4 (Loeb Classical Library, vol. 370), London and Cambridge, MA 1945, 504: "Atque in totum corpori arborum ut reliquorum animalium cutis, sanguis, caro, nervi, venae, ossa, medullae."

7 See for example the *minbar* studied by Jonathan M. Bloom et al., *The Minbar from the Kutubiyya Mosque*, New York 1998.

8 Cf. Mariam Rosser-Owen, *Islamic Arts from Spain*, London 2010, 64.

9 Pliny 1945 (as in note 6), 536: "Haec prima origo luxuriae arborum, aliam alia integi et vilioris ligni e pretiosiore corticem fieri. Ut una arbor saepius veniret, excogitatae sunt et ligni bratteae."

10 Ibid.

11 Ibid.: "Media pars arborum crispior, et quo propior radici minoribus magisque flexilibus maculis."

12 Pliny 1945 (as in note 6), 430.

13 Erwin Panofsky, *Galileo as Critic of the Arts*, The Hague 1954, 17–18.

14 Giorgio Vasari, *Le Vite de' Più Eccellenti Pittori, Scultori e Architettori*, ed. by Rosanna Bettarini and Paola Barocchi, 6 vols., Florence 1966–1987, vol. 1, 157: "E perché tale professione consiste solo ne' disegni che siano atti a tale esercizio, pieni di casamenti e di cose che abbino i lineamenti quadrati e si possa per via di chiari e di scuri dare loro forza e rilievo, hannolo fatto sempre persone che hanno avuto più pacienza che

disegno." Here I followed, with minor adjustments, the translation provided in Gerard Baldwin Brown, *Vasari on Technique*, London 1907, 263. I discussed some of these issues in Marta Ajmar, Mechanical *Disegno*, in: *RIHA Journal* 84, 2014, 1–21.

15 Vasari 1966–1987 (as in note 14), vol. 3, 523.

16 Ibid., vol. 3, 525: "La colpa era stata dell'esercizio che era basso, e non dell'ingegno suo, che era alto e Pellegrino."

17 Ibid., vol. 1, 157: "Ma per essere cosa che tosto diventa nera e non contrafà se non la pittura, essendo da meno di quella e poco durabile per i tarli e per il fuoco, è tenuto tempo buttato invano, ancora che è sia pure e lodevole e maestrevole."

18 Cf. Ajmar 2014 (as in note 14).

19 Werner Sombart, *Der moderne Kapitalismus*, vol. 2, Munich and Leipzig 1928, 1138.

20 Ibid.

21 Joachim Radkau, *Wood: A History*, Cambridge 2012, 18.

22 Ibid.

23 Ibid., 31.

24 See Roberta Morelli, La foresta industriale, in: Philippe Braunstein and Luca Molà (eds.), *Il Rinascimento italiano e l'Europa: Produzione e tecniche*, vol. 3, Treviso 2007, 457–478.

25 Cf. Radkau 2012 (as in note 21), 32.

26 Morelli 2007 (as in note 24), 468.

27 See ibid., 469.

28 See ibid., 474; Joachim Radkau, Fine delle foreste rinnovabili? Economia del legno e foreste tra Sette e Ottocento, in: Alberto Caracciolo and Gabriella M. Bonacchi (eds.), *Il declino degli elementi: Ambiente naturale e rigenerazione delle risorse nell'Europa moderna*, Bologna 1990, 187–202, here 190.

29 Cf. Morelli 2007 (as in note 24), 458–459.

30 See ibid.

31 Cf. Radkau 2012 (as in note 21), 88.

32 See Wilmering 1999 (as in note 1), 22, for this important suggestion.

33 Ibid.

34 For an overview of their work, see Graziano Manni, *I signori della prospettiva: Le tarsie dei Canozi e dei canoziani (1460–1520)*, 2 vols., Carpi 2001–2002; Pier Luigi Bagatin, *L'Arte dei Canozi Lendinaresi*, Trieste 1990.

35 See Pier Luigi Bagatin, *Le pitture lignee di Lorenzo e Cristoforo da Lendinara*, Treviso 2004, 228–240, for a detailed list of the woods used.

36 See id., *Preghiere di legno: Tarsie ed intagli di fra Giovanni da Verona*, Florence 2000, 54–55.

37 Cf. Jean-Louis Gaulin, Trattati di agronomia e innovazione agricola, in: Braunstein and Molà 2007 (as in note 24), vol. 3, 145–163; Daniela Frigo, *Il padre di famiglia: Governo della casa e governo civile nella tradizione dell' 'economica' tra cinque e seicento*, Rome 1985; Mauro Ambrosoli, *The Wild and the Sown: Botany and Agriculture in Western Europe, 1350–1850*, Cambridge 1997; Antonio Saltini, *Storia delle scienze agrarie: Venticinque secoli di pensiero agronomico*, vol. 1, Bologna, 1984.

38 Petrus de Crescentiis, *Il libro della agricultura*, Vicenza 1490, book 2, ch. 37 (unpaginated).

39 See Bagatin 2004 (as in note 36), 231.

40 Petrus de Crescentiis 1490 (as in note 38), book 2, ch. 18.

41 See Wilmering 1999 (as in note 1), 9.

42 Vincenzo Tanara, *L'economia del cittadino in villa*, Venice 1661, 514.

43 Ibid.: "[…] Venti da' quali agitata questa pianta, si viene a rarificare in qualche parte, per dove entrando aria, et humidità, si causi questa diversità di vene, e colori, qual nelle radiche è maggiore."

44 Ibid.: "Monti, Case, Paesi, Capi d'Huomini, Animali, […] e simili di vista dilettevole."

45 Ibid. See also Leon Battista Alberti, *De pictura* [1450], Basel 1540, 52.

46 Petrus de Crescentiis 1490 (as in note 38), book 2, ch. 5: "La pianta secondo che dice Platone è simigliante alla figura d'uno huomo travolto, cioè che habbia il capo di socto; imperciò che ella la ha le radici di sotto simiglianti a la bocca, ma si spandono atorno accioché ricevano nutrimento."

47 Pliny 1945 (as in note 6), vol. 4, 504: "Atque in totum corpori arborum ut reliquorum animalium cutis, sanguis, caro, nervi, venae, ossa, medullae." For other Classical and Medieval references revealing an understanding of wood as operating like a body and wood as a living material carrying similarities with animal matter, see Christina Neilson, Carving Life: The Meaning of Wood in Early Modern European Sculpture, in: *The Matter of Art: Materials, Practices, Cultural Logics, c. 1250–1750*, ed. by Christy Anderson, Anne Dunlop, and Pamela H. Smith, Manchester 2014, 223–239.

48 Pliny 1945 (as in note 6), 2: "Restat ut – neque ipsa anima carentia, quandoquidem nihil sine ea vivit – terra edita aut inde eruta dicantur ac nullum sileatur rerum naturae opus" ("It remains to describe the things produced by the earth or dug up from it – these also not being devoid of vital spirit, since nothing lives without it – and not to pass over in silence any of the works of nature").

49 Alberti 1540 (as in note 45), 52: "Ipsam denique naturam pingendo delectari manifestum est. Videmus enim naturam, ut saepe in marmoribus Hippocentauros regumque barbatas facies effigiet."

50 Leonardo da Vinci, *Anatomical Manuscript B*, Royal Collection, RCIN 919028. Cf. Martin Clayton and Ron Philo, *Leonardo da Vinci, Anatomist*, London 2012.

51 Leonardo da Vinci, *Trattato della pittura*, Vicenza 2000, 396: "La parte più giovane della pianta arà la

scorza più pulita e tersa, che alcuna altra parte. […] Quella parte dell'albero arà più ruida e grossa scorza, che sarà di maggior vecchiezza. Li circuli delli rami degli alberi segati mostrano il numero delli suoi anni, e quali furono più umidi o più secchi secondo la maggiore o minore loro grossezza."

52 For the enormous popularity of regimens discussing the benefits and disadvantages of environmental conditions for human life in the Renaissance, see Sandra Cavallo and Tessa Storey, *Healthy Living in Late Renaissance Italy*, Oxford 2013.

53 Leonardo 2000 (as in note 51), 408: "Quando tu vuoi che il legno nel segare non faccia alcuna crepatura, fallo lungamente bollire nell'acqua comune, o che tu lo tenghi lungamente nel fondo di un fiume, tantochè consumi il suo natural vigore."

54 See Ingold 2000 (as in note 4), and Tim Ingold, *Making: Anthropology, Archaeology, Art and Architecture*, London and New York 2013.

55 See Bagatin 2004 (as in note 36), 383.

56 See Wilmering 1999 (as in note 1), 49 and 57.

57 See Ajmar 2023 (as in note 2), 67–69.

58 See ibid.

59 Cf. M. J. Thornton, *Tarsie*: Design and Designers, in: *Journal of the Warburg and Courtauld Institutes* 36, 1973, 377–382, here 377–378.

60 See Ajmar 2023 (as in note 2).

61 Cf. Pliny 1945 (as in note 6), book 16, ch. 41.

62 See *Pietro Crescentio Bolognese […] Nel quale si trattano gli ordini di tutte le cose che si appartengono a commodi e a gli utili della villa*, Venice 1561, 81.

63 For the re-making of this panel, including the use of woodworm-infested oak, see Ajmar 2023 (as in note 3).

64 Cf. Wilmering 1999 (as in note 1), 15 and 20; Robinson, Michaelsen, and Robinson 2016 (as in note 1).

65 See ibid.

66 See ibid., 53–66.

67 See Bagatin 2000 (as in note 36), 55.

68 Cf. Robinson, Michaelsen, and Robinson 2016 (as in note 1), 53–66.

69 See Giovanni Brizzi, *Il coro intarsiato dell'abbazia di Monte Oliveto Maggiore*, Milan 1989, 15.

70 Cf. Robinson, Michaelsen, and Robinson 2016 (as in note 1), 53–66.

71 The most in-depth visual and documentary study of this intarsia cycle to date is Francesca Cortesi Bosco, *Il coro intarsiato di Lotto e Capoferri per Santa Maria Maggiore in Bergamo*, 2 vols., Bergamo 1987.

72 Ibid., vol. 1, 197–199.

73 Ibid.

74 Ibid.

75 Ibid., vol. 1, 197–199 and 175–180.

76 Ibid., vol. 1, 125–138.

77 Ibid., vol. 1, 320–324, vol. 2, 119–120.

78 Ibid.

79 Ibid.

80 Ibid., vol. 1, 323.

81 Cf. Chiara Meneghello et al., Bog Oak: Characteristics and Characterization of a Log from the Venetian Plain (Italy), in: *Journal of Archaeological Science: Reports* 43, 2022, 1–7 (DOI: https://doi.org/10.1016/j.jasrep.2022.103473 [last accessed 16 December 2023]).

82 Ibid., 1.

83 Ferrante Imperato, *Dell'historia naturale*, Naples 1599, 584.

84 Cf. Cortesi Bosco 1987 (as in note 71), vol. 1, 197–199.

85 I would like to thank Simone Chiarugi for making me aware of the importance of training and tuning the senses to help build intarsia making skills.

86 For ideas of becoming, see Tim Ingold, Toward an Ecology of Materials, in: *Annual Review of Anthropology* 41, 2012, 427–442; and Karen Barad, Posthumanist Performativity: Toward an Understanding of How Matter Comes to Matter, in: *Signs: Journal of Women in Culture and Society* 28, 2003, no. 3, 801–831.

87 Cf. Manni 2002 (as in note 34).

88 For a discussion of human-nonhuman partnerships "as fellow travellers" in design, see Le Cain 2017 (as in note 3), 1–22. Of particular interest here is Le Cain's exploration of the role of the silkworm; ibid., 185–243.

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